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DIVISION OF SPERRY RAND CORPORATION

SPECIFICATION SHEET

SHEET	165	REVISION —

SPECIFICATION SYMBOL
SB-10163

COMMAND TEST

This program consists of a series of tests that check the functions of the instructions on the 1219 Computer. These tests are connected and controlled by an executive routine (COMA). Included within the command executive routine is a sequential updating of the ICR, thereby enabling one cycle of the command executive to check all instruction except Input/Output and the Enable Real Time Clock instructions, and the operational validity of all index registers.

The operator has the option of selecting either or both a computer console error display or an error typeout. If PROGRAM STOP 0 is set and an error is detected, the test, will stop and display the function code in the uppermost bits of the CO register. In those tests which use test patterns, correct versus incorrect bit information will be displayed in the AU and AL registers. AU will contain the correct bit configuration and AL will contain the incorrect bit configuration. However, on the tests for function codes 10, 11 and 62 the display will be reversed with AL containing the correct bit configuration and AU the incorrect. The shift function codes have shift count and bit error display. If PROGRAM SKIP 4 is not set, Typeout Subroutines will provide the operator with a typeout of the status of the Command Test. If an error is detected and PROGRAM SKIP 4 is not set, the function code of the erring instruction will be bufferred out in an error message. All messages are buffered out in field data code via channel 0.

The Command Test may be run separately or as a part of the Integrated Command-Arithmetic test. If it is run separately PROGRAM SKIP 2 must be set to remain in Command Test.

The following is the operating procedure for the COMMAND TEST:

    a. Disconnect the RTC

    b. Load the COMMAND TEST PROGRAM or the INTEGRATED TEST PROGRAM. The jumps and stops for this program are as specified in the following table.

PROGRAM SWITCH	PROGRAM ACTION
PROGRAM SKIP 0	Set to recycle current function code subroutine upon error detection
PROGRAM SKIP 2	Set to remain in COMMAND TEST
PROGRAM SKIP 4	Set to supress typeouts
PROGRAM STOP 0	Set for computer console error display
PROGRAM STOP 2	Set to end COMMAND TEST after a selected number of cycles of the command executive routine. (The number in address NYMB).

    c. Set PROGRAM SKIPS and STOPS as desired according to the above table.

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d. Master Clear the Computer.

e. Set the 1232/1532 channel number in AL
    bits 6 to 3.

f. Set bit AL bit 8 if the I/O Console is a 1532.

g. Set AL bits 17-15 as follows:

    Set bit 17 if computer is in 1218 normal mode
    Set bit 16 if computer is in 1218 NTDS mode
    Set bit 15 if computer is in 1219 normal mode

h. Insert (if necessary) the plug-in printed wiring
    assembly 7104010 in the location specified as
    follows:

    A4AlJ5G if computer is in 1218 normal mode
    A4AlJ5F if computer is in 1218 NTDS mode
    A4AlJ4G if computer is in 1219 normal mode

i. Set P=1501.

j. Start the Computer.

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TITLE: COMA - 1219B COMMAND TEST EXECUTIVE

DECK IDENTIFIER: FACT

CS-1 LABEL: COMA   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: H W M modified by TLR   DATE: 8 Dec. 67

NUMBER OF L₄ OUTPUT INSTRUCTIONS: 161

DESCRIPTION:

This routine is the Executive Control Routine for the 1219 Command Test. Upon entry into this routine as an individual program or as a subroutine, references are made to all subroutines which test the various instructions of the 1219B Computer. This routine sequentially updates the ICR, thereby ensuring the modification capability and the operational validity of all index registers Input/Output and the real time clock instructions are not covered by this program.

The program is initiated by setting P to 1501 if this routine is to be used as an individual program, or using address 1500 as the subroutine entrance if this routine is to be used as a subroutine. Upon entering this routine the following header is typed if PROGRAM SKIP 4 is not set: COMMAND TEST, ERROR DISPLAY AU, AL. Upon referencing each subroutine and at the completion of the subroutine run, the control is returned to COMA where PROGRAM SKIP 0 is checked for the test to continue. If PROGRAM SKIP 0 is set, the subroutine previously run is re-cycled until PROGRAM SKIP 0 is released. PROGRAM SKIP 0 may be set upon receiving an error stop during the running of an error display subroutine. COMA operates in 8 cycle runs, one for each index register. The 8 cycle runs are counted and when the number of runs is equal to the contents of address NYMB an error flag is checked to determine if an error occurred. If an error occurred, FAILED RECYCLE is typed. If no error occurred OK END is typed. After one of these typeouts, PROGRAM STOP 2 is referenced. If set the test is ended. If not set, PROGRAM SKIP 2 is referenced. If PROGRAM SKIP 2 is set, the program will remain in COMA. If it is not set, the program exits from COMA.

The typeouts are supressed in the subroutines TYPEC, TYPEF, TYPEO, TFDIS, and TSDIS, if PROGRAM SKIP 4 is set. PROGRAM STOP 0 is set during the running of COMA if an error stop is wanted in the error display subroutines TEDIS and TSDIS.

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TITLE: COMA - 1219B COMMAND TEST EXECUTIVE

INPUT PARAMETERS (Listed Sequentially):

SPERRF (Error Flag) from TFDIS and TSDIS

OUTPUT PARAMETERS (Listed Sequentially):

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):
TYPT IOSET TYPE TFDIS TSDIS ALL COMMAND TEST SUBROUTINES: TF10, TF11,
TF12,TF13,TF32,TF33,TF36,TF37,TF70,TS73,TF46,TF47,TF44,TF45,TF42,TF43,
TF74,TF75,TF40,TF41,TF14,TF15,TF20,TF21,TF71,TF16,TF17,TF22,TF23,TF24
TF25,TF26,TF27,TF02,TF03,TF06,TF07,TF04,TF05,TF51,TF52,TF53,TF34,TF60
TF61,TF62,TF63,TF64,TF65,TF66,TF67,TF35,TF55,TF76,TF30,TF31,TF73,TF56
TF57,TC61,TC65,TC67,TS62,TS61,TS63,TS60,TS41,TS42.TS43,TS45,TS46,TS47
TS44,TS51,TS52,TS53,TS54,and TS55.

ALARMS AND/OR REMARKS:
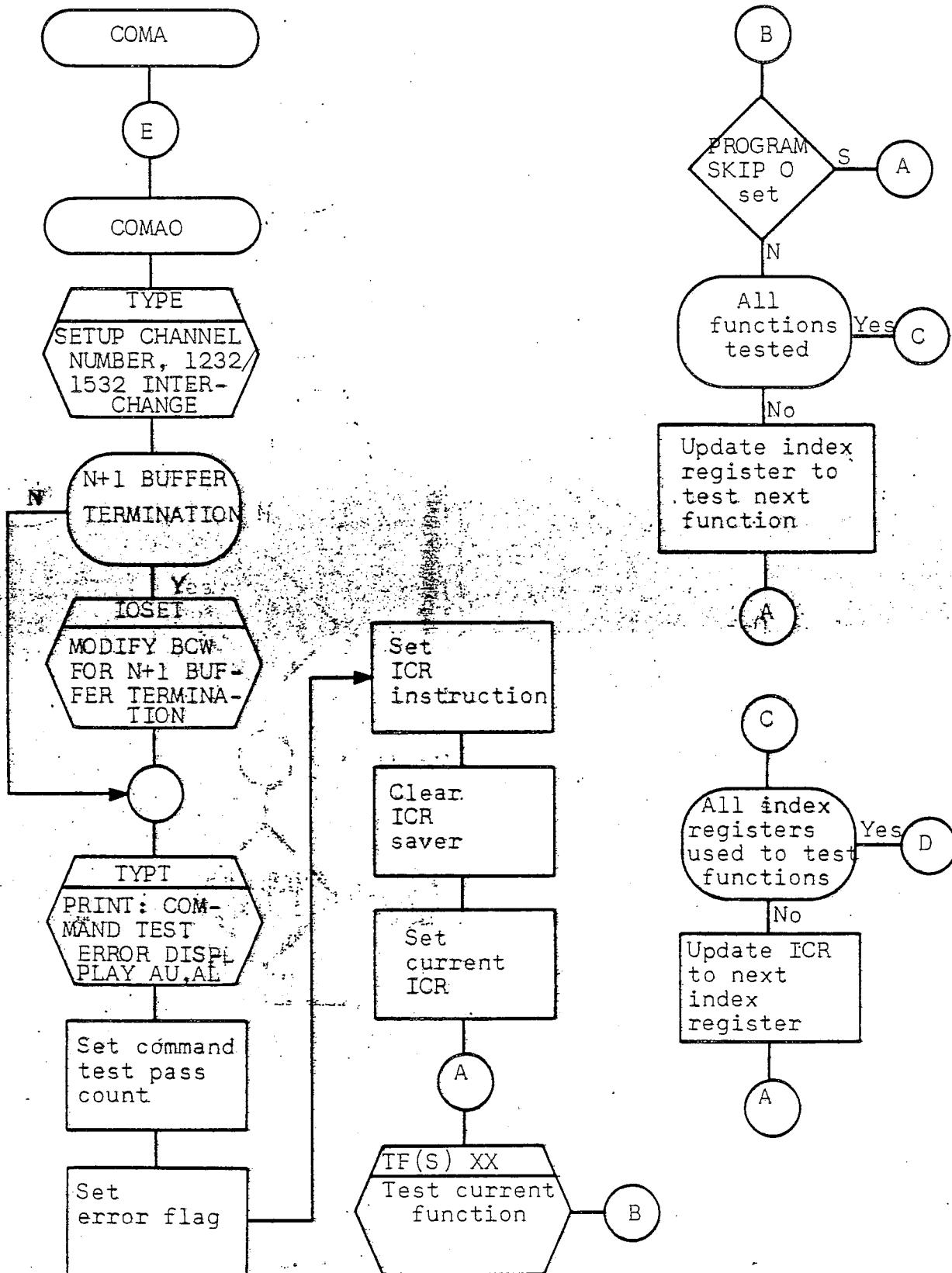
SYSTEM DATA REFERENCES:

PROGRAM SKIP 0:   Previously referenced subroutines will recycle until
                  PROGRAM SKIP 0 is set.
PROGRAM SKIP 2 set: Remain in the COMA routine, i.e., do not exit
                  as from a subroutine
PROGRAM STOP 2 set: STOP TEST at the completion of one 8 cycle run.
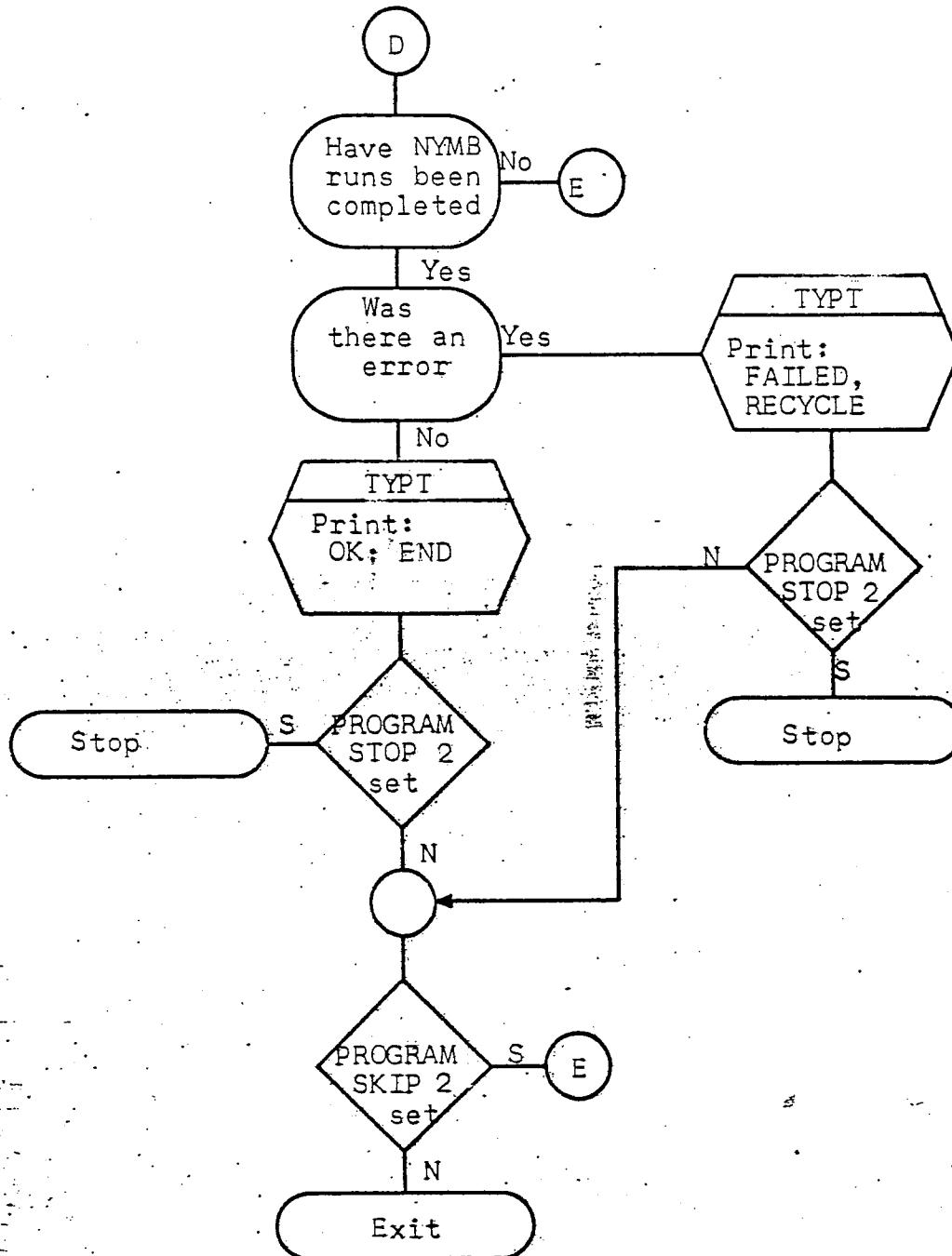
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(COMA)

(E)

(COMAO)

TYPE
SETUP CHANNEL NUMBER, 1232/1532 INTER-CHANGE

N+1 BUFFER TERMINATION — N

IOSET
MODIFY BCW FOR N+1 BUFFER TERMINATION

Yes

TYPT
PRINT: COMMAND TEST ERROR DISPLAY AU,AL

Set command test pass count

Set error flag

Set ICR instruction

Clear ICR saver

Set current ICR

(A)

TF(S) XX
Test current function — (B)

(B)

PROGRAM SKIP O set — S — (A)

N

All functions tested — Yes — (C)

No

Update index register to test next function

(A)

(C)

All index registers used to test functions — Yes — (D)

No

Update ICR to next index register

(A)

COMA - 1219B COMMAND TEST EXECUTIVE

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(D)

Have NYMB runs been completed ── No ──(E)

│ Yes

Was there an error ── Yes ── TYPT / Print: FAILED, RECYCLE

│ No

TYPT / Print: OK; END

PROGRAM STOP 2 set — N

PROGRAM STOP 2 set ── S ── Stop

Stop ── S ── PROGRAM STOP 2 set

│ N

PROGRAM SKIP 2 set ── S ──(E)

│ N

Exit

COMA - 1219B COMMAND TEST EXECUTIVE (Cont.)

SPECIFICATION SYMBOL
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TITLE: TYPE - SETUP CHANNEL NUMBER, 1232/1532 INTERCHANGE

DECK IDENTIFIER: FACT

CS-1 LABEL: TYPE   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: TLR   DATE: 8 Dec. 67

NUMBER OF L₄ OUTPUT INSTRUCTIONS: 25

DESCRIPTION:

This subroutine inserts the 1232/1532 channel number in all I/O
instructions. It also modifies the TYPT subroutine so as to
accept either 1232 or 1532 coded data.

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PROGRAM DATA PAGE (Cont)

SPECIFICATION SYMBOL
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TITLE: TYPE

INPUT PARAMETERS (Listed Sequentially):

ALPARM - Initial AL input parameter

OUTPUT PARAMETERS (Listed Sequentially):

T$1
T$2   I/O instructions with channel number inserted
T$3
T$4

RNOOP { RJP·CONVER if 1232 selected
        { ADDALK·40 if 1532 selected
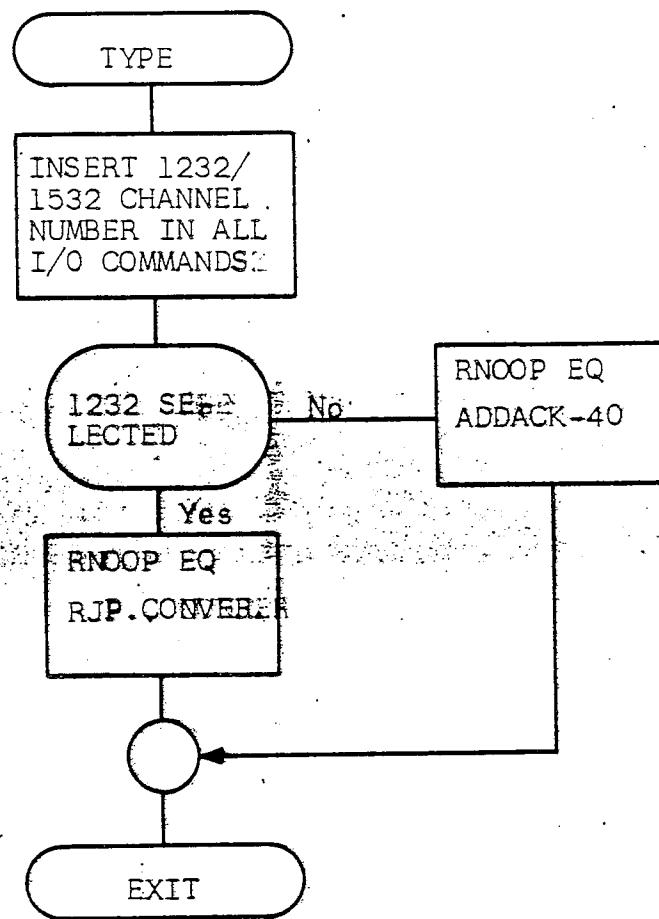
ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:

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SPECIFICATION SYMBOL
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```
        ⟨  TYPE  ⟩
            │
    ┌───────────────┐
    │ INSERT 1232/  │
    │ 1532 CHANNEL  │
    │ NUMBER IN ALL │
    │ I/O COMMANDS  │
    └───────────────┘
            │
       ╭──────────╮                  ┌──────────────┐
       │ 1232 SE- │      No          │ RNOOP EQ     │
       │ LECTED   │─────────────────▶│ ADDACK-40    │
       ╰──────────╯                  └──────────────┘
            │ Yes                           │
    ┌───────────────┐                       │
    │ RNOOP EQ      │                       │
    │ RJP.CONVERT   │                       │
    └───────────────┘                       │
            │                               │
           ( )◀──────────────────────────────
            │
        ⟨  EXIT  ⟩
```

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PROGRAM DATA PAGE

SPECIFICATION SYMBOL
SB-10163

TITLE: IOSET

DECK IDENTIFIER: FACT

CS-1 LABEL: IOSET   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: TLR   DATE: 8 DEC. 67

NUMBER OF L$_4$ OUTPUT INSTRUCTIONS: 10

DESCRIPTION:

This subroutine modifies output and external function buffers for
N+1 Termination.

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TITLE: IOSET

INPUT PARAMETERS (Listed Sequentially):

T$1+2
T$2+2

OUTPUT PARAMETERS (Listed Sequentially):

T$1+2
T$2+1

ABNORMAL EXITS (Listed Sequentially):
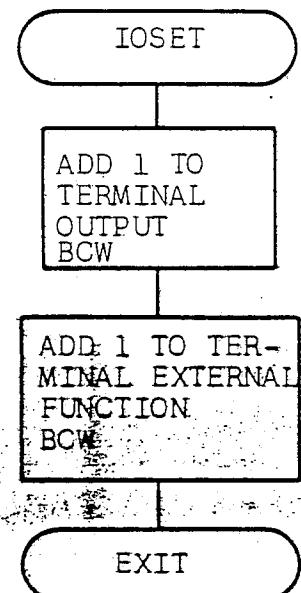
NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:

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```
        ( IOSET )
           |
   +----------------+
   | ADD 1 TO       |
   | TERMINAL       |
   | OUTPUT         |
   | BCW            |
   +----------------+
           |
   +----------------+
   | ADD 1 TO TER-  |
   | MINAL EXTERNAL |
   | FUNCTION       |
   | BCW            |
   +----------------+
           |
        ( EXIT )
```

	SPECIFICATION SYMBOL
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TITLE: TFDIS - Error display for type 1 instructions

DECK IDENTIFIER: FACT

CS-1 LABEL: TFDIS   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: TLR   DATE: 8 Dec. 67

NUMBER OF L_4 OUTPUT INSTRUCTIONS: 58

DESCRIPTION:

This subroutine, TFDIS, displays errors for type 1 instructions.

PROGRAM SKIP 4 is referenced when TFDIS is entered. If PROGRAM SKIP 4 is set the error display will be in the CO, AU, and AL registers only. If PROGRAM SKIP 4 is not set there will be an error typeout followed by the console register error display. The console register error display displays the errors if PROGRAM STOP O is set.

If PROGRAM SKIP 4 is set, CO is entered with the function code in error and PROGRAM STOP O is referenced. If PROGRAM STOP O is set, the program stops, displaying the function code in CO and appropriate patterns in AU and AL. Upon restarting, or if PROGRAM STOP O is not set, CO is cleared and an exit is made from the subroutine. If PROGRAM SKIP 4 is not set, the error flag in COMA is set, the printer is enabled and Function Code XX typed. The printer is disabled and the console register display portion of TFDIS is entered.

TITLE: TFDIS - Error display subroutine for type 1 instructions

INPUT PARAMETERS (Listed Sequentially):

ALL Type 1 Instructions
  $BUFF_1$
  $BUFF_2$
  TFX

OUTPUT PARAMETERS (Listed Sequentially):
  SPERRF (Error Flag)
  Buffer BUFF to BUFF2 (FUNCTION CODE XX)

AENORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):
  COMA
ALL COMMAND TEST SUBROUTINES
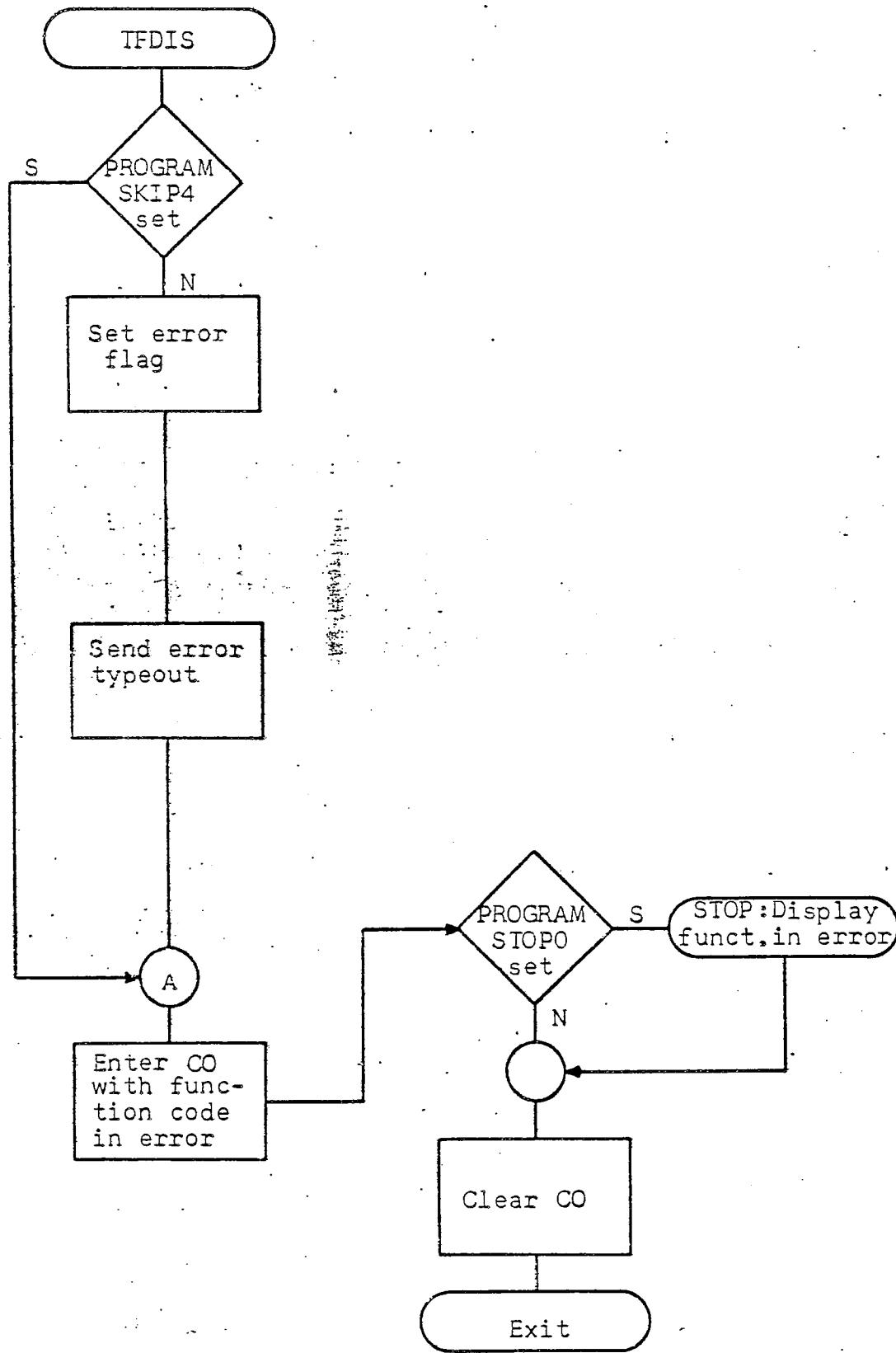
SYSTEM DATA REFERENCES:
PROGRAM SKIP 4 set: error typeout not wanted, continue with console
                     error display   not set: error typeout
                     (Function Code XX)
PROGRAM STOP 0 set: stop for console error display

ALARMS AND/OR REMARKS:

```
                    ( TFDIS )
                        │
                        ▼
            S      ◇ PROGRAM ◇
         ◄─────────   SKIP4
                        set
                        │ N
                        ▼
                  ┌───────────┐
                  │ Set error │
                  │ flag      │
                  └───────────┘
                        │
                        ▼
                  ┌───────────┐
                  │ Send error│
                  │ typeout   │
                  └───────────┘
                        │
                        ▼
                       (A)
                        │
                        ▼
                  ┌───────────┐
                  │ Enter CO  │
                  │ with func-│────►
                  │ tion code │
                  │ in error  │
                  └───────────┘
```

```
                  ◇ PROGRAM ◇    S    ( STOP:Display )
                     STOPO    ─────────( funct.in error)
                      set
                       │ N
                       ▼
                      ( )◄──────────────────
                       │
                       ▼
                  ┌───────────┐
                  │ Clear CO  │
                  └───────────┘
                       │
                       ▼
                  (   Exit   )
```

TFDIS - ERROR DISPLAY SUBROUTINE FOR TYPE 1 INSTRUCTIONS

TITLE: TSDIS - Error display for type 2 instructions

DECK IDENTIFIER: FACT

CS-1 LABEL: TSDIS   KEY: IS LABEL DUPLICATE? No

PROGRAMMER: TLR   DATE: 8 Dec. 67

NUMBER OF L_4 OUTPUT INSTRUCTIONS: 27

DESCRIPTION:

This subroutine, TSDIS, displays errors for type 2 instructions.

PROGRAM SKIP 4 is referenced when TSDIS is entered. If PROGRAM SKIP 4 is set the error display will be in the CO, AU and AL registers only. If PROGRAM SKIP 4 is not set there will be an error typeout followed by the console register error display. The console register error display displays the errors if PROGRAM STOP 0 is set.

If PROGRAM SKIP 4 is set, CO is entered with the function code in error and PROGRAM STOP 0 is referenced. If PROGRAM STOP 0 is set the program stops, displaying the function code in CO and appropriate patterns in AU and AL. Upon restarting or if PROGRAM STOP 0 is not set, CO is cleared and an exit is made from the subroutine. If PROGRAM SKIP 4 is not set the error flag in COMA is set. The printer is enabled and the message, Function Code 50XX, typed. The printer is disabled and the console register display portion of TSDIS is entered.

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TITLE: TSDIS - Error display for type 2 instructions

INPUT PARAMETERS (Listed Sequentially):

All Type 2 Instructions

BUFF 1
BUFF 2
BUFF 3
BUFF 4
TFX

OUTPUT PARAMETERS (Listed Sequentially):

SPERRF (Error Flag)
Buffer BUFF to BUFF2 (FUNCTION CODE XXXX)

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA
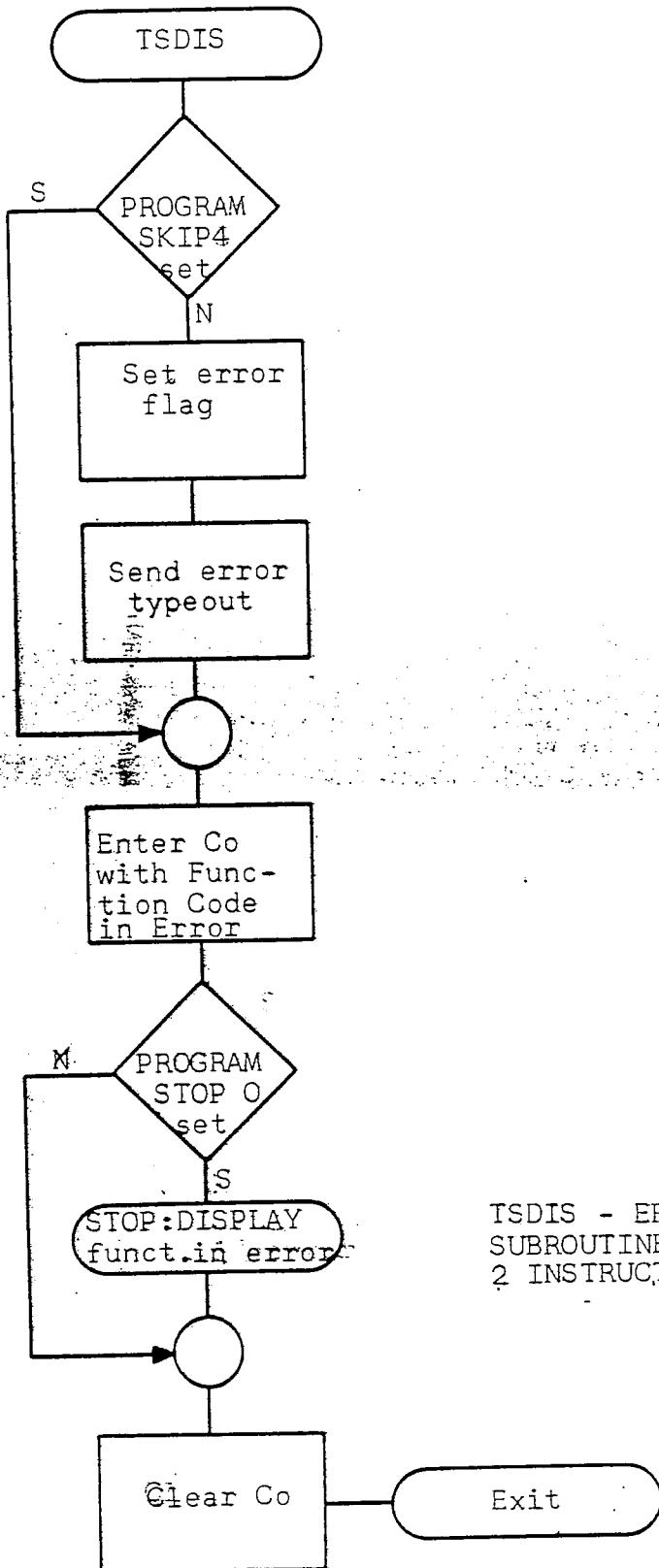
ALL COMMAND TEST SUBROUTINES

SYSTEM DATA REFERENCES:

PROGRAM SKIP 4 set: error typeout not wanted, continue with register
                     error display
PROGRAM STOP 0 set: stop for error display

ALARMS AND/OR REMARKS:

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```
                    ╭──────────────╮
                    │    TSDIS     │
                    ╰──────────────╯
                           │
              S           ◇◇◇
         ┌─────────────  PROGRAM  
         │               SKIP4
         │               set ◇◇
         │                │ N
         │          ┌──────────────┐
         │          │  Set error   │
         │          │    flag      │
         │          └──────────────┘
         │                 │
         │          ┌──────────────┐
         │          │  Send error  │
         │          │   typeout    │
         │          └──────────────┘
         │                 │
         │                ◯
         └───────────────►
                          │
                 ┌──────────────┐
                 │  Enter Co    │
                 │  with Func-  │
                 │  tion Code   │
                 │  in Error    │
                 └──────────────┘
                          │
                         ◇◇◇
              N          PROGRAM
         ┌─────────────  STOP O
         │               set ◇◇
         │                │ S
         │          ╭──────────────╮
         │          │ STOP:DISPLAY │
         │          │funct.in error│
         │          ╰──────────────╯
         │                 │
         │                ◯
         └───────────────►
                          │
                 ┌──────────────┐        ╭──────────────╮
                 │  Clear Co    │────────│     Exit     │
                 └──────────────┘        ╰──────────────╯
```

TSDIS - ERROR DISPLAY
SUBROUTINE FOR TYPE
2 INSTRUCTIONS

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PROGRAM DATA PAGE

SPECIFICATION SYMBOL
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TITLE: TPAT - TEST PATTERNS FOR COMA

DECK IDENTIFIER: FACT

CS-1 LABEL: TPAT   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: P M C modified by TLR   DATE: 8 Dec. 67

NUMBER OF L_4 OUTPUT INSTRUCTIONS: 83

DESCRIPTION:

This subroutine contains all the normal test patterns and constants used in COMA.

Also contained within TPAT are the shift set up (17 & 22) for the testing of shift instructions.

TITLE: ___TPAT - TEST PATTERNS FOR COMA___

INPUT PARAMETERS (Listed Sequentially):

OUTPUT PARAMETERS (Listed Sequentially):

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

All COMA Subroutines

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:

SPECIFICATION SYMBOL
SB-10163

TITLE: TF02-COMPARE A LOWER WITH Y (02xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF02   KEY: _____   IS LABEL DUPLICATE? No

PROGRAMMER: F W S modified by TLR   DATE: 8 Dec. 67

NUMBER OF L_4 OUTPUT INSTRUCTIONS: 45

DESCRIPTION:

This subroutine tests the Compare A Lower with Y instruction
(Function Code 02). Patterns are entered into AL and shifted for a
sliding ones and sliding zero patterns. A CMAL instruction is then
executed utilizing an associated pattern. The jump equals and jump
not equals instructions are used for checking validity of each execu-
tion. If all execution is correct an exit is made to the executive
routine (COMA). If an error is detected, the correct bit configura-
tion is entered into A Upper, the incorrect into A Lower, and an
exit is made to the display subroutine (TFDIS). Upon return from
TFDIS an exit is made to the executive routine (COMA) for continuing
the test or recycling this subroutine.

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TITLE: __TF02 - COMPARE A LOWER WITH Y (02xxxx)__

INPUT PARAMETERS (Listed Sequentially):

COMA.   TEST PATTERNS

	TPAT1	-00.0000
	TPAB1	-00.0001
	TCO	-77.7776

OUTPUT PARAMETERS (Listed Sequentially):

BUFF1
BUFF2
TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA
TFDIS (Error Display)

SYSTEM DATA REFERENCES:
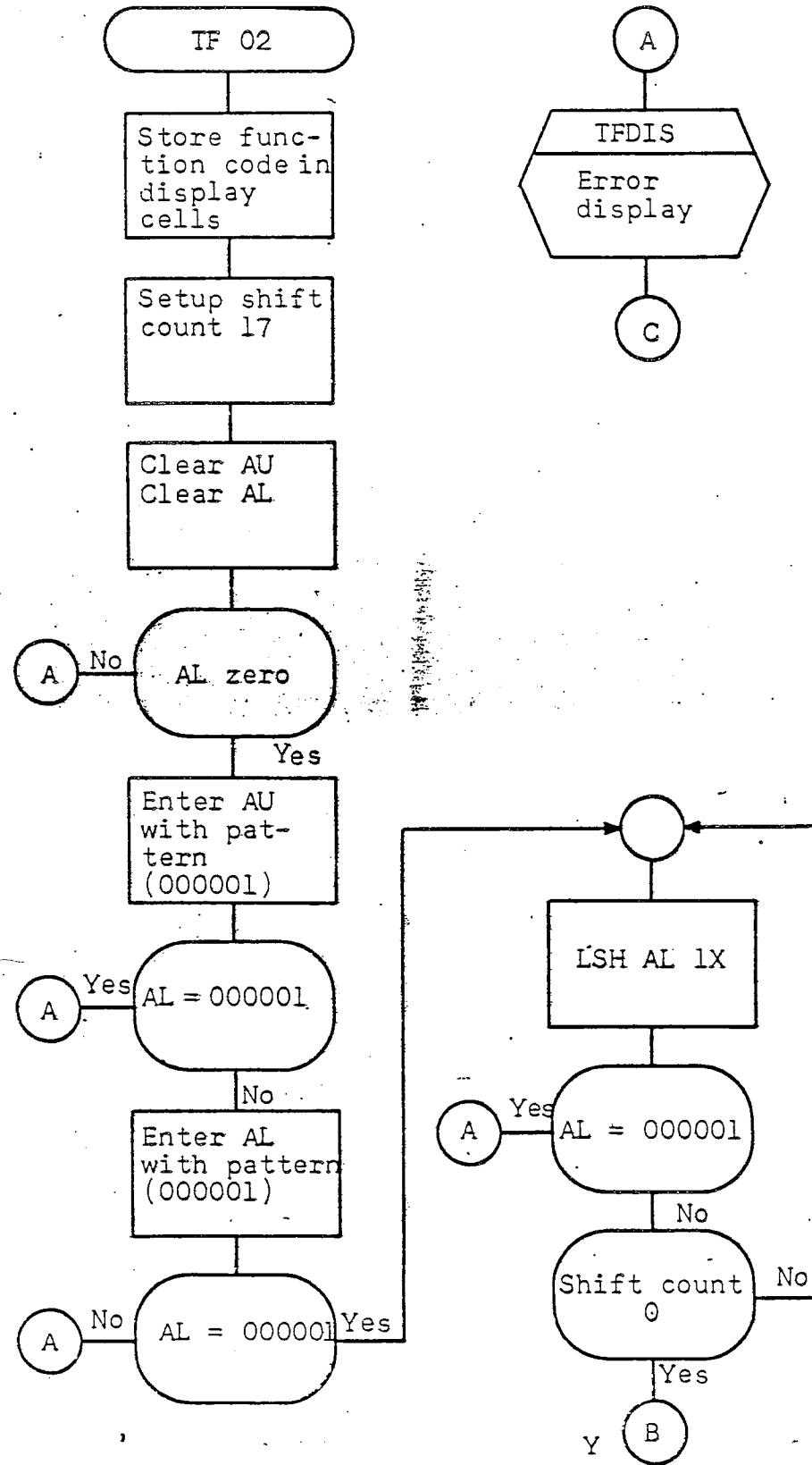
ALARMS AND/OR REMARKS:
   PROGRAM SKIP 4 - set for error display only
                    not set for error typeout (Function Code 02)
   PROGRAM STOP 0 - A Upper contains correct information
                    A Lower contains incorrect information
                    CO contains the function code (02xxxx)
   PROGRAM SKIP 0 - not set to continue test
                    set to recycle subroutine (TF02)
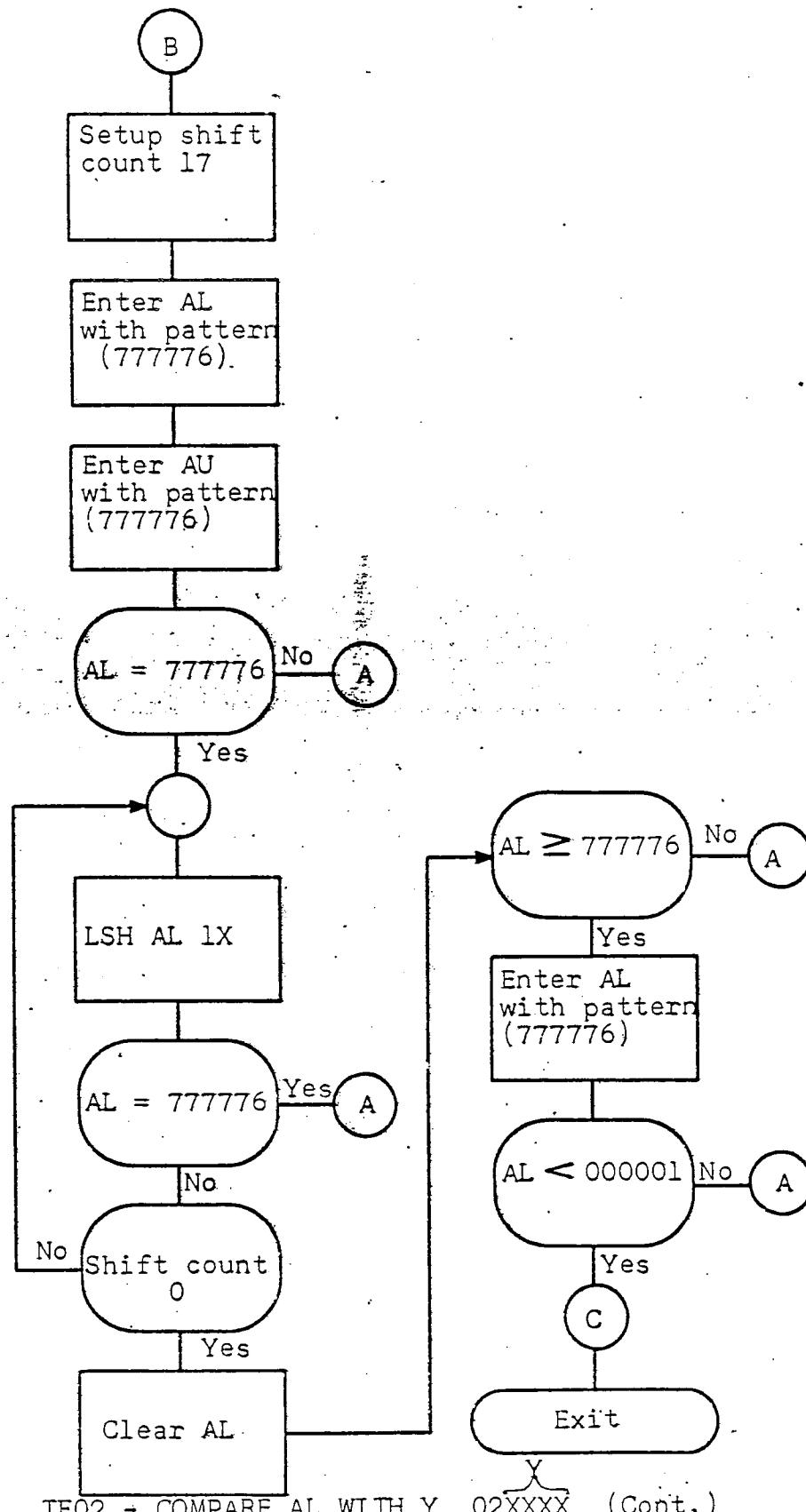
```
        ( TF 02 )                        ( A )

   ┌─────────────┐                  ┌─────────────┐
   │Store func-  │                  │   TFDIS     │
   │tion code in │                  │   Error     │
   │display      │                  │   display   │
   │cells        │                  └─────────────┘
   └─────────────┘                        │
                                        ( C )
   ┌─────────────┐
   │Setup shift  │
   │count 17     │
   └─────────────┘

   ┌─────────────┐
   │Clear AU     │
   │Clear AL     │
   └─────────────┘

   No  ╭──────────╮
( A )──│ AL zero  │
       ╰──────────╯
              Yes

   ┌─────────────┐
   │Enter AU     │
   │with pat-    │
   │tern         │
   │(000001)     │
   └─────────────┘

   Yes ╭──────────────╮                        ( )
( A )──│ AL = 000001  │              ┌─────────────┐
       ╰──────────────╯              │             │
              No                     │  LSH AL 1X  │
   ┌─────────────┐                   └─────────────┘
   │Enter AL     │
   │with pattern │           Yes ╭──────────────╮
   │(000001)     │        ( A )──│ AL = 000001  │
   └─────────────┘               ╰──────────────╯
                                        No
   No ╭──────────────╮ Yes        ╭──────────────╮ No
( A )─│ AL = 000001  │────         │ Shift count  │──
      ╰──────────────╯             │     0        │
                                   ╰──────────────╯
                                        Yes
                                  Y   ( B )
```

TF02 - COMPARE AL WITH Y   02XXXX

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(B)

Setup shift
count 17

Enter AL
with pattern
(777776).

Enter AU
with pattern
(777776)

AL = 777776 — No — (A)

Yes

LSH AL 1X

AL = 777776 — Yes — (A)

No

Shift count
0

No

Yes

Clear AL

AL ≥ 777776 — No — (A)

Yes

Enter AL
with pattern
(777776)

AL < 000001 — No — (A)

Yes

(C)

Exit

TF02 - COMPARE AL WITH Y   02XXXX   (Cont.)

SPECIFICATION SYMBOL
SB-10163

TITLE: TF03 - TEST COMPARE AL TO Y+B (03xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF03   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: F W S modified by TLR   DATE: 8 Dec. 67

NUMBER OF L_4 OUTPUT INSTRUCTIONS: 32

DESCRIPTION:

This subroutine checks the Compare A Lower To Y + B instruction (Function Code 03). A Lower is entered with a pattern after which a CMALB is executed and verified with a Jump Equals instruction. If correct, the pattern is shifted and the 03 instruction is again executed and verified. If correct a B Skip instruction is used to update B while patterns are entered into AL as a result of an add ALK. These patterns are also utilized for the execution of an 03 instruction and verified with a Jump Equals. If an error is detected during verification, the correct information is entered into A Upper, the incorrect into A Lower, and an exit is made to the Display subroutine (TFDIS). Upon returning to this subroutine (TF03), an exit is made to the Executive routine (COMA) for continuing the test or recycling this subroutine.

SPECIFICATION SYMBOL
SB-10163

TITLE: TF03 – TEST COMPARE AL TO Y+B (03xxxx)

INPUT PARAMETERS (Listed Sequentially):

COMA   TEST PATTERNS

                            TCO   -777776
                            TPAB7   -000022

OUTPUT PARAMETERS (Listed Sequentially):

BUFF 1
BUFF 2
TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):
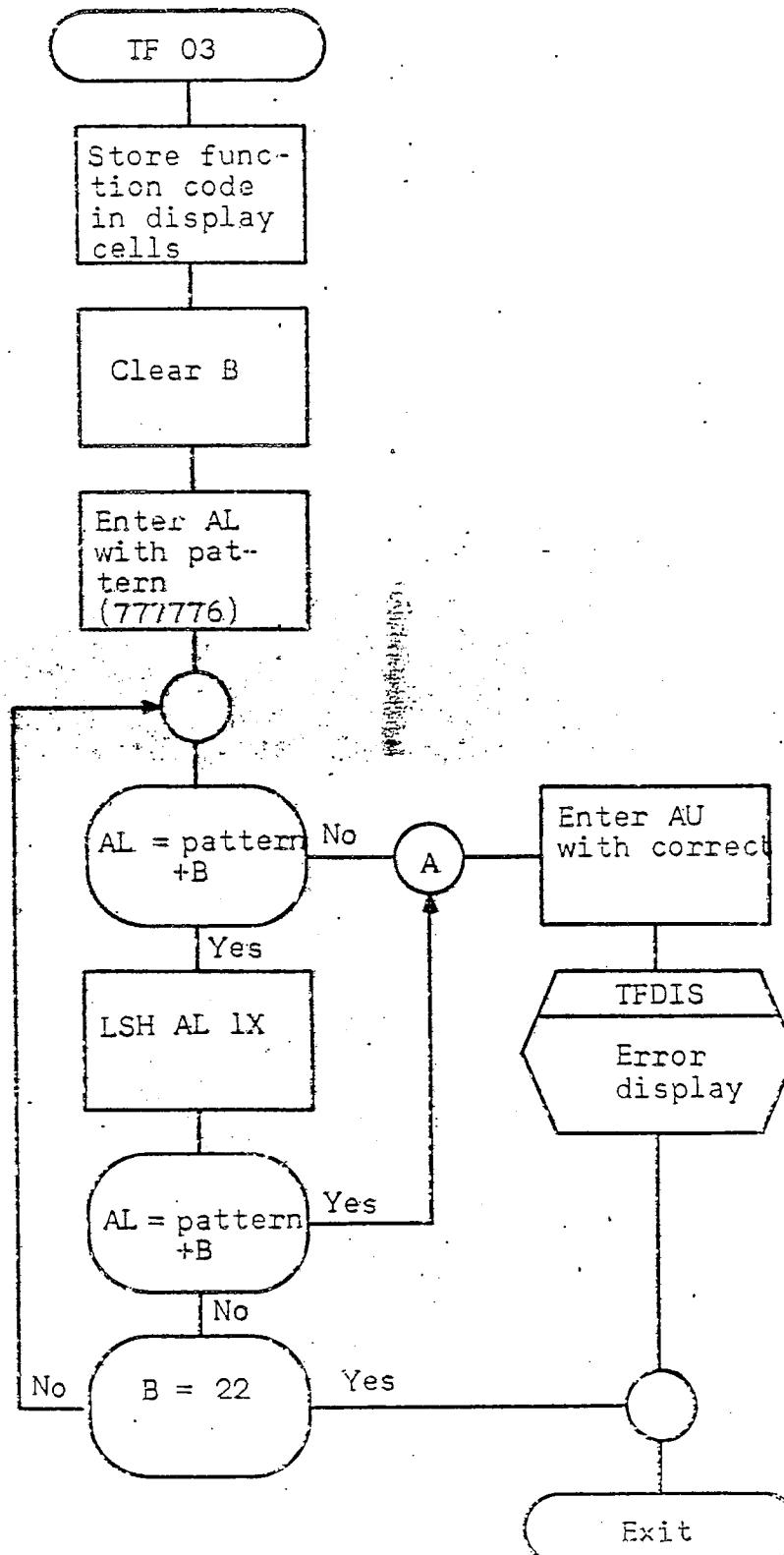
COMA (EXEC)
TFDIS (Error Display)

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:

ERROR DISPLAY   - set for error display only
PROGRAM SKIP 4 - not set for error typeout (Function Code 03)
PROGRAM STOP 0 - Correct information in A Upper
                  incorrect information in A Lower
                  Function code (03xxxx) in CO
PROGRAM SKIP 0 - not set to continue test
                  set to recycle subroutine (TF03)

UNIVAC
DIVISION OF SPERRY RAND CORPORATION

SPECIFICATION SHEET

SHEET	191	REVISION	—

SPECIFICATION SYMBOL
SB-10163

```
        ( TF 03 )
            │
   ┌─────────────────┐
   │ Store func-     │
   │ tion code       │
   │ in display      │
   │ cells           │
   └─────────────────┘
            │
   ┌─────────────────┐
   │                 │
   │   Clear B       │
   │                 │
   └─────────────────┘
            │
   ┌─────────────────┐
   │ Enter AL        │
   │ with pat-       │
   │ tern            │
   │ (777776)        │
   └─────────────────┘
            │
           (○)◀──────────────┐
            │                │
       ┌────────┐            │
      (AL = pattern) ─No─ (A) ─── ┌──────────────┐
      (   +B    )                 │ Enter AU     │
       └────────┘                 │ with correct │
           │ Yes                  └──────────────┘
   ┌─────────────────┐                   │
   │  LSH AL 1X      │              ┌──────────┐
   │                 │              │  TFDIS   │
   └─────────────────┘              │  Error   │
           │                        │  display │
      ┌────────┐                    └──────────┘
     (AL = pattern) ─Yes────┘            │
     (   +B    )                         │
      └────────┘                         │
           │ No                          │
      ┌────────┐                        (○)
  No ─(  B = 22  )─ Yes ─────────────────┘
      └────────┘                         │
                                    ( Exit )
```

TF03:   COMPARE AL WITH Y+B   03XXXX
                                  Y

SPECIFICATION SYMBOL
SB-10163

TITLE: TF04 - SELECTIVE SUBSTITUTE (04xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF04   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: P M C modified by TLR   DATE: 8 Dec. 67

NUMBER OF L_1 OUTPUT INSTRUCTIONS: 44

DESCRIPTION:

This subroutine checks the Selective Substitute command. A variety
of patterns are brought into AU and AL with a SLSU executed using
a test·pattern. At the completion of the Selective Substitute
the result is checked for validity by comparing AL with the correct
information. If correct, the subroutine goes to the next pattern;
when all patterns are complete the subroutine returns to the execu-
tive routine (COMA). If the validity check detects an error, the
correct information is entered into AU; AL will contain the in-
correct. A return jump is then made to the display subroutine where,
with PROGRAM STOP 0 set, the display may be evaluated.

TITLE: TF04 - SELECTIVE SUBSTITUTE (04xxxx)

INPUT PARAMETERS (Listed Sequentially):

COMA   TEST PATTERNS

TPAT1	000000	TPAT7	070707
TPAT2	252525	TPAB1+1	777776
TPAT2+1	252525	TPAT4	770000
TPAT5	007777	TPAK7	777070
TPAT4	770000		
TPAT	777777		
TPAT3	525252		
TPAT3+1	525252		

OUTPUT PARAMETERS (Listed Sequentially):

BUFF1
BUFF2
TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):
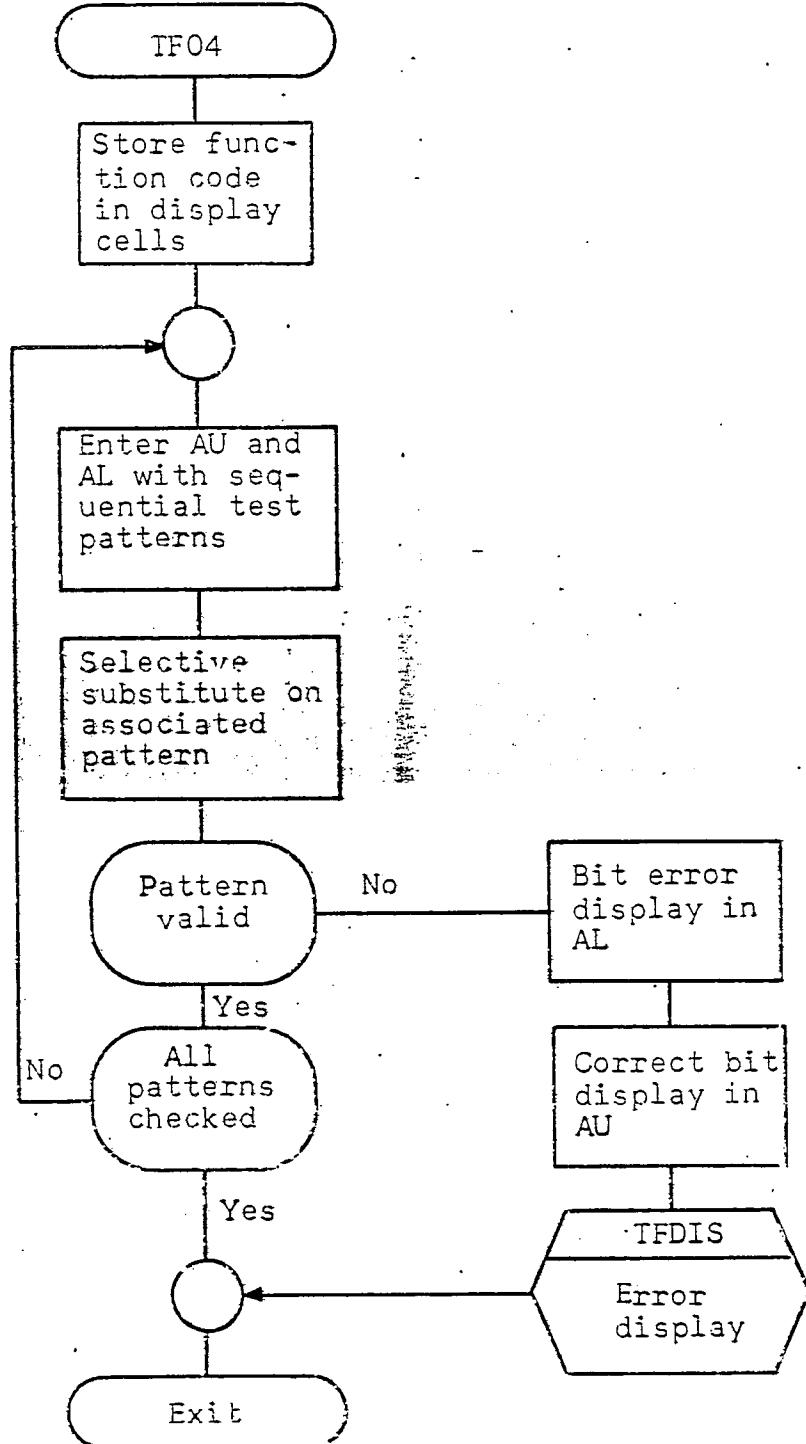
COMA - RETURN TO EXEC
TFDIS - ERROR DISPLAY

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:

ERROR DETECTION - PROGRAM STOP 0 set display of bit error in AL-
            correct bit configuration in AU - function code
            in CO (04)

PROGRAM SKIP 4 - set for console error display only,
            not set for error typeout (Function Code 04)

PROGRAM SKIP 0 - set to recycle subroutine (TF04)
            not set to continue test

SPECIFICATION SYMBOL
SB-10163

```
        ┌──────────────┐
        (    TF04      )
        └──────┬───────┘
               │
        ┌──────┴───────┐
        │ Store func-  │
        │ tion code    │
        │ in display   │
        │ cells        │
        └──────┬───────┘
               │
            ( ○ )◄──────────────┐
               │                │
        ┌──────┴───────┐        │
        │ Enter AU and │        │
        │ AL with seq- │        │
        │ uential test │        │
        │ patterns     │        │
        └──────┬───────┘        │
               │                │
        ┌──────┴───────┐        │
        │ Selective    │        │
        │ substitute on│        │
        │ associated   │        │
        │ pattern      │        │
        └──────┬───────┘        │
               │                │
          ╭────┴────╮   No   ┌──────────────┐
          │ Pattern ├───────►│ Bit error    │
          │ valid   │        │ display in   │
          ╰────┬────╯        │ AL           │
               │ Yes         └──────┬───────┘
          ╭────┴────╮               │
     No   │ All     │        ┌──────┴───────┐
    ┌─────┤ patterns│        │ Correct bit  │
    │     │ checked │        │ display in   │
    │     ╰────┬────╯        │ AU           │
    │          │ Yes         └──────┬───────┘
    │          │              ╱─────┴──────╲
    │        ( ○ )◄──────────┤   TFDIS     │
    │          │              │   Error    │
    │          │              │   display  │
    │   ┌──────┴───────┐      ╲────────────╱
    │   (    Exit      )
    │   └──────────────┘
```

TF04:   SELECTIVE SUBSTITUTE

SPECIFICATION SYMBOL
SB-10163

TITLE: TF05 - TEST SELECTIVE SUBSTITUTE PLUS B (05xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF05   KEY: _____   IS LABEL DUPLICATE? No

PROGRAMMER: P M C modified by TLR   DATE: 8 Dec. 67

NUMBER OF L₄ OUTPUT INSTRUCTIONS: 50

DESCRIPTION:

This subroutine tests the Selective Substitute Plus B command
(Function Code 05). A variety of patterns are entered into the B
Register, A Upper, and A Lower. Then the SLSUB instruction is
executed and checked for proper execution by a comparison with an
associated pattern. If execution was proper, the next set of
patterns is used. This continues until all sets have been used
and verified. If all are correct an exit is made to the Executive
routine (COMA). If an error is detected, the correct information
is entered in A Upper; A Lower contains the incorrect information,
and an exit is made to the Display subroutine (TFDIS). Upon re-
turning to this subroutine (TF05) an exit is made to the Executive
routine (COMA) for continuing the test or recyclying this sub-
routine (TF05).

SPECIFICATION SYMBOL
SB-10163

TITLE: TF05 - TEST SELECTIVE SUBSTITUTE PLUS B (05xxxx)

INPUT PARAMETERS (Listed Sequentially):

COMA

TEST PATTERNS

TPAB1	-000001	TPAS4	-000002
TPAT1	-000000	TPAS7	-777775
TPAT2+1	-252525	TPAS5	-000004
TPAT3	-525252	TPAT7	-070707
TPAT5	-007777	TPAK7	-077070
TPAT4	-770000		
TPAT	-777777		
TPAB1+1	-777776		

OUTPUT PARAMETERS (Listed Sequentially):

BUFF1
BUFF2
TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA (EXEC)
TFDIS (Error Display)
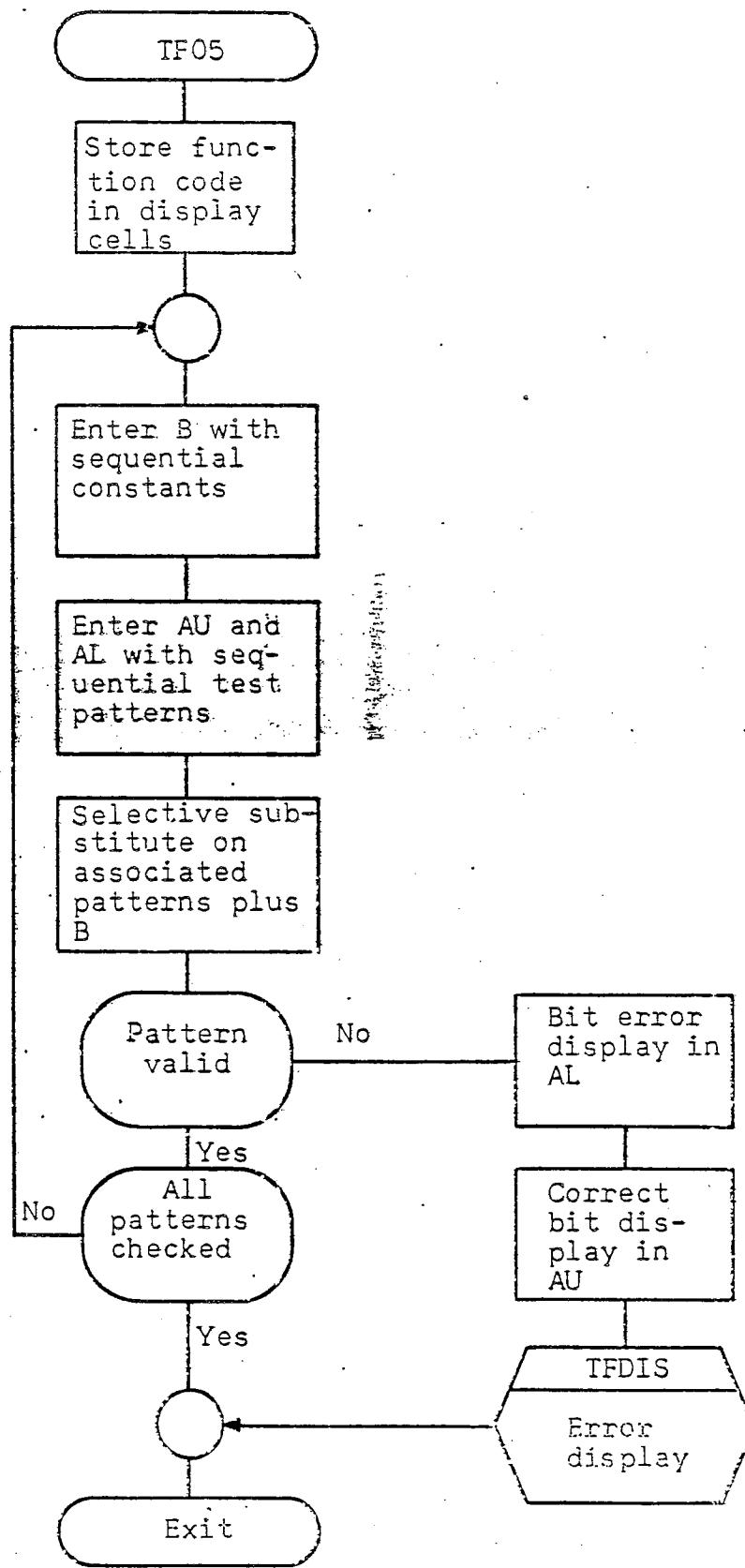
SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:

ERROR DISPLAY
PROGRAM STOP 0 - Correct information in A Upper
                 Incorrect information in A Lower
                 Function code (05xxxx) in CO
PROGRAM SKIP 4 - Set for console error display only
                 Not set for error typeout (Function code 05)
PROGRAM SKIP 0 - Not set to continue test
                 Set to recycle S/R (TF05)

SPECIFICATION SYMBOL
SB-10163

```
                    ( TF05 )
                       │
          ┌────────────────────────┐
          │ Store func-            │
          │ tion code             │
          │ in display            │
          │ cells                 │
          └────────────────────────┘
                       │
                      ( )◄──────────┐
                       │            │
          ┌────────────────────────┐│
          │ Enter B with          ││
          │ sequential            ││
          │ constants             ││
          └────────────────────────┘│
                       │            │
          ┌────────────────────────┐│
          │ Enter AU and          ││
          │ AL with seq-          ││
          │ uential test          ││
          │ patterns              ││
          └────────────────────────┘│
                       │            │
          ┌────────────────────────┐│
          │ Selective sub-        ││
          │ stitute on            ││
          │ associated            ││
          │ patterns plus         ││
          │ B                     ││
          └────────────────────────┘│
                       │            │
                ( Pattern )───No───► ┌──────────────┐
                ( valid   )          │ Bit error    │
                       │             │ display in   │
                      Yes            │ AL           │
                       │             └──────────────┘
                ( All      )                │
          No──( patterns  )          ┌──────────────┐
                ( checked  )          │ Correct      │
                       │             │ bit dis-     │
                      Yes            │ play in      │
                       │             │ AU           │
                       │             └──────────────┘
                       │                    │
                      ( )◄───────── < TFDIS      >
                       │            < Error       >
                       │            < display     >
                    ( Exit )
```

TF05: SELECTIVE SUBSTITUTE PLUS B

SPECIFICATION SYMBOL
SB-10163

TITLE: TF06 - TEST COMPARE MASK (06xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF06   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: F W S modified by TLR   DATE: 8 Dec. 67

NUMBER OF L₄ OUTPUT INSTRUCTIONS: 33

DESCRIPTION:

This subroutine tests the Compare Mask instruction (Function Code
06). A mask is entered into A Upper and, utilizing sliding zero
patterns in A Lower, the CMSK instruction is executed and checked
for proper execution. If each execution is correct and all patterns
have been checked an exit is made to the executive routine (COMA).
If an error is detected in one of the checks, the correct pattern is
entered into A Upper, A Lower contains the incorrect pattern, and
an exit is made to the display subroutine (TFDIS). Upon returing
to this subroutine (TF06) an exit is made to the executive routine
(COMA) to check for continuing the test or recycling this subroutine
(TF06).

ALARMS AND/OR REMARKS:
ERROR DISPLAY
PROGRAM STOP 0 - Correct information if
incorrect information.
Function code (06xxxx)
PROGRAM SKIP 4 - Set for console error
Not set for error type
PROGRAM SKIP 0 - Not set to continue &
Set to recycle subrout

SPECIFICATION SYMBOL
SB-10163

TITLE: TF06 - TEST COMPARE MASK (06xxxx)

INPUT PARAMETERS (Listed Sequentially):

COMA   TEST PATTERNS
                     TPAT   777777

OUTPUT PARAMETERS (Listed Sequentially):
 BUFF1
 BUFF2
 TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

 COMA
 TFDIS (Error Display)
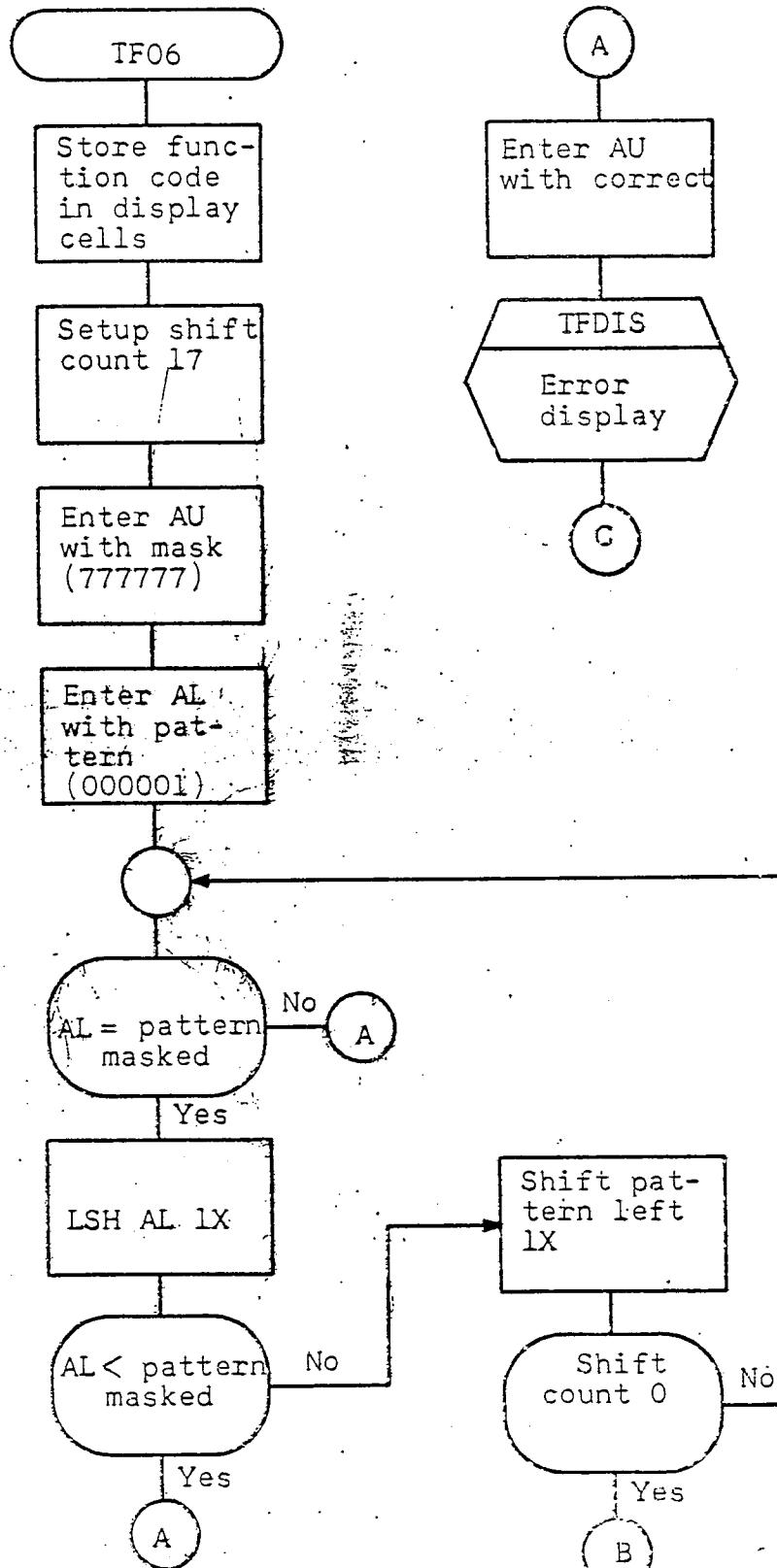
SYSTEM DATA REFERENCES:
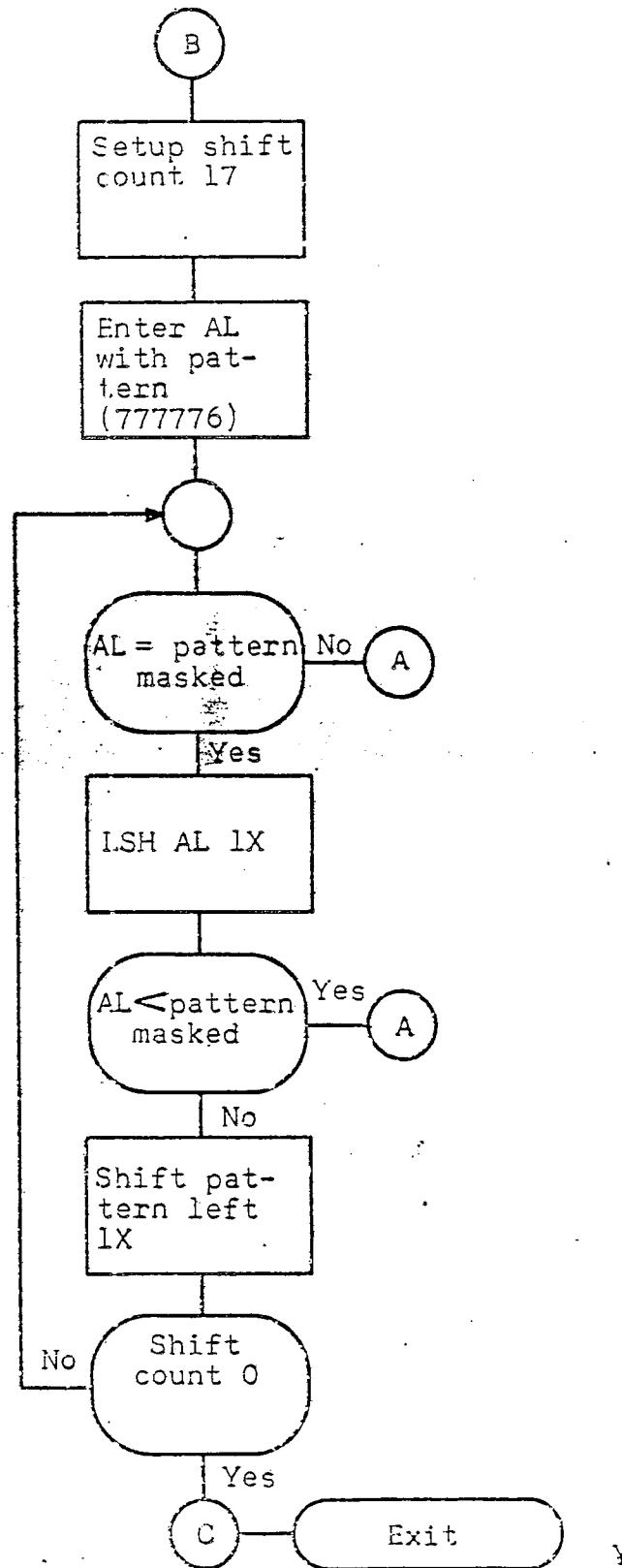
ALARMS AND/OR REMARKS:
 ERROR DISPLAY
 PROGRAM STOP 0 - Correct information in A Upper
                  Incorrect information in A Lower
                  Function code (06xxxx) in CO
 PROGRAM SKIP 4 - Set for console error display only
                  Not set for error typeout (Function code 06)
 PROGRAM SKIP 0 - Not set to continue test
                  Set to recycle subroutine (TF06)

A-1275

```
     ( TF06 )                                  ( A )
         |                                       |
+-----------------+                    +-----------------+
| Store func-     |                    | Enter AU        |
| tion code       |                    | with correct    |
| in display      |                    |                 |
| cells           |                    +-----------------+
+-----------------+                             |
         |                               /--------------\
+-----------------+                      |    TFDIS     |
| Setup shift     |                      |--------------|
| count 17        |                      |   Error      |
|                 |                      |   display    |
+-----------------+                      \--------------/
         |                                       |
+-----------------+                            ( C )
| Enter AU        |
| with mask       |
| (777777)        |
+-----------------+
         |
+-----------------+
| Enter AL        |
| with pat-       |
| tern            |
| (000001)        |
+-----------------+
         |
        ( )<-------------------------------------------+
         |                                             |
   /-----------\   No                                  |
   | AL = pattern|------( A )                           |
   | masked    |                                        |
   \-----------/                                        |
         | Yes                                          |
+-----------------+              +-----------------+    |
|                 |              | Shift pat-      |    |
| LSH AL 1X       |------------->| tern left       |    |
|                 |              | 1X              |    |
+-----------------+              +-----------------+    |
         |                               |             |
   /-----------\   No            /-----------\   No     |
   | AL < pattern|-------+       | Shift      |---------+
   | masked    |         |       | count 0    |
   \-----------/         |       \-----------/
         | Yes           +-------------+  | Yes
        ( A )                           ( B )      Y
```

TF06:   MASK COMPARE AL WITH L(Y) (AU)   06XXXX

```
                    ( B )
                      |
         ┌────────────────────────┐
         │ Setup shift            │
         │ count 17               │
         └────────────────────────┘
                      |
         ┌────────────────────────┐
         │ Enter AL               │
         │ with pat-              │
         │ tern                   │
         │ (777776)               │
         └────────────────────────┘
                      |
                     ( )
                      |
          ╭──────────────────╮
          │ AL = pattern     │ No ──( A )
          │    masked        │
          ╰──────────────────╯
                   Yes
                      |
         ┌────────────────────────┐
         │ LSH AL 1X              │
         └────────────────────────┘
                      |
          ╭──────────────────╮
          │ AL < pattern     │ Yes ──( A )
          │    masked        │
          ╰──────────────────╯
                    No
                      |
         ┌────────────────────────┐
         │ Shift pat-             │
         │ tern left              │
         │ 1X                     │
         └────────────────────────┘
                      |
          ╭──────────────────╮
    No ── │ Shift            │
          │ count 0          │
          ╰──────────────────╯
                   Yes
                      |
                    ( C )      ( Exit )     Y.

        TF06:   MASK COMPARE AL WITH L(Y) (AU)   06XXXX
```

SPECIFICATION SYMBOL
SB-10163

TITLE: TF07 - TEST COMPARE MASK PLUS B (07xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF07   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: F W S modified by TLR   DATE: 8 Dec. 67

NUMBER OF L_4 OUTPUT INSTRUCTIONS: 35

DESCRIPTION:

This subroutine tests the Compare Mask Plus B instruction (function code 07). A mask is entered into A Upper and utilizing a sliding ones pattern in A Lower, A CMSKB instruction is executed and checked for proper execution. If correct the next sequential pattern is checked with the B Register being updated with a B skip instruction. If all patterns are correct an exit is made to the executive routine (COMA). If the check on the 07 instruction shows it to be improper, A Upper is entered with the correct pattern, A Lower contains the incorrect, and an exit is made to the display subroutine (TFDIS). Upon returning to this subroutine (TF07) an exit is made to the executive routine (COMA) to check for continuing the test or re-cycling this subroutine (TF07).

SPECIFICATION SYMBOL
SB-10163

TITLE:____TF07_____

INPUT PARAMETERS (Listed Sequentially):
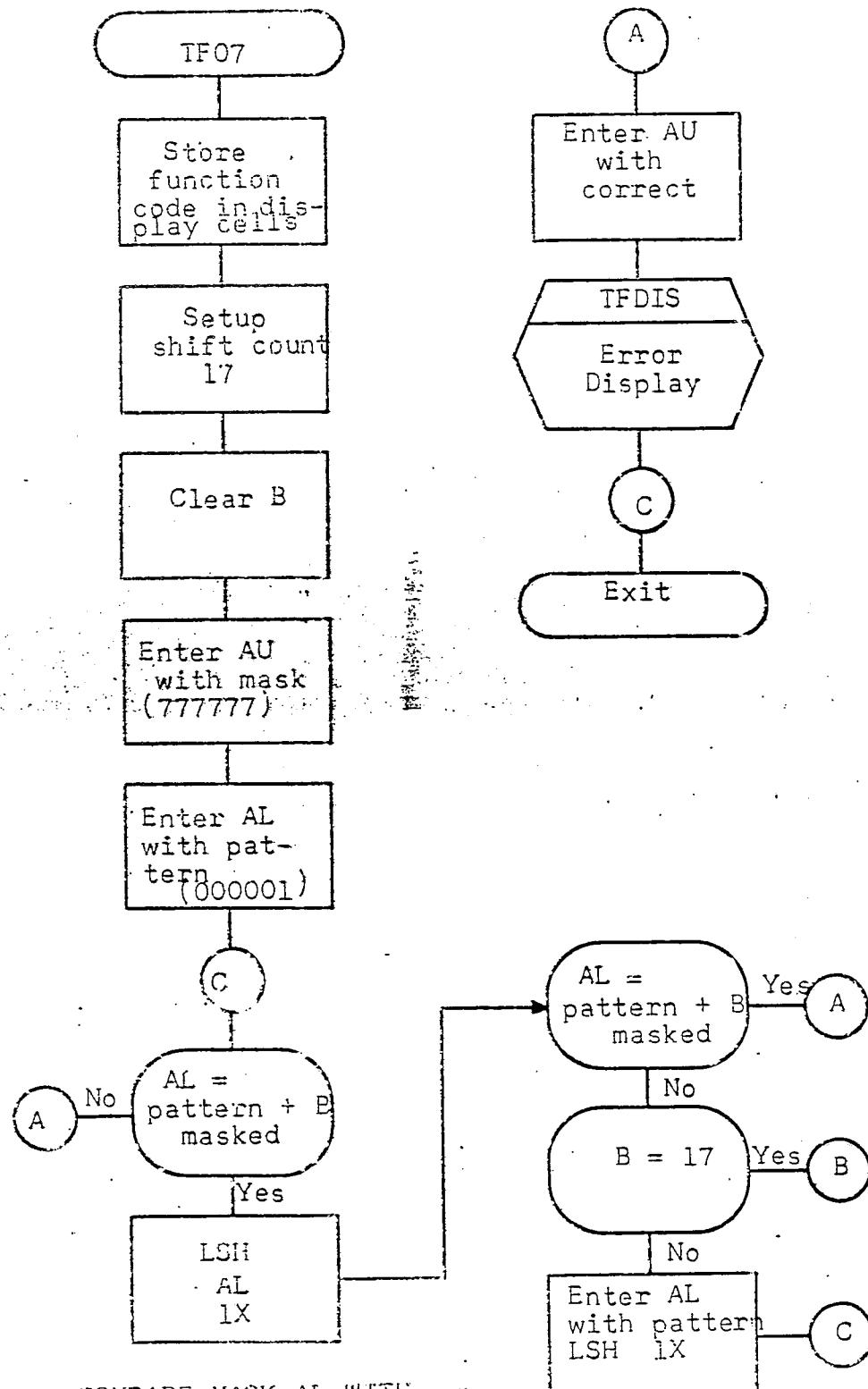
COMA

OUTPUT PARAMETERS (Listed Sequentially):

BUFF1
BUFF2
TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA
TFDIS (Error Display)

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:

ERROR DISPLAY
PROGRAM STOP 0 - A Upper contains correct information
                A Lower contains incorrect information
                CO contains function code (07xxxx)
PROGRAM SKIP 4 - Set for console error display only
                Not set for error typeout (Function Code 07)
PROGRAM SKIP Q - Not set to continue test
                Set to recycle subroutine (TF07)

SPECIFICATION SYMBOL
SB-10163

(TF07)

```
┌─────────────────┐
│ Store           │
│ function        │
│ code in dis-    │
│ play cells      │
└─────────────────┘

┌─────────────────┐
│ Setup           │
│ shift count     │
│ 17              │
└─────────────────┘

┌─────────────────┐
│ Clear B         │
└─────────────────┘

┌─────────────────┐
│ Enter AU        │
│ with mask       │
│ (777777)        │
└─────────────────┘

┌─────────────────┐
│ Enter AL        │
│ with pat-       │
│ tern            │
│ (000001)        │
└─────────────────┘
```

(C)

(A) — No — AL = pattern + B masked — Yes

```
┌─────────────────┐
│ LSH             │
│ AL              │
│ 1X              │
└─────────────────┘
```

(A)

```
┌─────────────────┐
│ Enter AU        │
│ with            │
│ correct         │
└─────────────────┘
```

TFDIS
Error Display

(C)

(Exit)

AL = pattern + B masked — Yes — (A)

No

B = 17 — Yes — (B)

No

```
┌─────────────────┐
│ Enter AL        │
│ with pattern    │  — ( C )
│ LSH  1X         │
└─────────────────┘
```

TF07: COMPARE MASK AL WITH
L(Y +B)(AU)
07XXXX
Y

| SPECIFICATION SYMBOL |
| SB-10163 |

TITLE: __TF10 - TEST ENTER A UPPER (10xxxx)__

DECK IDENTIFIER: __FACT__

CS-1 LABEL: __TF10__   KEY: _____   IS LABEL DUPLICATE? __No__

PROGRAMMER: __P M C modified by TLR__   DATE: __8 Dec. 67__

NUMBER OF L_A OUTPUT INSTRUCTIONS: ____41____

DESCRIPTION:

This subroutine checks the Enter A Upper command. A variety of
patterns are entered into AU with an Enter A Upper command. The
result of the ENTAU command is checked for validity by entering
AL with an associated test pattern and comparing A with a constant.
If correct, the subroutine goes to the next pattern. When all
patterns have been checked, the subroutine returns to the executive
routine (COMA). If the validity check detects an error, AU will
contain incorrect information and AL will contain the correct in-
formation. An exit is then made to the display subroutine where,
with PROGRAM STOP 0 set, the function code will be displayed in CO
and the error may be evaluated. Upon returning to this subroutine
(TF10) an exit is made to the executive routine (COMA) to check for
continuing the test or recycling this subroutine.

SPECIFICATION SYMBOL
SB-10163

TITLE: TF10

INPUT PARAMETERS (Listed Sequentially):

COMA   TEST PATTERNS

TPAT	777777	TPAT4	770000
TPAT+1	777777	TPAT4+1	770000
TPAT1	000000	TPAT5	007777
TPAT1+1	000000	TPAT5+1	007777
TPAT2	252525	TPAT6	707070
TPAT2+1	252525	TPAT6+1	707070
TPAT3	525252	TPAT7	070707
TPAT3+1	525252	TPAT7+1	070707

OUTPUT PARAMETERS (Listed Sequentially):

BUFF1
BUFF2
TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA - (EXEC)
TFDIS - (Error Display)

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:

ERROR DISPLAY
PROGRAM STOP 0 - Incorrect information in A Upper
                Correct information in A Lower
                Function code (10xxxx) in CO
PROGRAM SKIP 4 - Set for console error display only
                Not set for error typeout (Function Code 10)
PROGRAM SKIP 0 - Not set to continue program
                Set to recycle test (TF10)

SPECIFICATION SYMBOL
SB-10163

```
              ( TF10 )
                 │
        ┌─────────────────┐
        │     Store       │
        │   function      │
        │  code in dis-   │
        │   play cells    │
        └─────────────────┘
                 │
                (○)◄──────────┐
                 │            │
        ┌─────────────────┐   │
        │    Enter AU     │   │
        │  with sequen-   │   │
        │   tial test     │   │
        │    pattern      │   │
        └─────────────────┘   │
                 │            │
        ┌─────────────────┐   │
        │    Enter AL     │   │
        │  with associ-   │   │
        │  ated   test    │   │
        │    pattern      │   │
        └─────────────────┘   │
                 │            │
        ┌─────────────────┐   │
        │   Compare A     │   │
        │     with        │   │
        │   constant      │   │
        └─────────────────┘   │
                 │            │
             ╱─────────╲   No      ┌─────────────┐
            │  AU = AL  ├──────────│  Bit error  │
             ╲─────────╱           │   display   │
                 │ Yes             │    in AU    │
                 │                 └─────────────┘
             ╱─────────╲                  │
       No   │   All     │           ┌─────────────┐
     ┌──────│ patterns  │           │ Correct bit │
     │       ╲ checked ╱            │   display   │
     │         │ Yes               │   in   AL   │
     │         │                   └─────────────┘
     │        (○)◄─────────┐              │
     │         │           │        ╱───────────╲
     │         │           └───────│   TFDIS    │
     │      ( EXIT )               │   Error    │
     │                              ╲  display  ╱
     └───────────────────────────────╲────────╱
```

TF10:   TEST FUNC ENTER A UPPER

SPECIFICATION SYMBOL
SB-10163

TITLE: TF11 - TEST ENTER A UPPER PLUS B (11xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF11   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: P M C modified by TLR   DATE: 8 Dec. 67

NUMBER OF L₄ OUTPUT INSTRUCTIONS: 44

DESCRIPTION:

This subroutine checks the Enter A Upper Plus B command. A B constant is entered into B and then a pattern is entered into AU with an Enter AU Plus B command.

The result of the ENTAUB command is checked for validity by entering AL with an associated pattern and comparing A with a constant. If correct, the subroutine goes to the next pattern using a different B constant. When all patterns have been checked, the subroutine returns to the Executive routine (COMA). If the validity check detects an error, AU will contain the incorrect information and AL the correct information. An exit is then made to the display subroutine where, with PROGRAM STOP 0 is set, the function code will be displayed in CO, and the error display may be evaluated. Upon returning to this subroutine (TF11) an exit is made to the Executive routine (COMA) to check for continuing the test or recycling this subroutine.

TITLE: TF11

INPUT PARAMETERS (Listed Sequentially):

COMA   TEST PATTERNS

TPAT	777777	TPAT6	707070
TPAT+1	777777	TPAT6+1	707070
TPAT1	000000	B BOX	CONSTANTS
TPAT1+1	000000	TPAB1	000001
TPAT2	252525	TPAB1+1	777776
TPAT2+1	252525	TPAS4	000002
TPAT3	525252	TPAT1	000000
TPAT3+1	525252	TPAS5	000004

OUTPUT PARAMETERS (Listed Sequentially):

TPAS6	000007
TPAS7	777775

BUFF1
BUFF2
TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA - (EXEC)
TFDIS - (Error Display)

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:
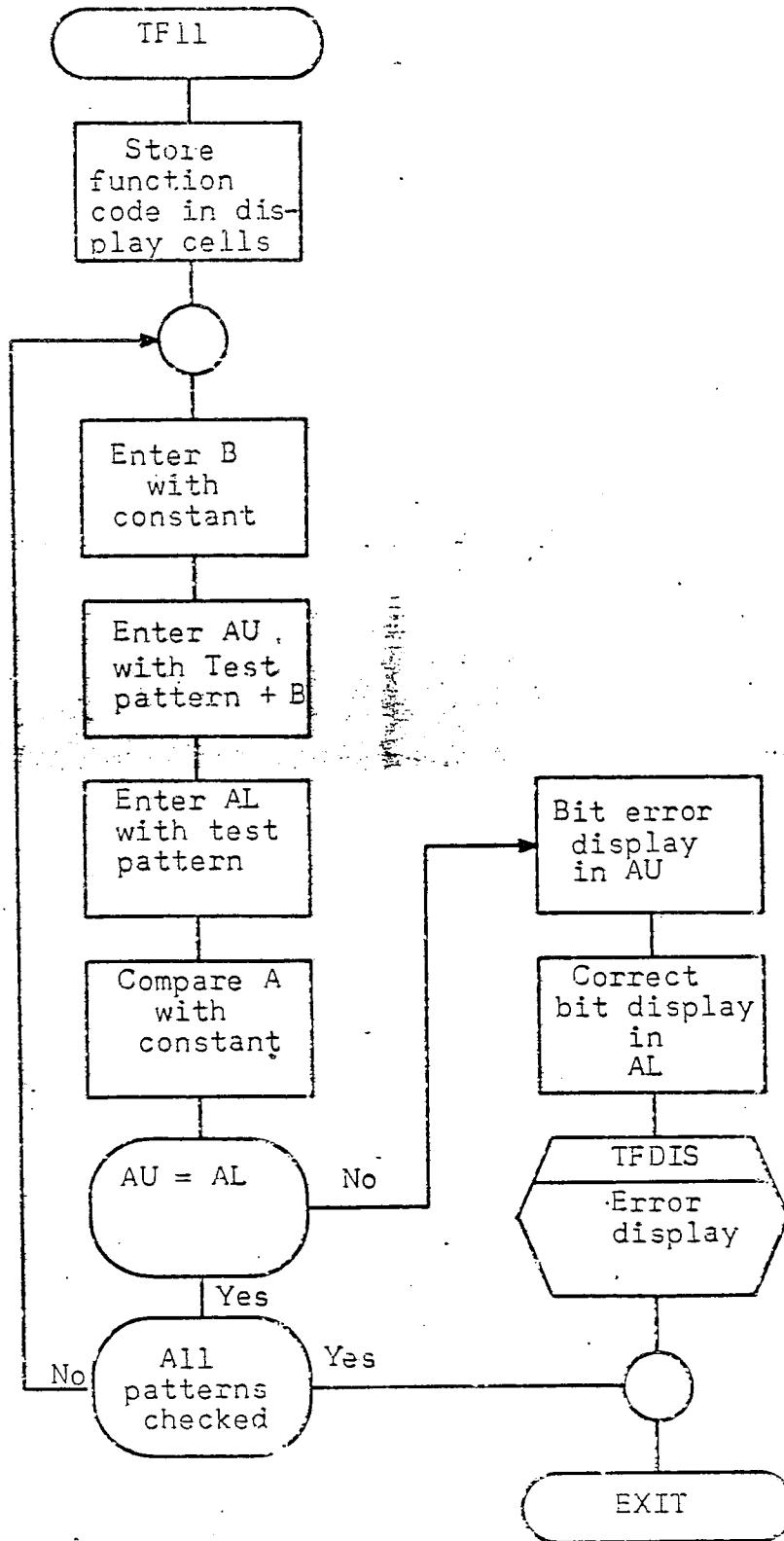
ERROR DISPLAY
PROGRAM STOP 0 - Incorrect information in A Upper
                Correct information in A Lower
                Function code (11xxxx) in CO
PROGRAM SKIP 4 - Set for error console error display only
                Not set for error typeout (Function Code 11)
PROGRAM SKIP 0 - Not set to continue test
                Set to recycle subroutine (TF11)

UNIVAC
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SPECIFICATION SHEET

SHEET 210 | REVISION —

SPECIFICATION SYMBOL
SB-10163

(TF11)

Store
function
code in dis-
play cells

○

Enter B
with
constant

Enter AU
with Test
pattern + B

Enter AL
with test
pattern

Compare A
with
constant

AU = AL   No

Yes

All
patterns   Yes
checked

No

Bit error
display
in AU

Correct
bit display
in
AL

TFDIS
Error
display

○

(EXIT)

TF11: TEST FUNC ENTER A UPPER PLUS B

SPECIFICATION SYMBOL
SB-10163

TITLE: __TF12 - TEST ENTER A LOWER (12xxxx)__

DECK IDENTIFIER: __FACT__

CS-1 LABEL: __TF12__   KEY: _____   IS LABEL DUPLICATE? __No__

PROGRAMMER: __P M C modified by TLR__   DATE: ___8 Dec. 67___

NUMBER OF L_4 OUTPUT INSTRUCTIONS: __41__

DESCRIPTION:

This subroutine checks the Enter A Lower command. A variety of
patterns are entered into AL with an Enter A Lower command. The
result of the ENTAL command is checked for validity by entering
AU with an associated pattern and then comparing A with a constant.
If correct, the subroutine goes to the next pattern. When all
patterns have been checked, the subroutine returns to the Executive
routine (COMA). If the validity check detects an error, AL will
contain the incorrect information and AU the correct information.
An exit is then made to the display subroutine where with PROGRAM
STOP 0 set, the function code will be displayed in CO, and the
error may be evaluated. Upon returning to this subroutine (TF12)
an exit is made to the executive routine (COMA) to check for
continuing the test or recycling this subroutine.

SPECIFICATION SYMBOL
SB-10163

TITLE: TF12

INPUT PARAMETERS (Listed Sequentially):

COMA   TEST PATTERNS

TPAT	777777		TPAT4+1	770000
TPAT+1	777777		TPAT5	007777
TPAT1	000000		TPAT5+1	007777
TPAT1+1	000000		TPAT6	707070
TPAT2	252525		TPAT6+1	707070
TPAT2+1	252525		TPAT7	070707
TPAT3	525252		TPAT7+1	070707
TPAT3+1	525252			
TPAT4	770000			

OUTPUT PARAMETERS (Listed Sequentially):

BUFF1
BUFF2
TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):
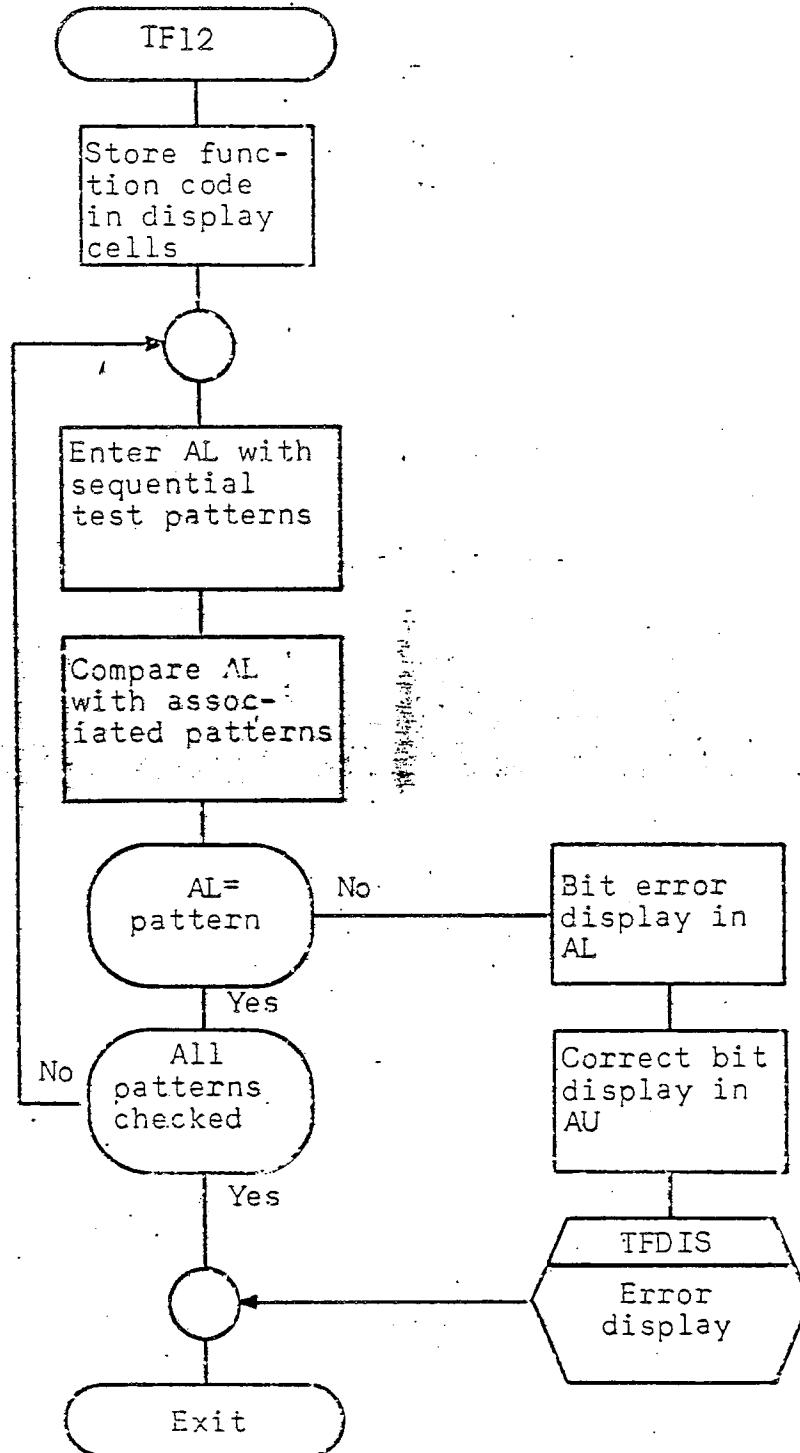
COMA - (EXEC)
TFDIS - Error Display

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:

ERROR DISPLAY
PROGRAM STOP 0 - Incorrect information in A Lower
           Correct information in A Upper
           Function code (12xxxx) in CO
PROGRAM SKIP 4 - Set for console error display only
           Not set for error typeout (Function Code 12)
PROGRAM SKIP 0 - Not to continue test
           Set to recycle subroutine (TF12)

A-1975

```
          ( TF12 )
              |
    +---------------------+
    | Store func-         |
    | tion code           |
    | in display          |
    | cells               |
    +---------------------+
              |
             (O)<--------------+
              |                |
    +---------------------+    |
    | Enter AL with       |    |
    | sequential          |    |
    | test patterns       |    |
    +---------------------+    |
              |                |
    +---------------------+    |
    | Compare AL          |    |
    | with assoc-         |    |
    | iated patterns      |    |
    +---------------------+    |
              |                |
         (  AL=   )  No    +---------------------+
         ( pattern )-----> | Bit error           |
              |            | display in          |
             Yes           | AL                  |
              |            +---------------------+
         (  All   )  No         |
    No<--( patterns )      +---------------------+
         ( checked )       | Correct bit         |
              |            | display in          |
             Yes           | AU                  |
              |            +---------------------+
                                |
             (O)<-------+ / TFDIS    \
              |          \  Error     /
              |           \ display  /
          ( Exit )
```

TF12:   TEST FUNC ENTER A LOWER

TITLE: TF13 - TEST ENTER AL MODIFIED BY B (13xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF13   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: P M C modified by TLR   DATE: 8 Dec. 67

NUMBER OF L₄ OUTPUT INSTRUCTIONS: 43

DESCRIPTION:

This subroutine checks the Enter A Lower Modified By B command.
A constant is entered into B and then a pattern is entered into
AL with the Enter AL Plus B command. The execution of the ENTALB
command is checked for validity by entering AU with an associated
test pattern and then comparing A with a constant. If cor-
rect, the subroutine goes on to the next pattern using a dif-
ferent, B-modifying constant. When all patterns have been
checked, the subroutine returns to the Executive routine (COMA).
If the validity check detects an error, AL will contain the in-
correct information and AU the correct information. An exit
then is made to the display subroutine where, with PROGRAM STOP 0
set, the function code will be displayed in CO, and the error
display may be evaluated. Upon returning to this subroutine
(TF13) an exit is made to the Executive routine (COMA) to check
for continuing the test or recycling this subroutine.

SPECIFICATION SYMBOL
SB-10163

TITLE: TF13

INPUT PARAMETERS (Listed Sequentially):

COMA   TEST PATTERNS

TPAT	777777	TPAT6+1	707070	TPAS6	000007
TPAT+1	777777	TPAT7	070707	TPAS7	777775
TPAT1	000000	TPAT7+1	070707		
TPAT1+1	000000	B BOX	CONSTANTS		
TPAT2	252525	TPAB1	000001		
TPAT2+1	252525	TPAB1+1	777776		
TPAT3	525252	TPAS4	000002		
TPAT3+1	525252	TPAT1	000000		
TPAT6	707070	TPAS5	000004		

OUTPUT PARAMETERS (Listed Sequentially):

BUFF1
BUFF2
TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA - (EXEC)
TFDIS - Error Display
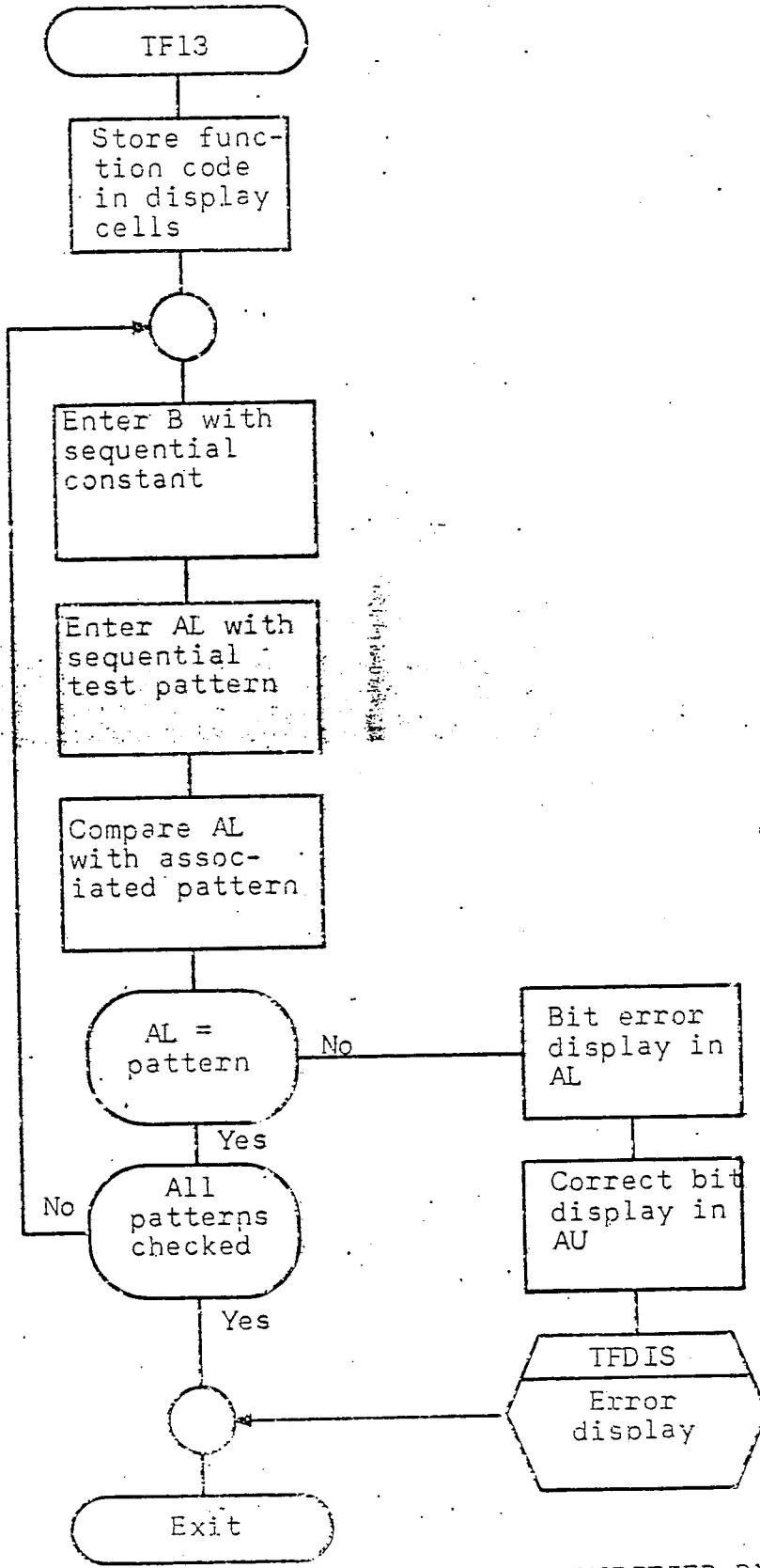
SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:

ERROR DISPLAY
PROGRAM STOP 0 - Incorrect information in A Lower
                Correct information in A Upper
                Function code (13xxxx) in CQ
PROGRAM SKIP 4 - Set for console error display only
                Not set for error typeout (Function Code 13)
PROGRAM SKIP 0 - Not set to continue test
                Set to recycle subroutine (TF13)

SPECIFICATION SYMBOL
SB-10163

```
        ( TF13 )
           │
   ┌───────────────┐
   │ Store func-   │
   │ tion code     │
   │ in display    │
   │ cells         │
   └───────────────┘
           │
          ( ○ )
           │
   ┌───────────────┐
   │ Enter B with  │
   │ sequential    │
   │ constant      │
   └───────────────┘
           │
   ┌───────────────┐
   │ Enter AL with │
   │ sequential    │
   │ test pattern  │
   └───────────────┘
           │
   ┌───────────────┐
   │ Compare AL    │
   │ with assoc-   │
   │ iated pattern │
   └───────────────┘
           │
```

AL = pattern — No → Bit error display in AL

Yes

All patterns checked — No

Yes

Correct bit display in AU

TFDIS Error display

Exit

TF13:   TEST FUNC ENTER AL MODIFIED BY B

SPECIFICATION SYMBOL
SB-10163

TITLE: TF14 - ADD A LOWER PLUS Y (14xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF14   KEY: _____   IS LABEL DUPLICATE? No

PROGRAMMER: F W S modigied by TLR   DATE: 8 Dec. 67

NUMBER OF L_4 OUTPUT INSTRUCTIONS: 21

DESCRIPTION:

This subroutine checks the Add A Lower Plus Y command. A test-pattern constant is entered into AL, and then an ADDAL command is executed (Y being another test pattern constant). Then a Jump command is performed if A is equal to zero, and B is entered with a constant. (TCO3 containing 377777.) Following this, a B jump command takes the program to an Add AL plus Y (Y is TPAB1 which contains a 00001 constant), and then a Jump back is made to the B Jump command. This is repeated until B is equal to zero. (377777 Add AL plus Y commands). Then a compare is made between AL and a test pattern at TCO 3 containing 377777. If AL is correct, the subroutine is returned to the executive routine (COMA): If either the Jump or A equal zero or the Compare command detects an error, AU will contain the correct information and the incorrect information will be in AL. An exit is then made to the display subroutine where, with PROGRAM STOP O set, the function code will be displayed in CO, and the error display may be evaluated. Upon returning to this subroutine (TF14) an exit is made to the Executive routine (COMA) to check for continuing the test or recycling this subroutine.

SPECIFICATION SYMBOL
SB-10163

TITLE: TF14

INPUT PARAMETERS (Listed Sequentially):

COMA   TEST PATTERNS

                        TPAT1   000000
                        TPAT2   252525
                        TPAT3   525252
                        TPAB1   000001
                        TCO3   377777

OUTPUT PARAMETERS (Listed Sequentially):

BUFF1
BUFF2
TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA - (EXEC)
TFDIS - Error Display

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:
ERROR DISPLAY
PROGRAM STOP 0 - Incorrect information in A Lower
                Correct information in A Upper
                Function code (14xxxx) in CO
PROGRAM SKIP 4 - Set for console error display only
                Not set for error typeout (Function Code 14)
PROGRAM SKIP 0 - Not set to continue test
                Set to continue test

SPECIFICATION SYMBOL
SB-10163

TF14

Store func-
tion code
in display
cells

Enter AL
with pat-
tern
(525252)

ADD AL +
252525

AL ZERO → No → A

Yes

ENT B =
377777

B = 0 → Yes → AL=377777 → No → A

No → Yes

ADD AL +
000001

B

Exit

A

Enter AU
with
correct

TFDIS
Error
display

B

TF14:   ADD AL+Y   14xxxx,
                                 Y

SPECIFICATION SYMBOL
SB-10163

TITLE: TF15 - ADD A LOWER PLUS (Y+B) (15xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF15   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: F W S modified by TLR   DATE: 8 Dec. 67

NUMBER OF L$_4$ OUTPUT INSTRUCTIONS: 26

DESCRIPTION:

This subroutine checks the Add A Lower plus (Y+B) command. A constant is entered into B and AL, then the ADDALB command is executed, using a test-pattern constant (Y+B) of the same value as B. AU is then entered with the correct information from a test pattern, followed by a compare of AL to that same test pattern to check the validity of the ADDALB command. If the result is correct, the next constant is entered into B and AL. This cycle is repeated until AL is equal to 000010. At this point the subroutine returns to the Executive routine (COMA). If the validity check detects an error an exit is made to the display subroutine where, with PROGRAM STOP 0 set, AU will contain the correct information, AL the incorrect information, the function code will be displayed in CO, and the error may be evaluated. Upon returning to this subroutine (TF15) an exit is made to the Executive routine (COMA) to check for continuing the test or recycling this subroutine.

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SPECIFICATION SHEET

PROGRAM DATA PAGE (Cont) SHEET 221 REVISION —

SPECIFICATION SYMBOL
SB-10163

TITLE: TF15

INPUT PARAMETERS (Listed Sequentially):
COMA   TEST PATTERNS

TPAB1	000001
TPAS4	000002
TPAS5	000004
TPAS	000010

OUTPUT PARAMETERS (Listed Sequentially):

BUFF 1
BUFF 2
TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA - (COMA)
TFDIS - Error Display
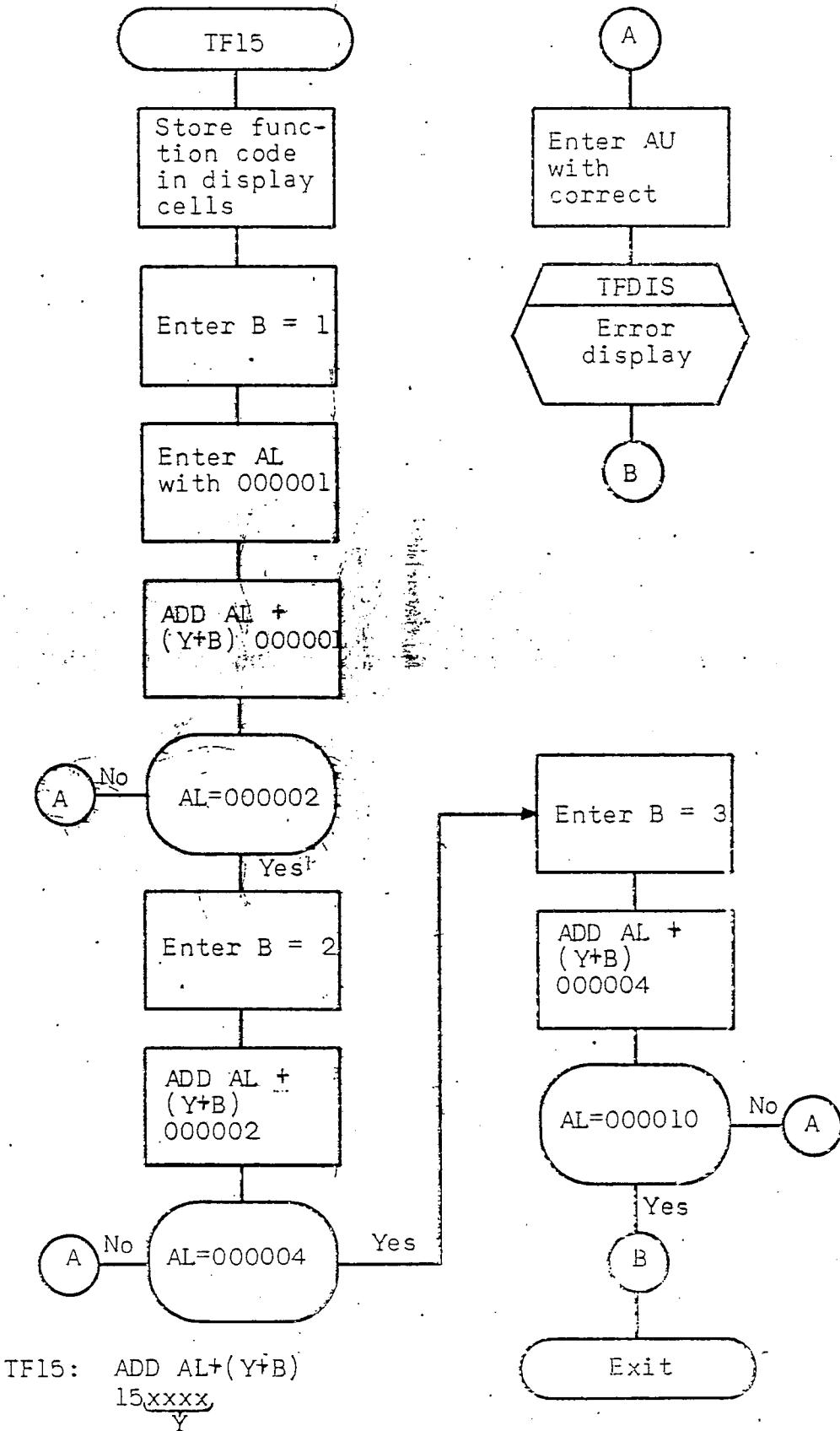
SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:

ERROR DISPLAY
PROGRAM STOP 0 - Incorrect information in A Lower
                 Correct information in A Upper
                 Function code (15xxxx) in CO
PROGRAM SKIP 4 - Set for console error display only
                 Not set for error typeout (Function Code 15)
PROGRAM SKIP 0 - Not set to continue test
                 Set to recycle subroutine (TF15)

SPECIFICATION SYMBOL
SB-10163

```
        ┌──────────────────┐                    ╭───╮
        │      TF15        │                    │ A │
        └──────────────────┘                    ╰───╯
                │                                  │
        ┌──────────────────┐             ┌──────────────────┐
        │ Store func-      │             │ Enter AU         │
        │ tion code        │             │ with             │
        │ in display       │             │ correct          │
        │ cells            │             └──────────────────┘
        └──────────────────┘                      │
                │                          ╱─────────────────╲
        ┌──────────────────┐              ╱      TFDIS        ╲
        │                  │              ╲      Error        ╱
        │  Enter B = 1     │               ╲    display     ╱
        │                  │                ╲──────────────╱
        └──────────────────┘                      │
                │                                ╭───╮
        ┌──────────────────┐                     │ B │
        │  Enter AL        │                     ╰───╯
        │  with 000001     │
        │                  │
        └──────────────────┘
                │
        ┌──────────────────┐
        │  ADD AL +        │
        │  (Y+B) 000001    │
        │                  │
        └──────────────────┘
                │
  ╭───╮  No  ╭──────────────╮              ┌──────────────────┐
  │ A │──────│  AL=000002   │              │                  │
  ╰───╯      ╰──────────────╯──────────────│  Enter B = 3     │
                │  Yes                      │                  │
        ┌──────────────────┐              └──────────────────┘
        │                  │                      │
        │  Enter B = 2     │              ┌──────────────────┐
        │                  │              │  ADD AL +        │
        └──────────────────┘              │  (Y+B)           │
                │                          │  000004          │
        ┌──────────────────┐              └──────────────────┘
        │  ADD AL +        │                      │
        │  (Y+B)           │              ╭──────────────╮  No  ╭───╮
        │  000002          │              │  AL=000010   │──────│ A │
        └──────────────────┘              ╰──────────────╯      ╰───╯
                │                                  │  Yes
  ╭───╮  No  ╭──────────────╮  Yes              ╭───╮
  │ A │──────│  AL=000004   │───────────────────│ B │
  ╰───╯      ╰──────────────╯                    ╰───╯
                                                    │
                                          ┌──────────────────┐
                                          │      Exit        │
                                          └──────────────────┘
```

TF15:   ADD AL+(Y+B)
         15xxxx
           Y

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PROGRAM DATA PAGE

SPECIFICATION SYMBOL
SB-10163

TITLE:____TF16 - SUBT A LOWER MINUS Y (16xxxx)_____

DECK IDENTIFIER:__FACT_____

CS-1 LABEL:____TF16_____ KEY:_____ IS LABEL DUPLICATE?__No____

PROGRAMMER:__F W S modified by ILR____ DATE:____8 Dec.. 67_____

NUMBER OF L_4 OUTPUT INSTRUCTIONS:____28_____

DESCRIPTION:

This subroutine checks the Subtract A Lower Minus Y command. A constant is entered into AL, and a test-pattern constant into AU (the correct information). Then the subtract A lower minus Y (Y is another test pattern) is executed. If A is equal to zero, another SUBAL command is executed and compared to another constant. If the validity check detects no error, another test-pattern constant is entered into AL and the sequence is repeated until the comparison shows that AL and the test pattern are equal to 700000. The subroutine then returns to the Executive routine (COMA). If an error is detected at any point in the subroutine, AU will contain the correct information, AL the incorrect information, and an exit will be made to the display subroutine. If PROGRAM STOP O is set, the function code will be displayed in CO and the error may be evaluated. Upon returning to this subroutine (TF16) an exit is made to the executive routine (COMA) to check for continuing the test or recycling the subroutine.

SPECIFICATION SYMBOL
SB-10163

TITLE: TF16

INPUT PARAMETERS (Listed Sequentially):

TEST PATTERNS

TPAT1	000000
TPAB1	000001
TPAB4+1	277777
TCO	777776
TCO1+1	177777
TCO4+1	200000
TCUT4	700000

OUTPUT PARAMETERS (Listed Sequentially):

BUFF1
BUFF2
TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA - (EXEC)
TFDIS - Error Display

SYSTEM DATA REFERENCES:
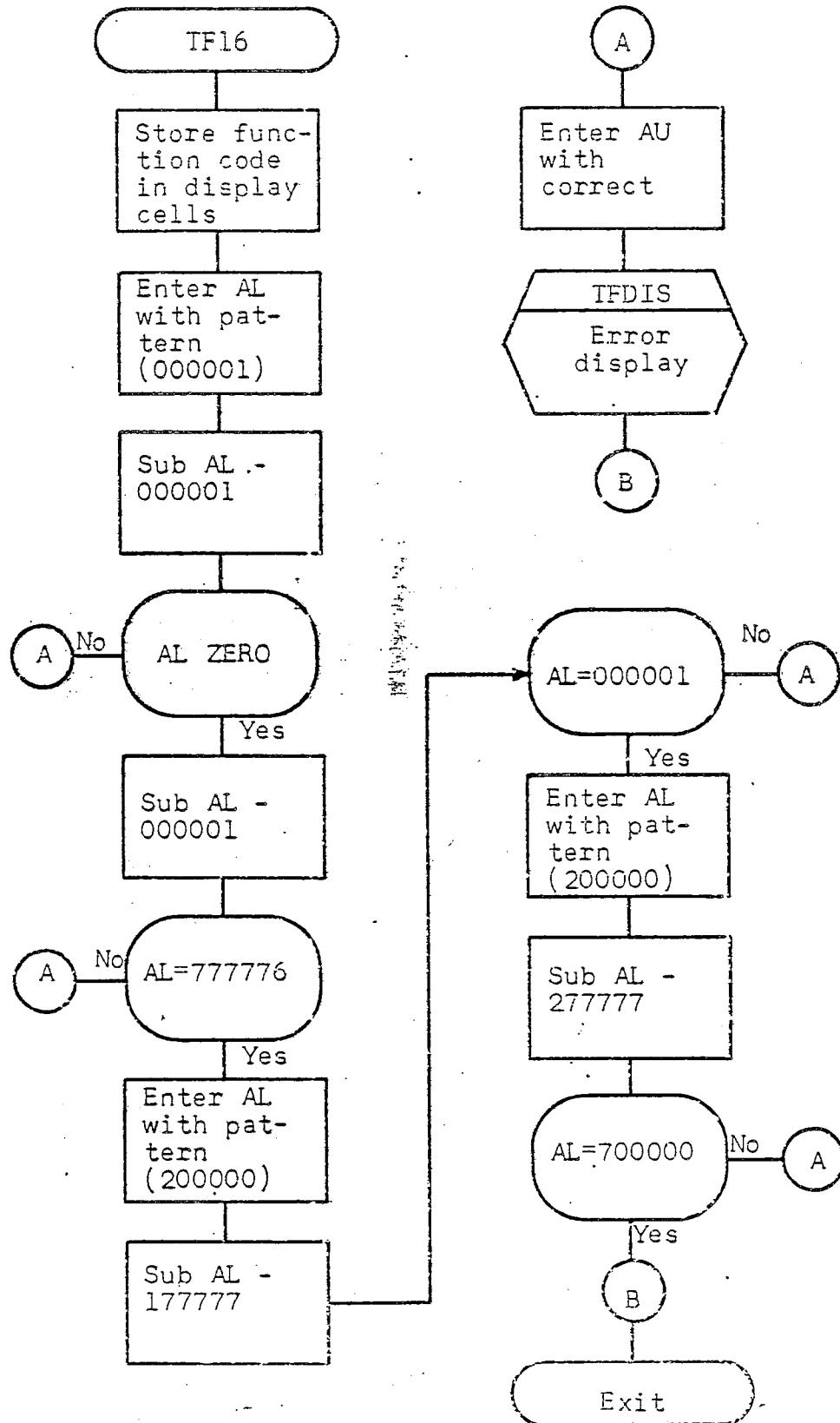
ALARMS AND/OR REMARKS:
ERROR DISPLAY
PROGRAM STOP 0 - Incorrect information in A Lower
Correct information in A Upper.
Function code (16xxxx) in CO
PROGRAM SKIP 4 - Set for console error display only
Not set for error typeout (Function Code 16)
PROGRAM SKIP 0 - Not set to continue test
Set to recycle subroutine (TF16)

SPECIFICATION SYMBOL
SB-10163

```
      ┌─────────────┐                        ( A )
     (    TF16      )                          │
      └─────────────┘                 ┌─────────────────┐
             │                        │ Enter AU        │
   ┌─────────────────┐                │ with            │
   │ Store func-     │                │ correct         │
   │ tion code       │                └─────────────────┘
   │ in display      │                         │
   │ cells           │                 ╱───────────────╲
   └─────────────────┘                 │    TFDIS       │
             │                         ├───────────────┤
   ┌─────────────────┐                 │    Error       │
   │ Enter AL        │                 │    display     │
   │ with pat-       │                 ╲───────────────╱
   │ tern            │                         │
   │ (000001)        │                       ( B )
   └─────────────────┘
             │
   ┌─────────────────┐
   │ Sub AL .-       │
   │ 000001          │
   └─────────────────┘
             │
  ( A )─No─( AL ZERO )                        ( AL=000001 )─No─( A )
                │ Yes                              │ Yes
   ┌─────────────────┐                   ┌─────────────────┐
   │ Sub AL -        │                   │ Enter AL        │
   │ 000001          │                   │ with pat-       │
   └─────────────────┘                   │ tern            │
             │                           │ (200000)        │
  ( A )─No─( AL=777776 )                 └─────────────────┘
                │ Yes                             │
   ┌─────────────────┐                  ┌─────────────────┐
   │ Enter AL        │                  │ Sub AL -        │
   │ with pat-       │                  │ 277777          │
   │ tern            │                  └─────────────────┘
   │ (200000)        │                            │
   └─────────────────┘                 ( AL=700000 )─No─( A )
             │                                    │ Yes
   ┌─────────────────┐                          ( B )
   │ Sub AL -        │                            │
   │ 177777          │                   ┌─────────────────┐
   └─────────────────┘                  (     Exit        )
                                         └─────────────────┘
```

TF16:   SUBT AL-Y   16xxxxx
                        Y

SPECIFICATION SYMBOL
SB-10163

TITLE: TF17 - SUBTRACT AL MINUS (Y+B) (17xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF17   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: F W S modified by TLR   DATE: 8 Dec. 67

NUMBER OF L_4 OUTPUT INSTRUCTIONS: 21

DESCRIPTION:

This subroutine checks the Subtract A Lower Minus (Y+B) command.
Constants are entered into AL, B and AU (AU being the correct
information as the result of the command). Then the SUBALB command
is executed and validity is checked if AL is equal to zero. AL
and B are entered with two different constants. Another Subtract
AL minus (Y+B) command is executed and AU is entered with the
correct information from a test-pattern constant. A compare is
executed between AL and the correct information of a test pattern
constant for validity. If correct, an exit is made to the execu-
tive routine (COMA) to continue the program. If an error is detected
by the validity checks, an exit is made to the display subroutine.
AU will contain the correct information, AL the incorrect infor-
mation, and if PROGRAM STOP 0 is set, CO will contain the func-
tion code, and the error may be evaluated. Upon return to this
subroutine (TF17) an exit is made to the executive routine (COMA)
to check for continuing the test or recycling this subroutine (TF17).

SPECIFICATION SYMBOL
SB-10163

TITLE: _____ TF17 _____

INPUT PARAMETERS (Listed Sequentially):

COMA   TEST PATTERNS

            TPAT1   000000
            TPAB2   200001
            TPAB1-11   000001
            TCO   777776
            TCO4+1   200000

OUTPUT PARAMETERS (Listed Sequentially):

BUFF1
BUFF2
TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):
COMA (EXEC)
TFDIS - Error Display
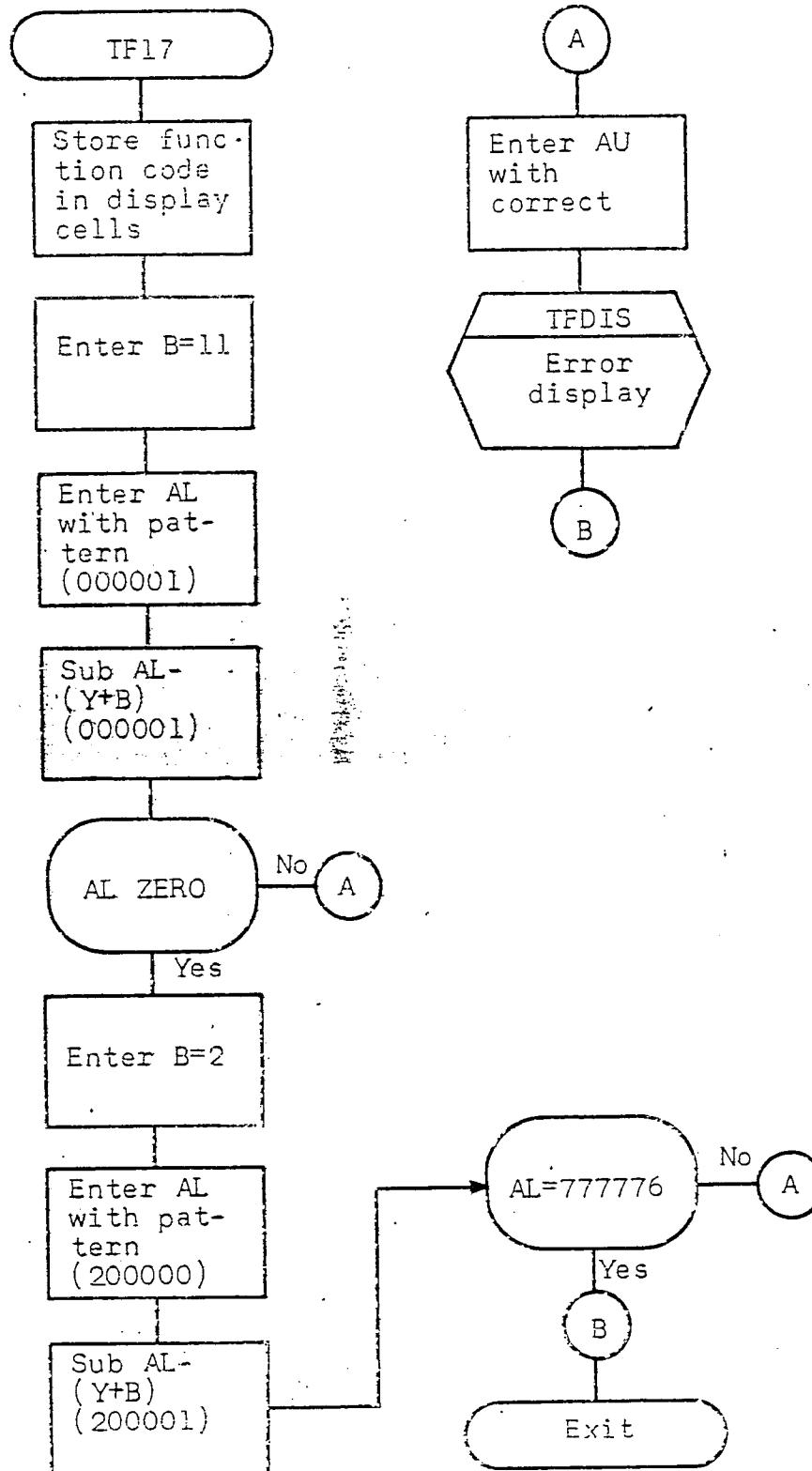
SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:
ERROR DISPLAY
PROGRAM STOP 0 - Correct information in A Upper
                 Incorrect information in A Lower
                 Function code (17xxxx) in CO
PROGRAM SKIP 4 - Set for console error display only
                 Not set for error typeout (Function Code 17)
PROGRAM SKIP 0 - Not set to continue test
                 Set to recycle subroutine

SPECIFICATION SYMBOL
SB-10163

```
      ( TF17 )                          ( A )
         │                                │
┌─────────────────┐              ┌─────────────────┐
│ Store func-     │              │ Enter AU        │
│ tion code       │              │ with            │
│ in display      │              │ correct         │
│ cells           │              └─────────────────┘
└─────────────────┘                       │
         │                        ╱─────────────────╲
┌─────────────────┐              │     TFDIS         │
│ Enter B=11      │              │─────────────────  │
│                 │              │     Error         │
│                 │              │     display       │
└─────────────────┘               ╲─────────────────╱
         │                                │
┌─────────────────┐                     ( B )
│ Enter AL        │
│ with pat-       │
│ tern            │
│ (000001)        │
└─────────────────┘
         │
┌─────────────────┐
│ Sub AL-         │
│ (Y+B)           │
│ (000001)        │
└─────────────────┘
         │
    ╱ AL ZERO ╲  No  ( A )
    ╲         ╱
      │ Yes
┌─────────────────┐
│ Enter B=2       │
│                 │
└─────────────────┘
         │
┌─────────────────┐          ╱ AL=777776 ╲  No  ( A )
│ Enter AL        │─────────▶╲           ╱
│ with pat-       │              │ Yes
│ tern            │            ( B )
│ (200000)        │
└─────────────────┘
         │
┌─────────────────┐
│ Sub AL-         │
│ (Y+B)           │
│ (200001)        │──────────▶ ( Exit )
└─────────────────┘
```

TF17: SUBT AL-(Y+B) $17\underline{xxxx}/\underline{Y}$

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PROGRAM DATA PAGE

SPECIFICATION SYMBOL
SB-10163

TITLE: TF20 - ADD A PLUS (Y) AND (Y+1) (20xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF20   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: F W S modified by TLR   DATE: 8 Dec. 67

NUMBER OF L_4 OUTPUT INSTRUCTIONS: 31

DESCRIPTION:

This subroutine checks the Add A Plus (Y) and (Y+1) command. AU
and AL are entered with a test pattern, and an Add A plus Y (Y being
another, test-pattern constant) is executed. The execution is
checked by jumping and entering the next sequential, test-pattern
constant into AU if A is equal to zero. ADDA is again executed,
and validity checked by a compare of A to the image, test-pattern
constant. Then an exchange of registers is accomplished by left
shifting A and comparing AL to the respective pattern and thereby
checking for validity of the AU bits. By left shifting A again,
the bits are replaced in their original positions and another Add
A command is executed and the results in AL are compared to a test
pattern. If correct, another left shifting and compare sequence
is performed. If correct, an exit is made to the executive routine
(COMA) to continue the program. If an error is detected by any of
the validity checks, an exit is made to the error display subroutine
with the sum of the ADD in AU and AL. With PROGRAM STOP 0 set, CO
will contain the function code and the error may be evaluated.
Upon return to this subroutine (TF20) an exit is made to the execu-
tive routine (COMA) to check for continuing the test or recycling
this subroutine (TF20).

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PROGRAM DATA PAGE (Cont)

SPECIFICATION SYMBOL
SB-10163

TITLE: TF20

INPUT PARAMETERS (Listed Sequentially):

COMA   TEST PATTERNS

TPAT1	000000	000000
TCO	777777	777776
TCO+1		777777
TCO1	177777	777777
TCO1+1	177777	
TCO3	377777	
TCO4+1	200000	

OUTPUT PARAMETERS (Listed Sequentially):

BUFF1
BUFF2
TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA - (EXEC)
TFDIS - Error Display
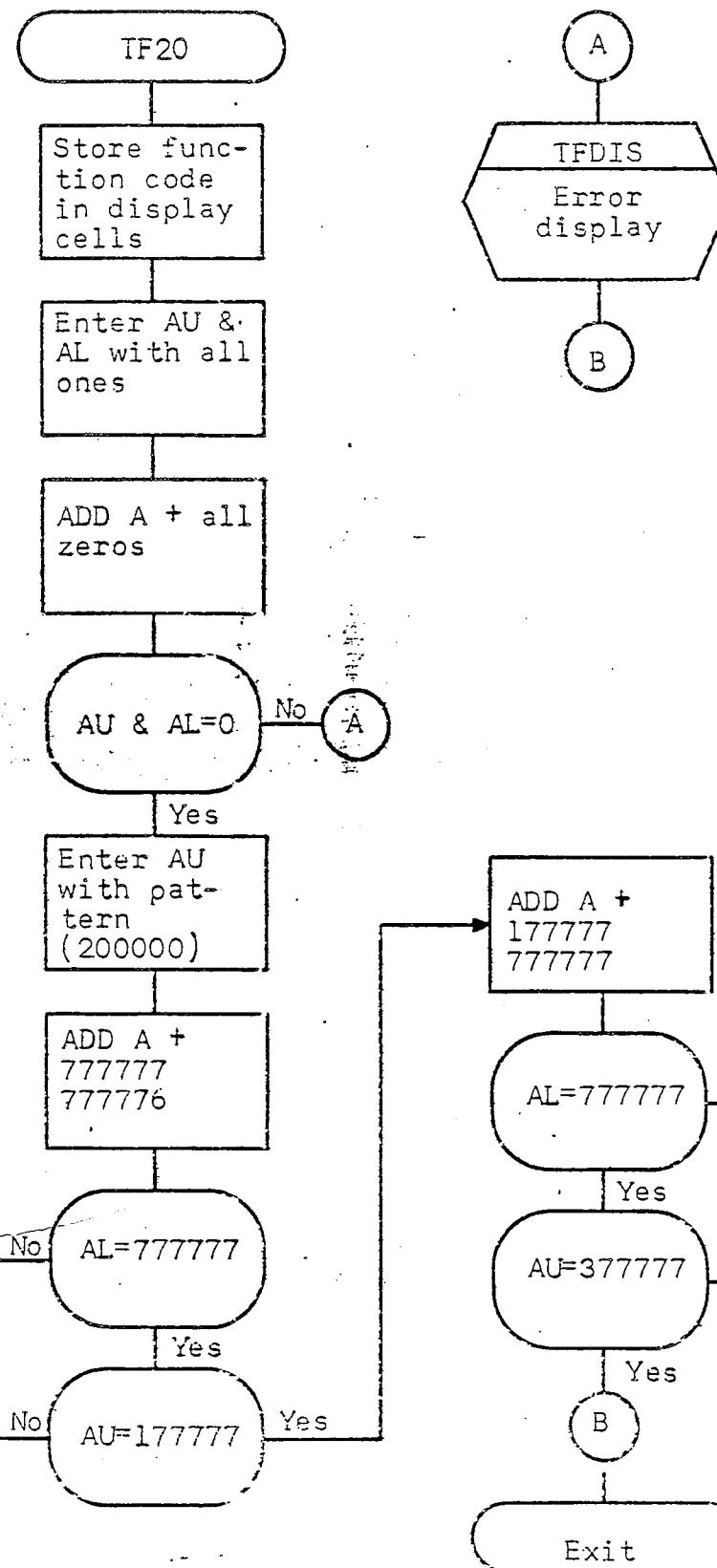
SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:

ERROR DISPLAY
PROGRAM STOP O - AU and AL = sum of Add
                CO = function code (20xxxx)
PROGRAM SKIP 4 - Set for console error display only
                Not set for error typeout (Function Code 20)
PROGRAM SKIP O - Not set to continue test
                Set to recycle subroutine (TF20)

A-1975

SPECIFICATION SYMBOL
SB-10163

TF20

Store function code in display cells

Enter AU & AL with all ones

ADD A + all zeros

AU & AL=0 —No→ A

Yes

Enter AU with pattern (200000)

ADD A + 777777 777776

A ←No— AL=777777

Yes

A ←No— AU=177777 —Yes→

A

TFDIS
Error display

B

ADD A + 177777 777777

AL=777777 —No→ A

Yes

AU=377777 —No→ A

Yes

B

Exit

TF20:   ADD A∓(Y)&(Y+1)   20xxxx

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SPECIFICATION SYMBOL
SB-10163

TITLE: TF21 - ADD A PLUS (Y+B) (Y+B+1) (21xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF21   KEY: _____   IS LABEL DUPLICATE? No

PROGRAMMER: F W S modified by TLR   DATE: 8 Dec. 67

NUMBER OF L_4 OUTPUT INSTRUCTIONS: 27

DESCRIPTION:

This subroutine checks the Add A Plus (Y+B) (Y+1+B) command. AU
and AL are entered with a test-pattern constant, B is entered with
a constant, and an ADDAB command is executed. Validity is checked
if A is equal to zero and another constant is entered into AU and B.
Another ADDAB command is executed, and if a borrow is generated, AL
is compared to the proper test pattern. If no borrow is generated,
an Add A to Y command is executed and AL is compared to the above
test pattern. If correct, a left shift A command is executed and
AL is compared to a test pattern as a validity check for AU bits.
If correct, an exit is made to the executive routine (COMA) to
continue the program. If an error is detected by any of the validity
checks, an exit is made to the error display subroutine. With PRO-
GRAM STOP O set, AU and AL will contain the sum of the Add A command,
CO will contain the function code, and the error may be evaluated.
Upon return to this subroutine (TF21) an exit is made to the execu-
tive routine (COMA) to check for continuing the test or recycling
this subroutine (TF21)

SPECIFICATION SYMBOL
SB-10163

TITLE: TF21

INPUT PARAMETERS (Listed Sequentially):

CCMA   TEST PATTERNS

TPAT1-1	000000	000000
TC0	777777	777776
TC0+1	777777	
TC01-4	177777	777777
TC03	377777	
TC04+1	200000	

OUTPUT PARAMETERS (Listed Sequentially):

BUFF1
BUFF2
TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

CCMA - (EXEC)
TFDIS - Error Display
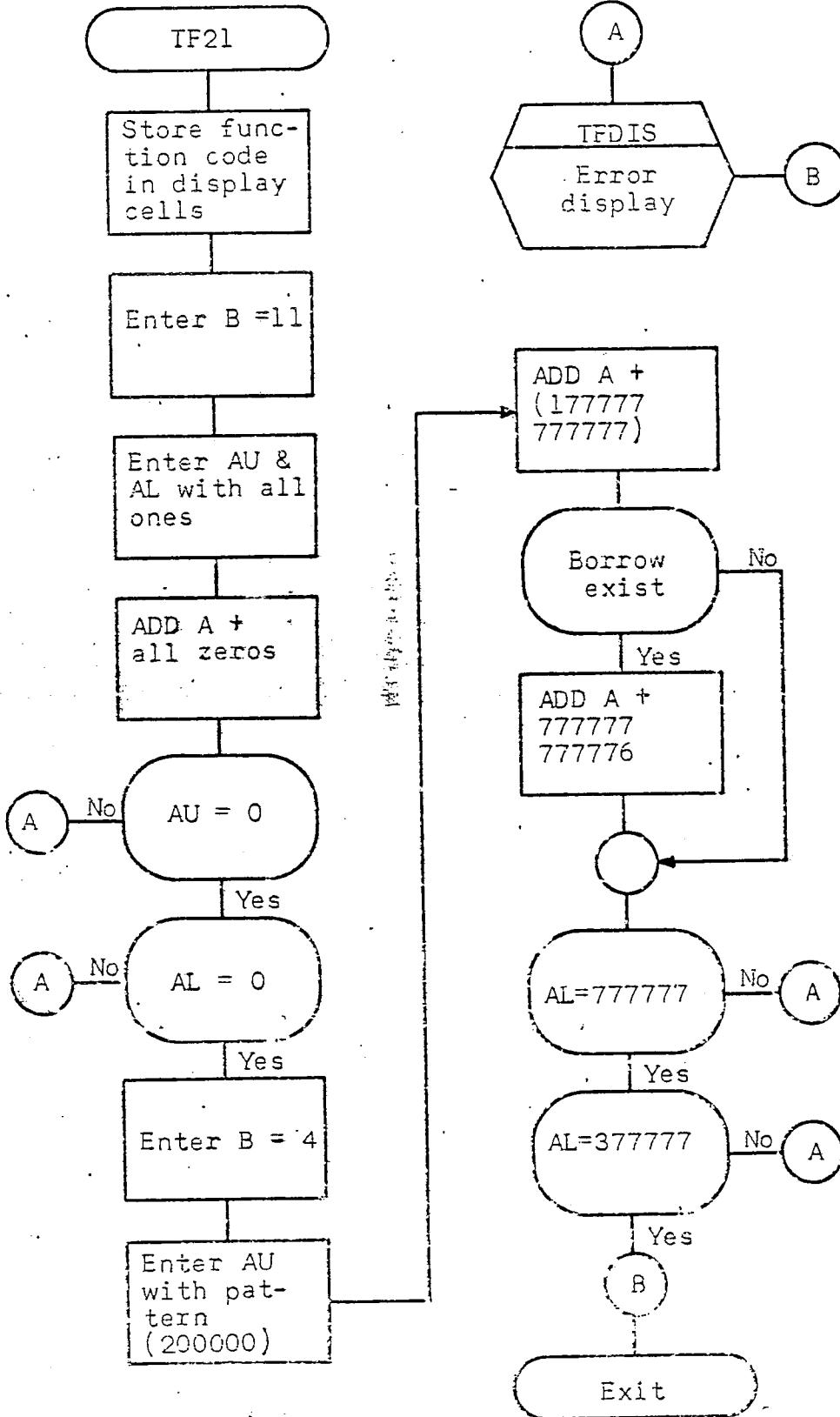
SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:
ERROR DISPLAY
PROGRAM STOP 0 - AU and AL = sum of Add A
                CO = function code (21xxxx)
PROGRAM SKIP 4 - Set for console error display only
                Not set for error typeout (Function Code 21)
PROGRAM SKIP 0 - Not set to continue test
                Set to recycle subroutine (TF21)

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SPECIFICATION SHEET

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SPECIFICATION SYMBOL
SB-10163

(TF21)

Store function code in display cells

Enter B = 11

Enter AU & AL with all ones

ADD A + all zeros

(A) No — AU = 0

Yes

(A) No — AL = 0

Yes

Enter B = 4

Enter AU with pattern (200000)

(A) — TFDIS / Error display — (B)

ADD A + (177777 777777)

Borrow exist — No

Yes

ADD A + 777777 777776

( )

AL = 777777 — No — (A)

Yes

AL = 377777 — No — (A)

Yes

(B)

(Exit)

TF21:   ADD A+(Y+B)(Y+B+1)   21xxxxx

SPECIFICATION SYMBOL
SB-10163

TITLE: TF22 - SUBTRACT A MINUS (Y) (22xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF22   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: F W S modified by TLR   DATE: 8 Dec. 67

NUMBER OF L_4 OUTPUT INSTRUCTIONS: 31

DESCRIPTION:

This subroutine checks the Subtract A Minus (Y) command. Test
patterns are entered into AU and AL, and a SUBA command is executed.
The validity of the result is checked by jumping to another enter
AU, AL, and Subtract A commands sequence. Then left shift A and
compare commands are executed to check validity of the bits that
were in AU. If no error is detected the next pattern is entered
into AU and AL, and this cycle is repeated. If correct, an exit is
made to the executive routine (COMA) to continue the program. If
an error is detected, the remainder of the subtract will be con-
tained in AU and AL. An exit is then made to the display subroutine
where with PROGRAM STOP 0 set, CO will contain the function code
and the error may be evaluated. Upon return to this subroutine
(TF22) an exit is made to the executive routine (COMA) to check for
continuing the test or recycling this subroutine.

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PROGRAM DATA PAGE (Cont)

SPECIFICATION SYMBOL
SB-10163

TITLE: TF22

INPUT PARAMETERS (Listed Sequentially):

COMA	TEST PATTERNS		
	TPAT	777777	
	TCO1	177777	777777
	TCO1+1	177777	
	TCO4	200000	000000
	TCO4+1	200000	
	TPAB1	000001	

OUTPUT PARAMETERS (Listed Sequentially):

BUFF1
BUFF2
TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA - (EXEC)
TFDIS - Error Display

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:

ERROR DISPLAY
PROGRAM STOP 0 - AU and AL = remainder
CO = function code (22xxxx)
PROGRAM SKIP 4 - Set for console error display only
Not set for error typeout (Function Code 22)
PROGRAM SKIP 0 - Not set to continue test
Set to recycle subroutine (TF22)
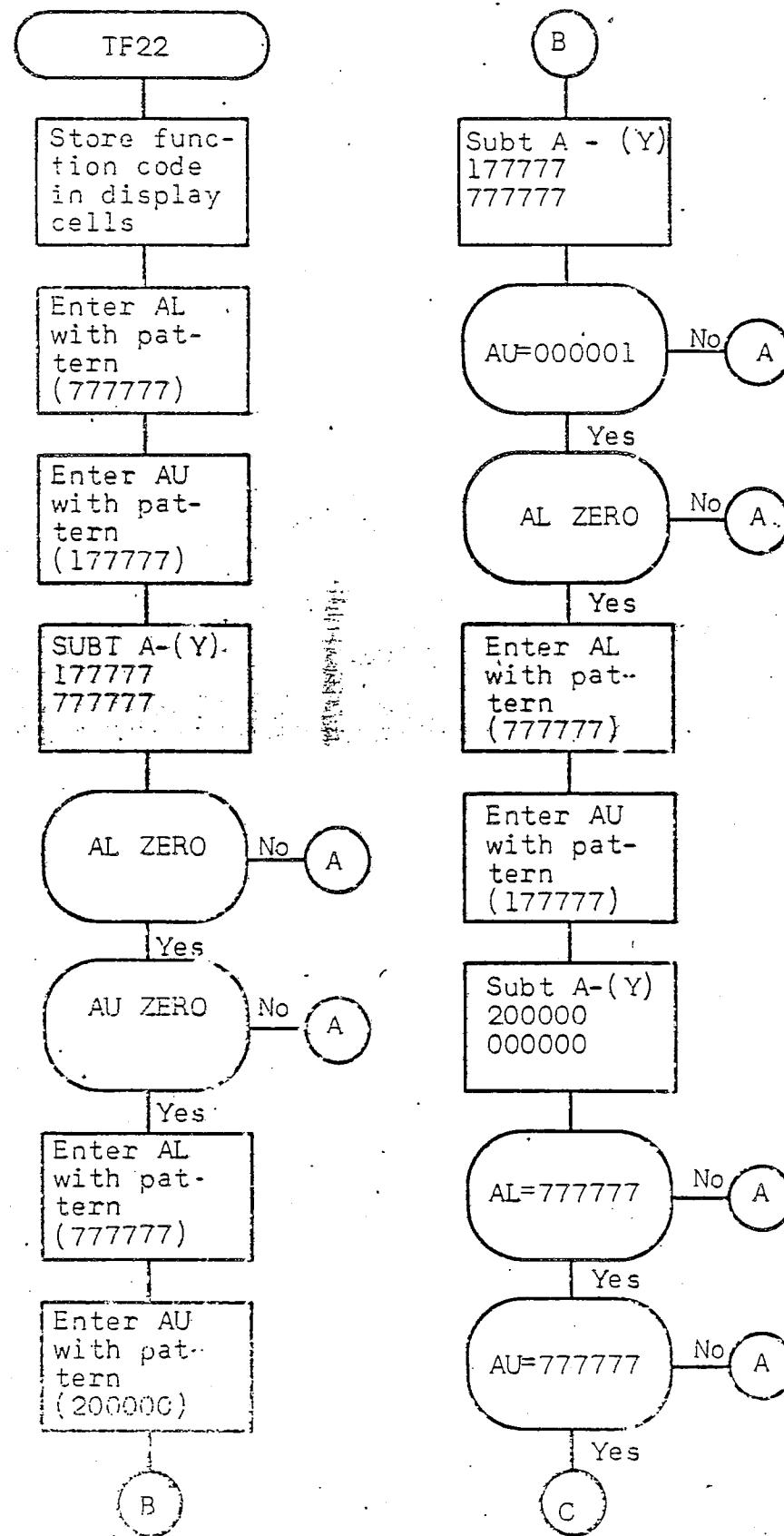
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SPECIFICATION SHEET

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SPECIFICATION SYMBOL
SB-10163

```
        ( TF22 )                              (B)

   ┌──────────────┐                    ┌──────────────┐
   │ Store func-  │                    │ Subt A - (Y) │
   │ tion code    │                    │ 177777       │
   │ in display   │                    │ 777777       │
   │ cells        │                    └──────────────┘
   └──────────────┘                            │
          │                               ╭──────────╮   No
   ┌──────────────┐                       │ AU=000001│────( A )
   │ Enter AL     │                       ╰──────────╯
   │ with pat-    │                            │ Yes
   │ tern         │                       ╭──────────╮   No
   │ (777777)     │                       │ AL ZERO  │────( A )
   └──────────────┘                       ╰──────────╯
          │                                    │ Yes
   ┌──────────────┐                    ┌──────────────┐
   │ Enter AU     │                    │ Enter AL     │
   │ with pat-    │                    │ with pat-    │
   │ tern         │                    │ tern         │
   │ (177777)     │                    │ (777777)     │
   └──────────────┘                    └──────────────┘
          │                                    │
   ┌──────────────┐                    ┌──────────────┐
   │ SUBT A-(Y)   │                    │ Enter AU     │
   │ 177777       │                    │ with pat-    │
   │ 777777       │                    │ tern         │
   └──────────────┘                    │ (177777)     │
          │                            └──────────────┘
     ╭──────────╮   No                        │
     │ AL ZERO  │────( A )              ┌──────────────┐
     ╰──────────╯                       │ Subt A-(Y)   │
          │ Yes                         │ 200000       │
     ╭──────────╮   No                  │ 000000       │
     │ AU ZERO  │────( A )              └──────────────┘
     ╰──────────╯                             │
          │ Yes                         ╭──────────╮   No
   ┌──────────────┐                     │ AL=777777│────( A )
   │ Enter AL     │                     ╰──────────╯
   │ with pat-    │                           │ Yes
   │ tern         │                     ╭──────────╮   No
   │ (777777)     │                     │ AU=777777│────( A )
   └──────────────┘                     ╰──────────╯
          │                                   │ Yes
   ┌──────────────┐
   │ Enter AU     │                         ( C )
   │ with pat-    │
   │ tern         │
   │ (200000)     │
   └──────────────┘
          │
        ( B )
```

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SPECIFICATION SHEET

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SPECIFICATION SYMBOL
SB-10163

```
        ( A )
          |
     ┌─────────┐
    ╱  TFDIS    ╲
   ╱─────────────╲
   ╲   Error      ╱
    ╲  display   ╱
     └─────────┘
          |
        ( C )
          |
    (    Exit    )
```

TF22:   SUBT A-(Y)   22xxxx

| SPECIFICATION SYMBOL |
| SB-10163 |

TITLE: TF 23 - SUBTRACT A MINUS Y+B AND Y+1+B (23xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF23   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: F W S modified by TLR   DATE: 8 Dec. 67

NUMBER OF L_4 OUTPUT INSTRUCTIONS: 25

DESCRIPTION:

This subroutine checks the Subtract A Minus Y+B and Y+1+B command,
AL, AU, and B are entered with constants and a SUBAB command is
executed; validity is checked if A is equal to zero. The above is
repeated with different constants and AL is compared to a constant
for validity and then checked for a borrow. If correct, an exit
is made to the executive routine (COMA) to continue the program.
If an error is detected by any of the validity checks, an exit is
made to the display subroutine. AU and AL will contain the remainder
of the subtract and, if PROGRAM STOP 0 is set, CO will display the
function code and the error may be evaluated. Upon return to this
subroutine (TF23) an exit is made to the executive routine (COMA)
to check for continuing the test or recycling this subroutine.

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PROGRAM DATA PAGE (Cont)

SPECIFICATION SYMBOL
SB-10163

TITLE: TF23

INPUT PARAMETERS (Listed Sequentially):

COMA

TEST PATTERNS

TPAT	777777	
TPAT1	000000	
TPAB1	000001	
TCO+1	177777	
TCO1-11	177777	777777
TCO4+1	200000	
TCO1-32	177777	777777

OUTPUT PARAMETERS (Listed Sequentially):

BUFF 1
BUFF 2
TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA - (EXEC)
TFDIS - Error Display

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:

ERROR DISPLAY
PROGRAM STOP 0 - AU and AL = remainder
                CO = function code (23xxxx)
PROGRAM SKIP 4 - Set for console error display only
                Not set for error typeout (Function Code 23)
PROGRAM SKIP 0 - Not set to continue test
                Set to recycle subroutine (TF23)
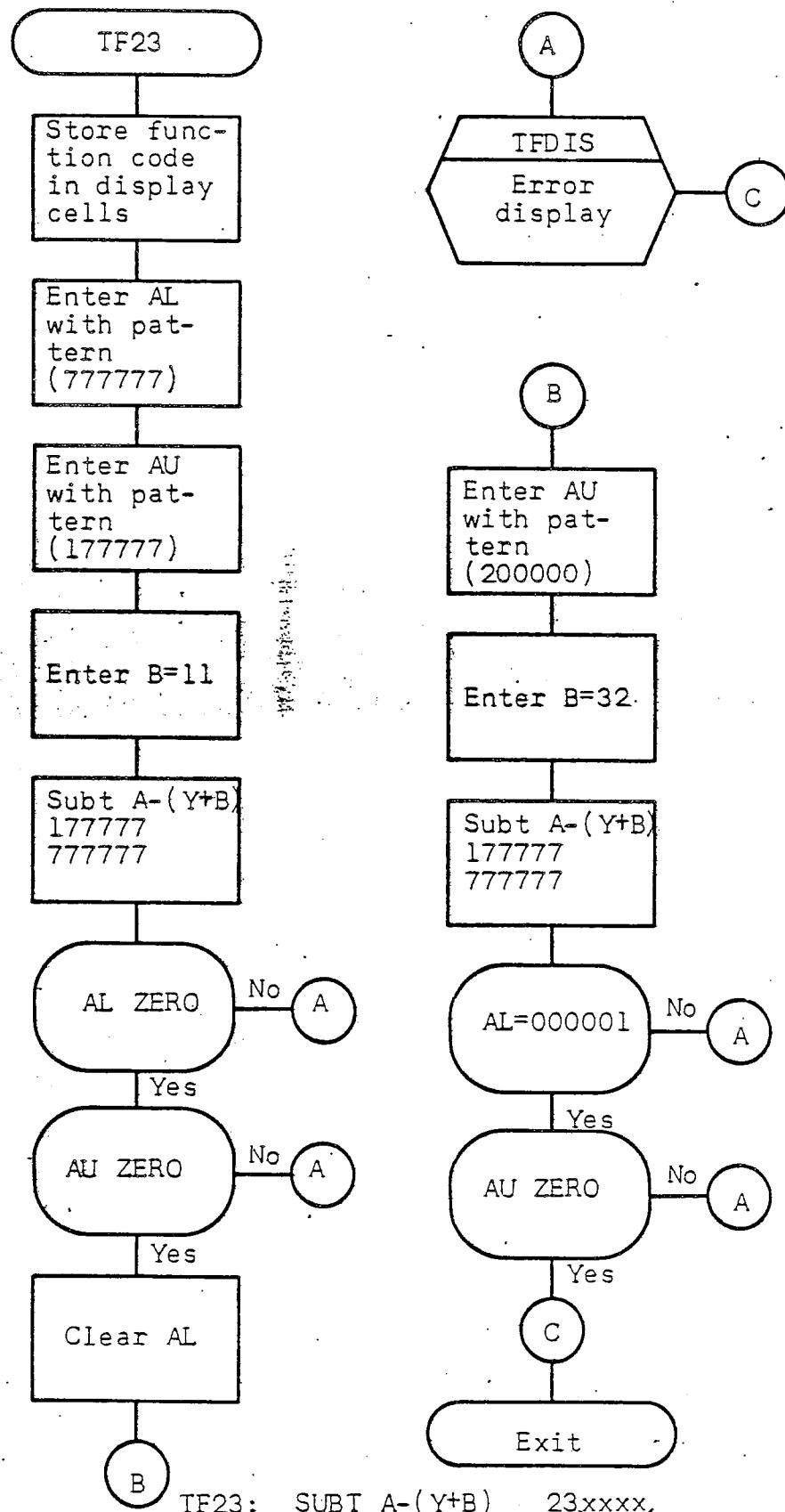
SPECIFICATION SYMBOL
SB-10163

```
   ( TF23 )                          ( A )
      │                                │
┌─────────────┐              ╱─────────────────╲
│ Store func- │             │      TFDIS        │──( C )
│ tion code   │              ╲     Error        ╱
│ in display  │               ╲   display      ╱
│ cells       │                ╲─────────────╱
└─────────────┘
      │
┌─────────────┐                       ( B )
│ Enter AL    │                         │
│ with pat-   │              ┌─────────────┐
│ tern        │              │ Enter AU    │
│ (777777)    │              │ with pat-   │
└─────────────┘              │ tern        │
      │                      │ (200000)    │
┌─────────────┐              └─────────────┘
│ Enter AU    │                     │
│ with pat-   │              ┌─────────────┐
│ tern        │              │             │
│ (177777)    │              │ Enter B=32  │
└─────────────┘              │             │
      │                      └─────────────┘
┌─────────────┐                     │
│             │              ┌─────────────┐
│ Enter B=11  │              │ Subt A-(Y+B)│
│             │              │ 177777      │
└─────────────┘              │ 777777      │
      │                      └─────────────┘
┌─────────────┐                     │
│ Subt A-(Y+B)│              ( AL=000001 ) ─No─ ( A )
│ 177777      │                     │
│ 777777      │                    Yes
└─────────────┘                     │
      │                      ( AU ZERO ) ─No─ ( A )
( AL ZERO ) ─No─ ( A )              │
      │                            Yes
     Yes                            │
      │                           ( C )
( AU ZERO ) ─No─ ( A )              │
      │                          ( Exit )
     Yes
      │
┌─────────────┐
│             │
│ Clear AL    │
│             │
└─────────────┘
      │
    ( B )
```

TF23:   SUBT A-(Y+B)   23xxxxx

TITLE: TF24 MULTIPLY A LOWER BY Y (24xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF 24   KEY: _____ IS LABEL DUPLICATE? _____

PROGRAMMER: F W S modified by TLR   DATE: 8 Dec. 67

NUMBER OF L_4 OUTPUT INSTRUCTIONS: 33

DESCRIPTION:

This subroutine checks the Multiply AL by Y command. AL is entered
with a constant and a MULAL by a test-pattern constant command is
executed. A validity check is made by jumping if A is equal to
zero, and entering a different constant into AL. Another 24 command
is executed and validity again checked. Then a MULAL command is
executed and validity is checked by comparing the result in AL to
a test-pattern constant. AU is checked by left shifting AU into AL
and doing another compare of AL to a different test pattern. If
correct the above cycle (with shifting) is repeated with a different
test pattern and if correct, an exit is made to the executive
routine (COMA) to continue the program. If an error is detected
by any of the validity checks an exit is made to the display sub-
routine. AU and AL will contain the product of the multiply and,
with PROGRAM STOP O set, CO will display the function code and the
error may be evaluated. Upon return to this subroutine (TF24) an
exit is made to the executive routine (COMA) to check for continu-
ing the test or recycling the subroutine.

SPECIFICATION SYMBOL
SB-10163

TITLE: TF24

INPUT PARAMETERS (Listed Sequentially):

COMA

TEST PATTERNS

TPAT3	525252
TPAB1	000001
TCO1+1	177777
TCO3	377777
TCUT5	343434
TCUT6	113663
TCUT7	664114

OUTPUT PARAMETERS (Listed Sequentially):

BUFF 1
BUFF 2
TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA - (EXEC)
TFDIS - Error Display
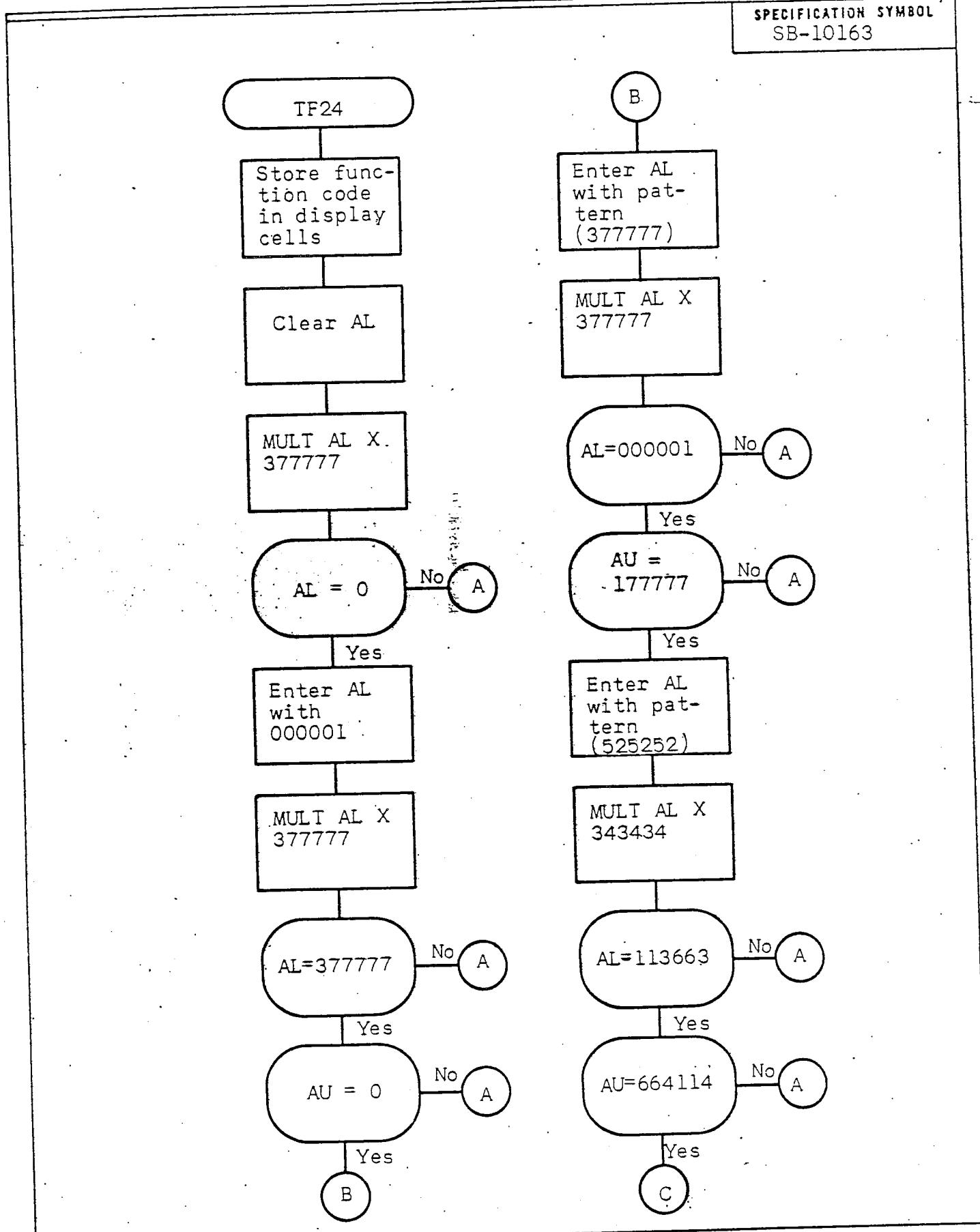
SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:
ERROR DISPLAY
PROGRAM STOP 0 - AU and AL = product
                CO = function code (24xxxx)
PROGRAM SKIP 4 - Set for console error display only
                Not set for error typeout (Function Code 24)
PROGRAM SKIP 0 - Not set to continue test
                Set to recycle subroutine (TF24)

```
        ( TF24 )                          ( B )

   ┌──────────────┐              ┌──────────────┐
   │ Store func-  │              │ Enter AL     │
   │ tion code    │              │ with pat-    │
   │ in display   │              │ tern         │
   │ cells        │              │ (377777)     │
   └──────────────┘              └──────────────┘

   ┌──────────────┐              ┌──────────────┐
   │              │              │ MULT AL X    │
   │  Clear AL    │              │ 377777       │
   │              │              │              │
   └──────────────┘              └──────────────┘

   ┌──────────────┐              ┌──────────────┐
   │ MULT AL X.   │          ( AL=000001 )──No──( A )
   │ 377777       │
   └──────────────┘                   Yes

    ( AL = 0 )──No──( A )       ( AU = 177777 )──No──( A )

        Yes                            Yes
   ┌──────────────┐              ┌──────────────┐
   │ Enter AL     │              │ Enter AL     │
   │ with         │              │ with pat-    │
   │ 000001       │              │ tern         │
   └──────────────┘              │ (525252)     │
                                 └──────────────┘
   ┌──────────────┐              ┌──────────────┐
   │ MULT AL X    │              │ MULT AL X    │
   │ 377777       │              │ 343434       │
   └──────────────┘              └──────────────┘

  ( AL=377777 )──No──( A )      ( AL=113663 )──No──( A )

        Yes                            Yes

   ( AU = 0 )──No──( A )        ( AU=664114 )──No──( A )

        Yes                            Yes

        ( B )                          ( C )
```

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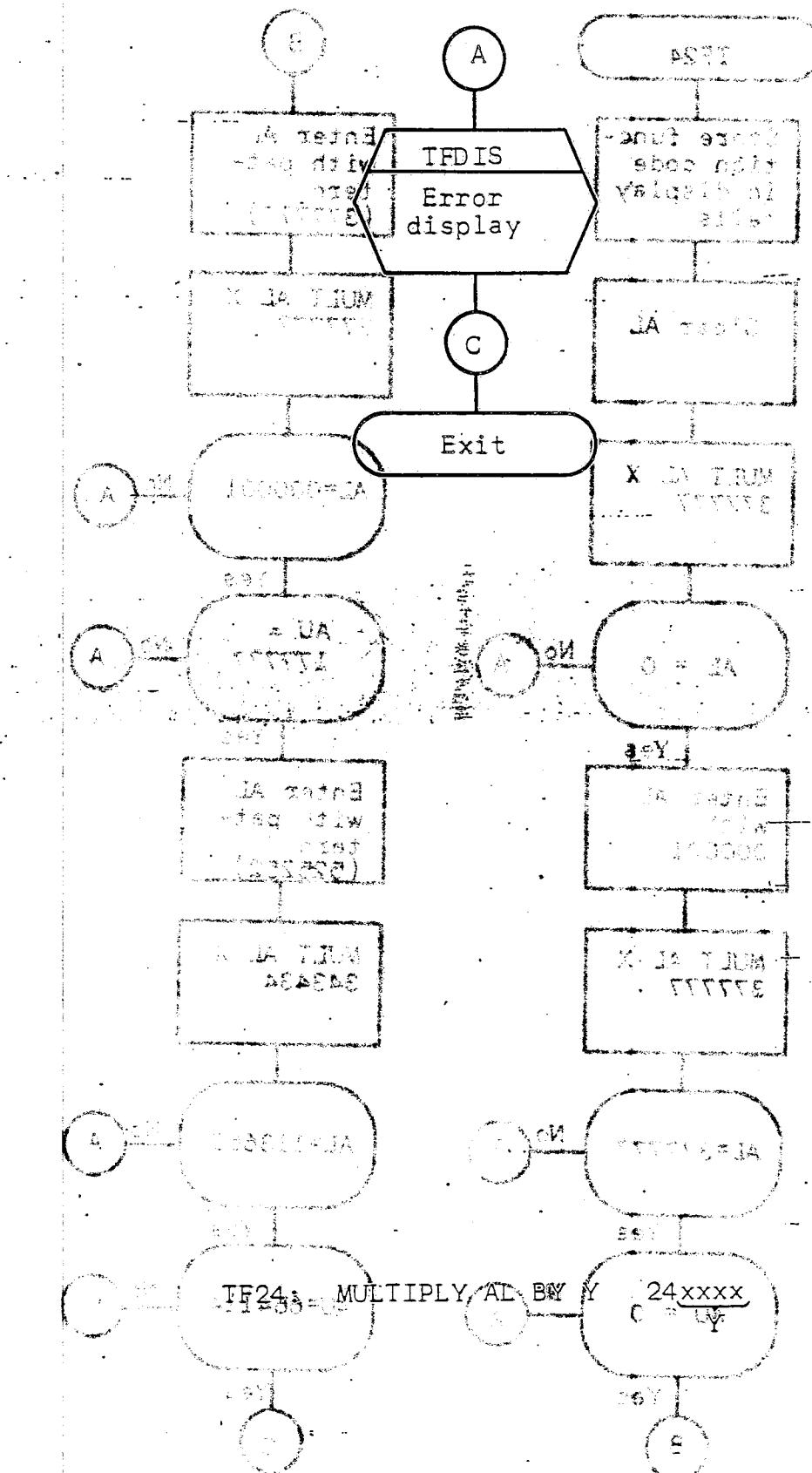
SPECIFICATION SHEET

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SPECIFICATION SYMBOL
SB-10163

(A)

TFDIS
Error
display

(C)

Exit

TF24: MULTIPLY AL BY Y $24\underline{xxxx}$ $\overline{Y}$

SPECIFICATION SYMBOL
SB-10163

TITLE: TF25 - MULTIPLY A LOWER BY Y PLUS B (25xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF25   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: F W S modified by TLR   DATE: 8 Dec. 67

NUMBER OF L_4 OUTPUT INSTRUCTIONS: 31

DESCRIPTION:

This subroutine checks the Multiply A Lower By Y Plus B command.
Constants are entered into AL and B and a MULALB command is execu-
ted using a test-pattern constant. Validity is checked by entering
another test pattern into AL and a constant into B if A is equal
to zero. Then another 25 command is executed, and AL validity is
checked. If AL is equal to zero, A is left shifted and a compare of
AL with a test pattern is executed to check the validity of AU.
If no error is detected, the above cycle (with the left shift) is
repeated with different constants. If no error is detected by any
of the validity checks, an exit is made to the executive routine
(COMA) to continue the program. If an error is detected an exit
is made to the display subroutine. AL and AU will contain the
product of the multiply and, with PROGRAM STOP O set, CO will con-
tain the function code and the error may be evaluated. Upon return
to this subroutine (TF25) an exit is made to the executive routine
(COMA) to check for continuing the test or recycling the subroutine.

SPECIFICATION SYMBOL
SB-10163

TITLE:_____ TF25 _____

INPUT PARAMETERS (Listed Sequentially):

COMA .   TEST PATTERNS

                        TPAB5+1   677777
                      . TCO2   010000
                        TCO4   000000

OUTPUT PARAMETERS (Listed Sequentially):

 BUFF 1
 BUFF 2
 TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA - (EXEC)
TFDIS - Error Display

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:
ERROR DISPLAY
PROGRAM STOP O - AU and AL = product
               -- CO = function code (25xxxx)
PROGRAM SKIP 4 - Set for console error display only
                 Not set for error typeout (Function Code 25)
PROGRAM SKIP O - Not set to continue test
                 Set to recycle subroutine (TF25)
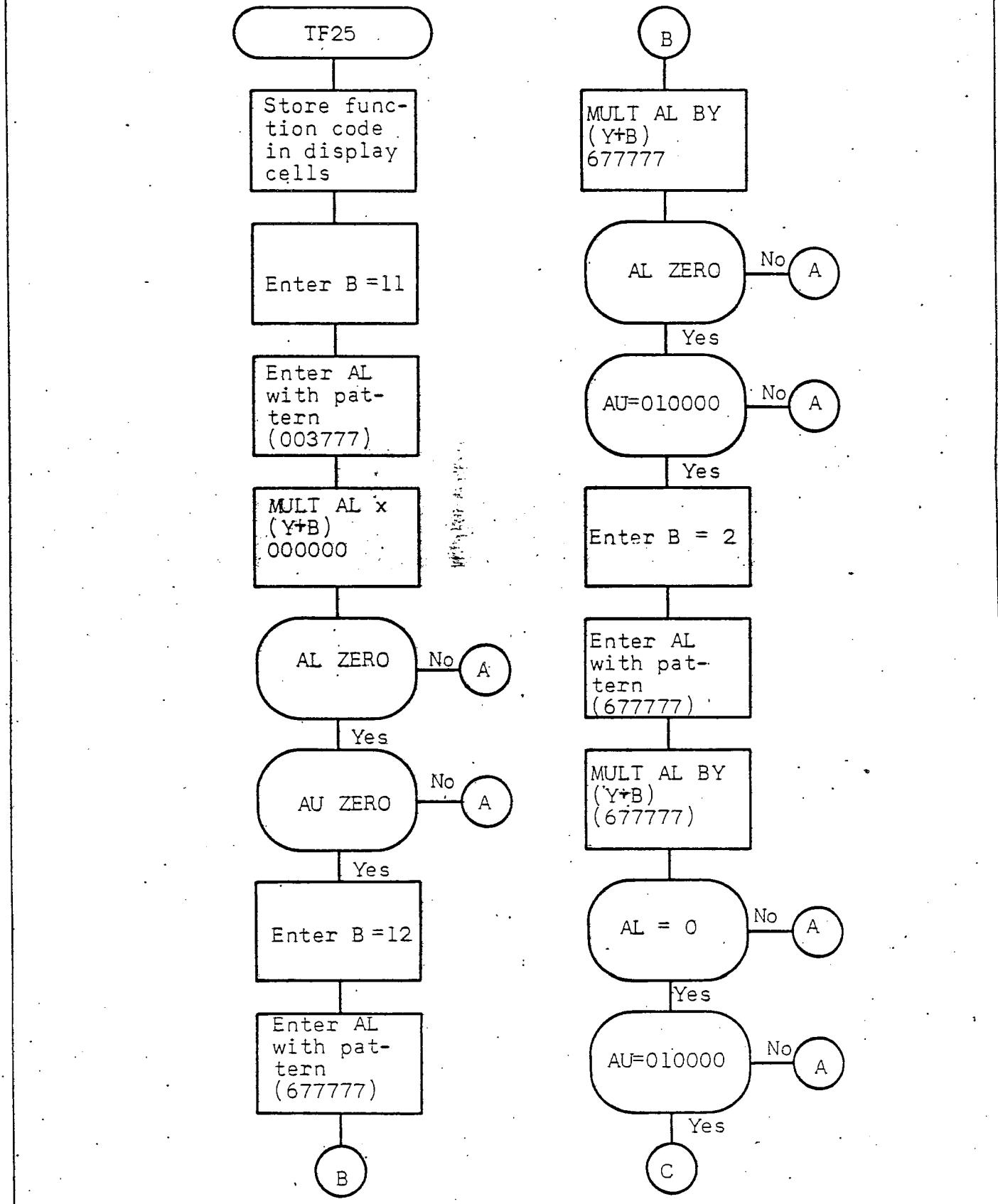
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SPECIFICATION SHEET

SPECIFICATION SYMBOL
SB-10163

```
    ( TF25 )                              ( B )
        |                                   |
+----------------+              +--------------------+
| Store func-    |              | MULT AL BY         |
| tion code      |              | (Y+B)              |
| in display     |              | 677777             |
| cells          |              +--------------------+
+----------------+                        |
        |                          _____
+----------------+                (           )  No
|                |                (  AL ZERO  )------( A )
| Enter B =11    |                (_____)
|                |                        | Yes
+----------------+                 _____
        |                         (           )  No
+----------------+                ( AU=010000 )------( A )
| Enter AL       |                (_____)
| with pat-      |                        | Yes
| tern           |              +--------------------+
| (003777)       |              |                    |
+----------------+              | Enter B = 2        |
        |                       |                    |
+----------------+              +--------------------+
| MULT AL x      |                        |
| (Y+B)          |              +--------------------+
| 000000         |              | Enter AL           |
+----------------+              | with pat-          |
        |                       | tern               |
   _____                  | (677777)           |
  (           )  No             +--------------------+
  ( AL ZERO   )----( A )                  |
  (_____)                 +--------------------+
        | Yes                   | MULT AL BY         |
   _____                  | (Y+B)              |
  (           )  No             | (677777)           |
  ( AU ZERO   )----( A )        +--------------------+
  (_____)                          |
        | Yes                     _____
+----------------+               (           )  No
|                |               (  AL = 0   )------( A )
| Enter B =12    |               (_____)
|                |                       | Yes
+----------------+                _____
        |                        (           )  No
+----------------+               ( AU=010000 )------( A )
| Enter AL       |               (_____)
| with pat-      |                       | Yes
| tern           |                    ( C )
| (677777)       |
+----------------+
        |
     ( B )
```

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SPECIFICATION SHEET
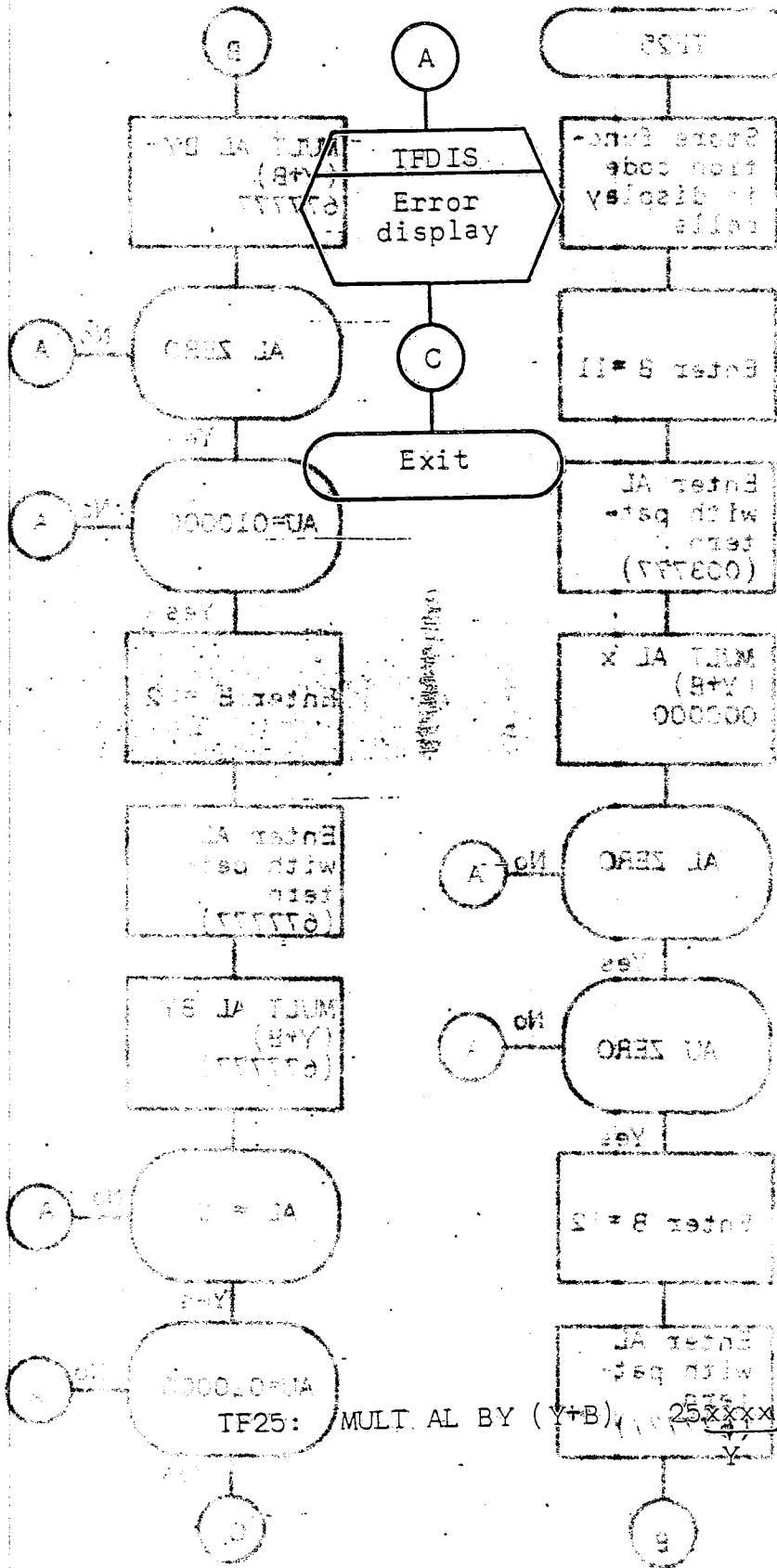
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SPECIFICATION SYMBOL
SB-10163

TFDIS

Error
display

C

Exit

TF25: MULT. AL BY (Y+B), 25XXXX

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PROGRAM DATA PAGE

SPECIFICATION SYMBOL
SB-10163

TITLE: TF26 - DIVIDE A BY Y (26xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF26 _____ KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: EWS modified by TLR _____ DATE: 8 Dec. 67.

NUMBER OF L_4 OUTPUT INSTRUCTIONS: 41

DESCRIPTION:

This subroutine checks the Divide A By Y command. AU and AL are
entered with test-pattern constants and a DIVA command is executed
using another test-pattern constant. A validity check is executed
by comparing AL to a test-pattern constant. If correct, A is left
shifted and another comparing of AL to check AU is executed. If
correct, AU is entered with a different, test-pattern constant and
another 26 command is executed. AL is checked for validity by another
comparison. AU validity is checked by entering AL and AU if A is
equal to zero. A DIVA command is then executed and validity is
checked the same as the first time. This is repeated one more time
with different test patterns, and if no error is detected, an exit
is made to the executive routine (COMA) to continue the program.
If an error is detected by any of the validity checks, an exit is
made to the display subroutine. AU will contain the remainder and
AL the quotient, and if PROGRAM STOP 0 is set, CO will display the
function code and the error may be evaluated. Upon return to this
subroutine (TF26) an exit is made to the executive routine (COMA)
to check for continuing the test or recycling the subroutine (TF26).

SPECIFICATION SYMBOL
SB-10163

TITLE: TF26

INPUT PARAMETERS (Listed Sequentially):

COMA   TEST PATTERNS

TPAT	777777	TCUT	500000
TPAT1	000000	TCUT1	477777
TPAB+1	300000	TCUT2	670000
TPAB4	107777	TCUT3	077777
TPAB4+1	277777		
TPAS4	000002		
TCO	777776		
TCO4+1	200000		

OUTPUT PARAMETERS (Listed Sequentially):

BUFF1
BUFF2
TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA (EXEC)
TFDIS - Error Display

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:

ERROR DISPLAY
PROGRAM STOP 0 - Remainder in AU
                Quotient in AL
                Function code (26xxxx) in CO
PROGRAM SKIP 4 - Set for console error display only
                Not set for error typeout (Function Code 26)
PROGRAM SKIP 0 - Not set to continue test
                Set to recycle subroutine (TF26)
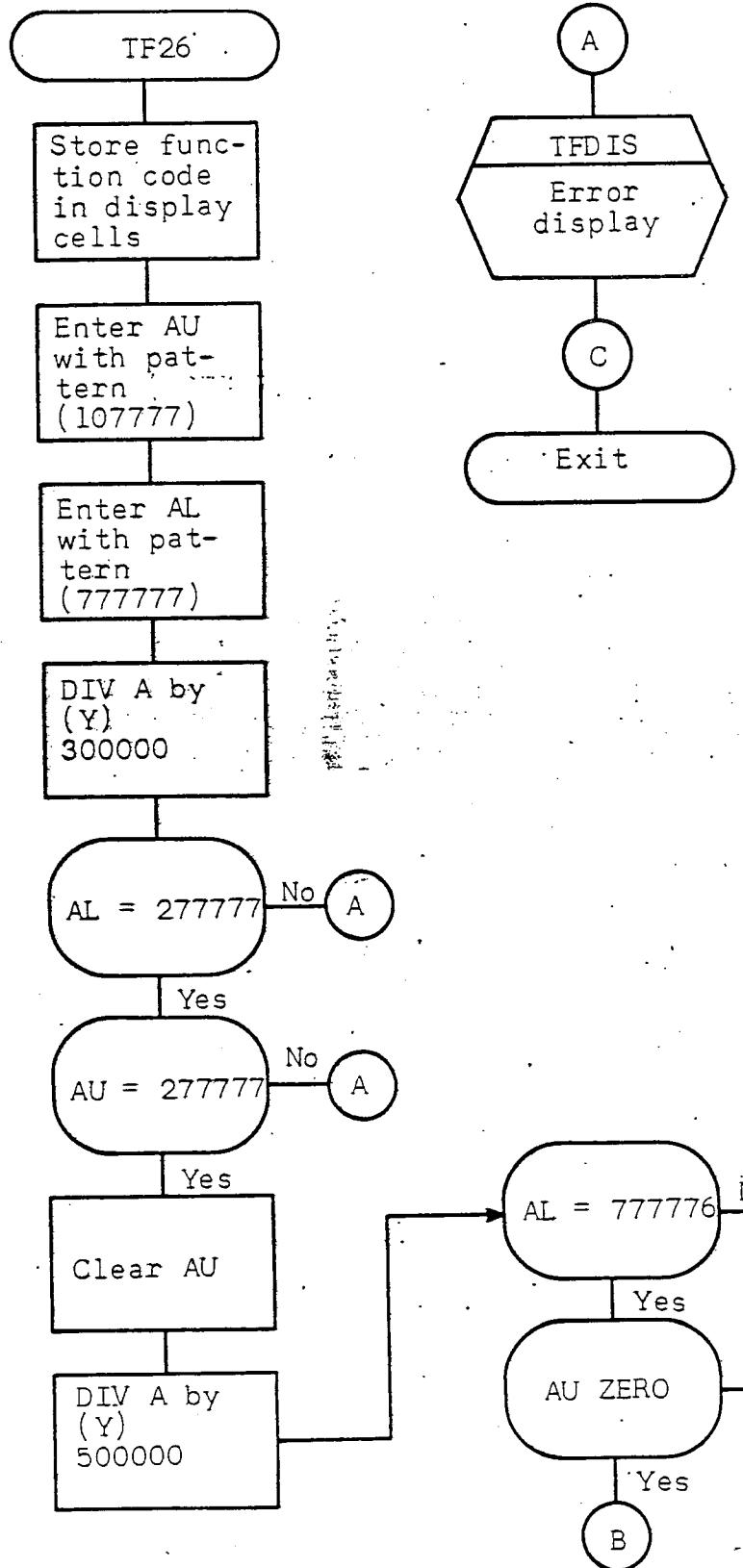
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SPECIFICATION SHEET

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SPECIFICATION SYMBOL
SB-10163

```
                    ( TF26 )                          ( A )
                       |                                |
          +-------------------------+        +----------------------+
          | Store func-             |        \       TFDIS         /
          | tion code               |         \     Error        /
          | in display              |          \    display     /
          | cells                   |          /               \
          +-------------------------+          +---------------+
                       |                                |
          +-------------------------+                  ( C )
          | Enter AU                |                   |
          | with pat-               |              ( Exit )
          | tern                    |
          | (107777)                |
          +-------------------------+
                       |
          +-------------------------+
          | Enter AL                |
          | with pat-               |
          | tern                    |
          | (777777)                |
          +-------------------------+
                       |
          +-------------------------+
          | DIV A by                |
          | (Y)                     |
          | 300000                  |
          +-------------------------+
                       |
              /                 \      No
             (  AL = 277777      )---------( A )
              \                 /
                    | Yes
              /                 \      No
             (  AU = 277777      )---------( A )
              \                 /
                    | Yes
          +-------------------------+
          |                         |
          | Clear AU                |              /              \      No
          |                         |             (  AL = 777776    )------( A )
          +-------------------------+              \              /
                       |                                 | Yes
          +-------------------------+              /              \      No
          | DIV A by                |------------(   AU ZERO       )------( A )
          | (Y)                     |             \              /
          | 500000                  |                   | Yes
          +-------------------------+                  ( B )
```

```
                        ( B )
                          │
              ┌───────────────────┐
              │ Enter AL          │
              │ with pat-         │
              │ tern              │
              │ (477777)          │
              └───────────────────┘
                          │
              ┌───────────────────┐
              │                   │
              │   Clear AU        │
              │                   │
              └───────────────────┘
                          │
              ┌───────────────────┐
              │ DIV A by          │
              │ (Y)               │
              │ 200000            │
              └───────────────────┘
                          │
              (  AL=000002  )──No──( A )
                          │
                        Yes
              (  AU=077777  )──No──( A )
                          │
                        Yes
              ┌───────────────────┐
              │ Enter AU          │
              │ with pat-         │
              │ tern              │
              │ (670000)          │
              └───────────────────┘
                          │
              ┌───────────────────┐
              │                   │              (  AL=277777  )──No──( A )
              │   Clear AL        │                       │
              │                   │                     Yes
              └───────────────────┘              (  AL=500000  )──No──( A )
                          │                              │
              ┌───────────────────┐                    Yes
              │ DIV A by          │                    ( C )
              │ (Y)               │
              │ 477777            │
              └───────────────────┘
```

TF26:   DIVIDE A BY (Y)   26 xxxx
                                  Y

SPECIFICATION SYMBOL
SB-10163

TITLE: TF27 - DIVIDE A BY Y+B (27xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF27   KEY: _____   IS LABEL DUPLICATE? No

PROGRAMMER: FWS modified by TLR   DATE: 8 Dec. 67.

NUMBER OF L_4 OUTPUT INSTRUCTIONS: 22

DESCRIPTION:

This subroutine checks the Divide A By A+B command. AL and AU
are entered with test-pattern constants and B with a constant, and
a DIVAB command is executed. The validity of the result is
checked by comparing AL to a test pattern, and if correct the
validity of AU is checked by entering a new constant in B if A
equals zero. Another 27 command is executed and validity checked
as before except for different test-pattern constants. If no
error is detected by any of the validity checks, an exit is made
to the executive routine (COMA) to continue the program. If an
error is detected an exit is made to the display subroutine. AU
will contain the remainder of the divide, and AL the quotient; if
PROGRAM STOP 0 is set, CO will display the function code and the
error may be evaluated. Upon return to this subroutine (TF27) an
exit is made to the executive routine (COMA) to check for continuing
the test or recycling this subroutine (TF27).

SPECIFICATION SYMBOL
SB-10163

TITLE: ___TF27___

INPUT PARAMETERS (Listed Sequentially):

COMA   TEST PATTERNS

TPAT1	000000
TPAB1	000001
TPAB4+1	277777
TCO	777776
TCUT	500000

OUTPUT PARAMETERS (Listed Sequentially):
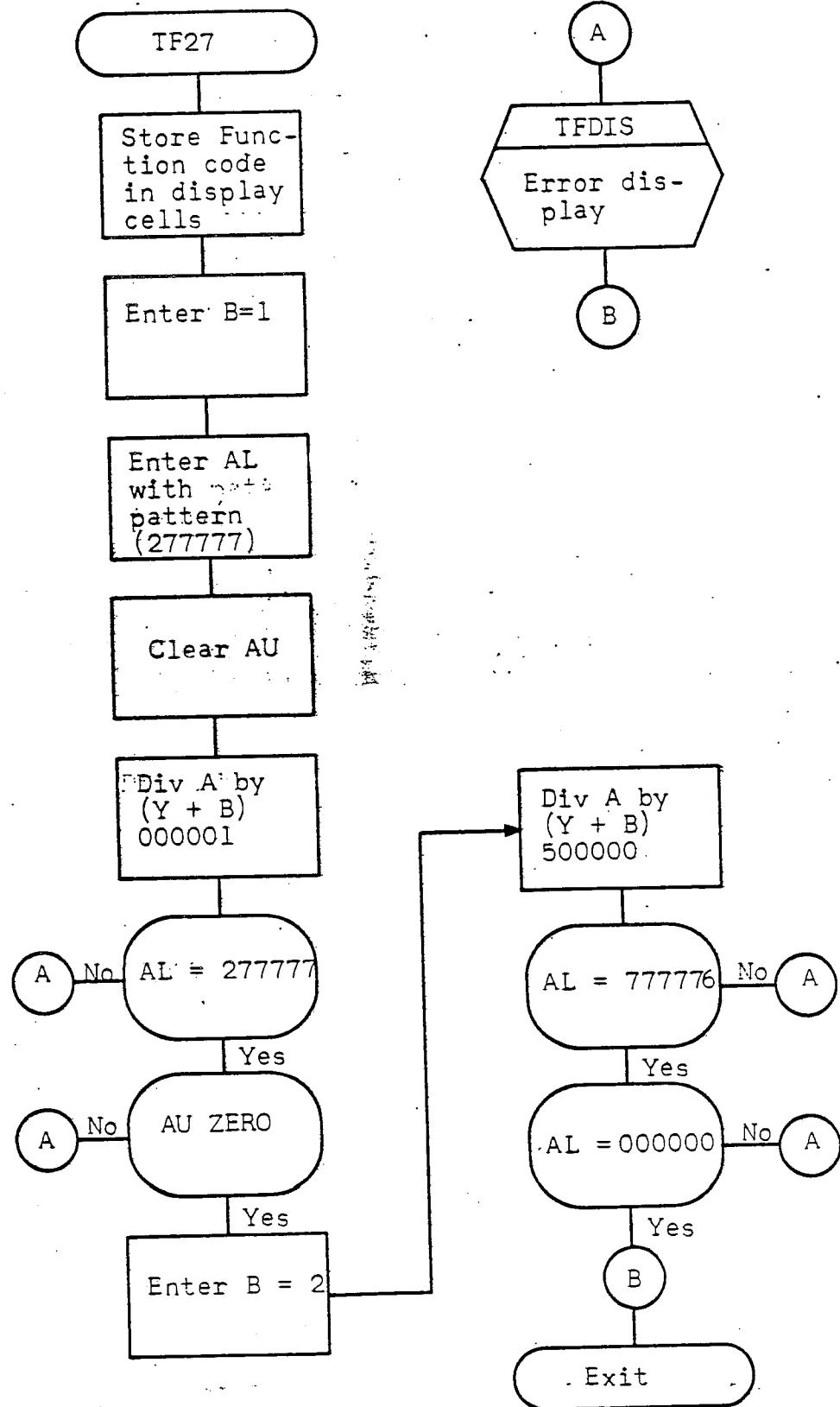
BUFF1
BUFF2
TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):
COMA - (EXEC)
TFDIS - Error Display

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:
ERROR DISPLAY
PROGRAM STOP 0 - Remainder in AU
                Quotient in AL
                Function code (27xxxx) in CO
PROGRAM SKIP 4 - Set for console error display only
                Not set for error typeout (Function Code 27)
PROGRAM SKIP 0 - Not set to continue test
               - Set to recycle subroutine (TF27)

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TF27

Store Function code in display cells

A

TFDIS

Error display

Enter B=1

B

Enter AL with pattern (277777)

Clear AU

Div A by (Y + B) 000001

Div A by (Y + B) 500000

A — No — AL = 277777

AL = 777776 — No — A

Yes

Yes

A — No — AU ZERO

AL = 000000 — No — A

Yes

Yes

Enter B = 2

B

Exit

TF27: DIVIDE A BY (Y+B) 27xxxxx

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SPECIFICATION SYMBOL
SB-10163

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TF27: DIVIDE A BY (Y+B) 27xxxx

TF27

Store function code in display cells

Enter B=1

Enter AL with pattern (777777)

Clear AU

Div A by (Y + B) 100000

AL = 777777 → No → A, Yes

AU ZERO → No → A, Yes

Enter B = 2

Div A by (Y + B) 000005

AL = 777777 → No → A, Yes

AL = 000000 → No → A, Yes

B

Exit

TF019 Error display → B

SPECIFICATION SYMBOL
SB-10163

TITLE: TF30 - INDIRECT RETURN JUMP (30xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF30   KEY: _____   IS LABEL DUPLICATE? No

PROGRAMMER: PMC modified by TER   DATE: 8 Dec. 67

NUMBER OF L₄ OUTPUT INSTRUCTIONS: 21

DESCRIPTION:

This subroutine checks the Indirect Return Jump command. An IRJP command is executed to a subroutine which updates the address of its entry return jump address by one, and returns the routine to the next, sequential, 30 command. If correct, this is repeated until all Indirect Jump commands have been executed, then an exit is made to the executive routine (COMA). If an error is detected, an exit is made to the display subroutine. If PROGRAM STOP 0 is set, CO will contain the function code and the error may be evaluated. (There is no error display in AU or AL.) Upon return to this subroutine (TF30) an exit is made to the executive routine (COMA) to check for continuing the test or recycling this subroutine (TF30).

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SPECIFICATION SHEET

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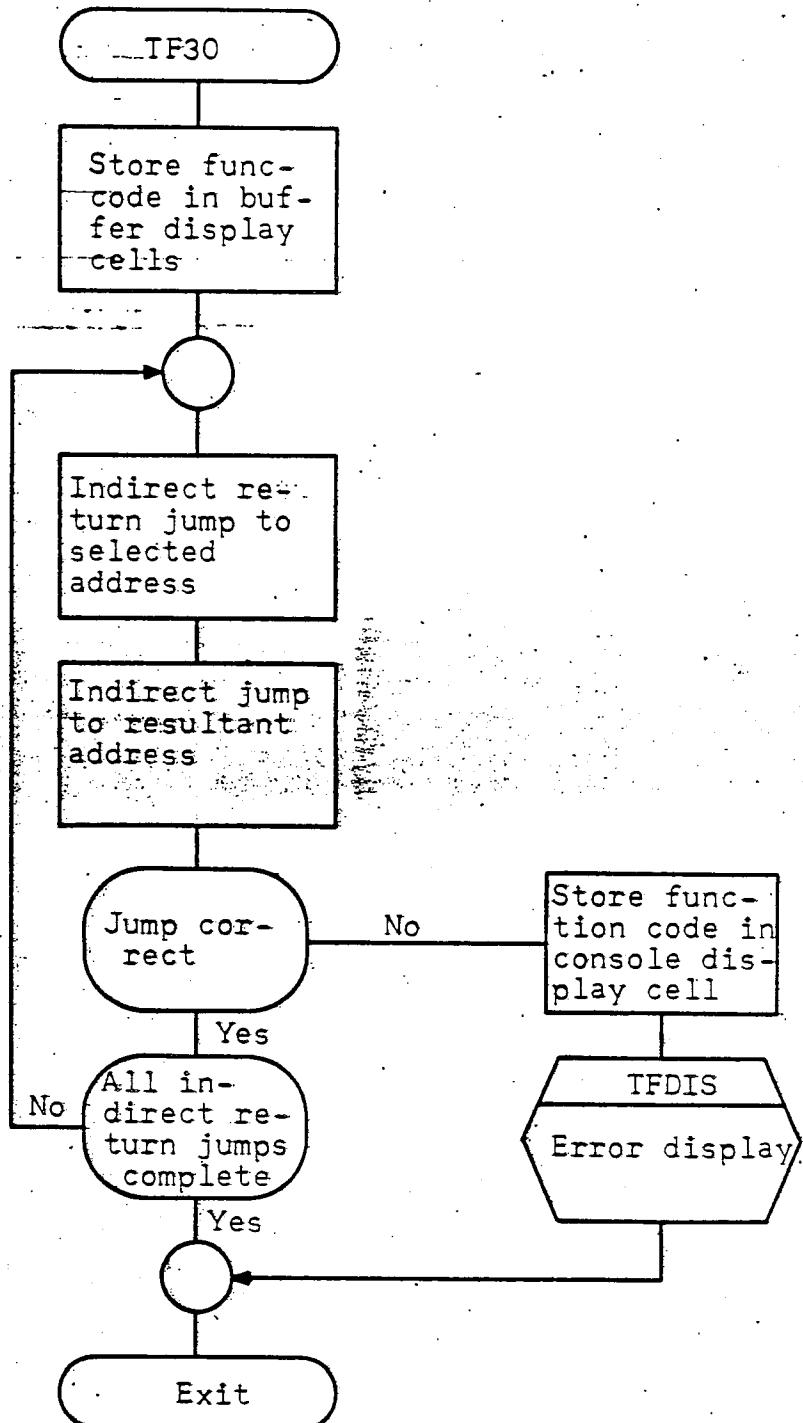
SPECIFICATION SYMBOL
SB-10163

TITLE: TF30

INPUT PARAMETERS (Listed Sequentially):

COMA
TEST PATTERNS
TPAT1   000000

OUTPUT PARAMETERS (Listed Sequentially):

BUFF1
BUFF2
TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA — (EXEC)
TFDIS — Error Display

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:

ERROR DISPLAY
PROGRAM STOP 0 — No error display in AU or AL
                Function code (30xxxx) in CO
PROGRAM SKIP 4 — Set for console error display only
                Not set for error typeout (Function Code 30)
PROGRAM SKIP 0 — Not set to continue test
                Set to recycle subroutine (TF30)

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SPECIFICATION SHEET

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SPECIFICATION SYMBOL
SB-10163

TF30

Store func-
code in buf-
fer display
cells

Indirect re-
turn jump to
selected
address

Indirect jump
to resultant
address

Jump cor-
rect → No → Store func-
tion code in
console dis-
play cell

Yes

All in-
direct re-
turn jumps
complete — No

Yes

TFDIS

Error display

Exit

TF30: INDIRECT RETURN JUMP

SPECIFICATION SYMBOL
SB-10163

TITLE: TF31 - INDIRECT RETURN JUMP PLUS B (31xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF31   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: PMC modified by TLR   DATE: 8 Dec. 67

NUMBER OF L4 OUTPUT INSTRUCTIONS: 36

DESCRIPTION:

This subroutine checks the Indirect Return Jump Plus B command.
B is entered with a constant and then an IRJPB command is executed
followed by an indirect jump to the resultant address (the entry
to a subroutine). If the execution is proper, the next, sequential,
test constant is checked by exiting from the subroutine and is
entered into B, and the foregoing sequence is repeated until the
prescribed number of 31- commands have been executed. If an error
is detected an exit is made to the display subroutine. If PROGRAM
STOP O is set, CO will display the function code and the error
may be evaluated. (There is no error display in AU or AL). Upon
return to this subroutine (TF31) an exit is made to the executive
routine (COMA) to check for continuing the test or recycling this
subroutine (TF31).

SPECIFICATION SYMBOL
SB-10163

TITLE: __TF31__

INPUT PARAMETERS (Listed Sequentially):

COMA   TEST PATTERNS

                        TPAT1   000000
                        TCO   777776

OUTPUT PARAMETERS (Listed Sequentially):
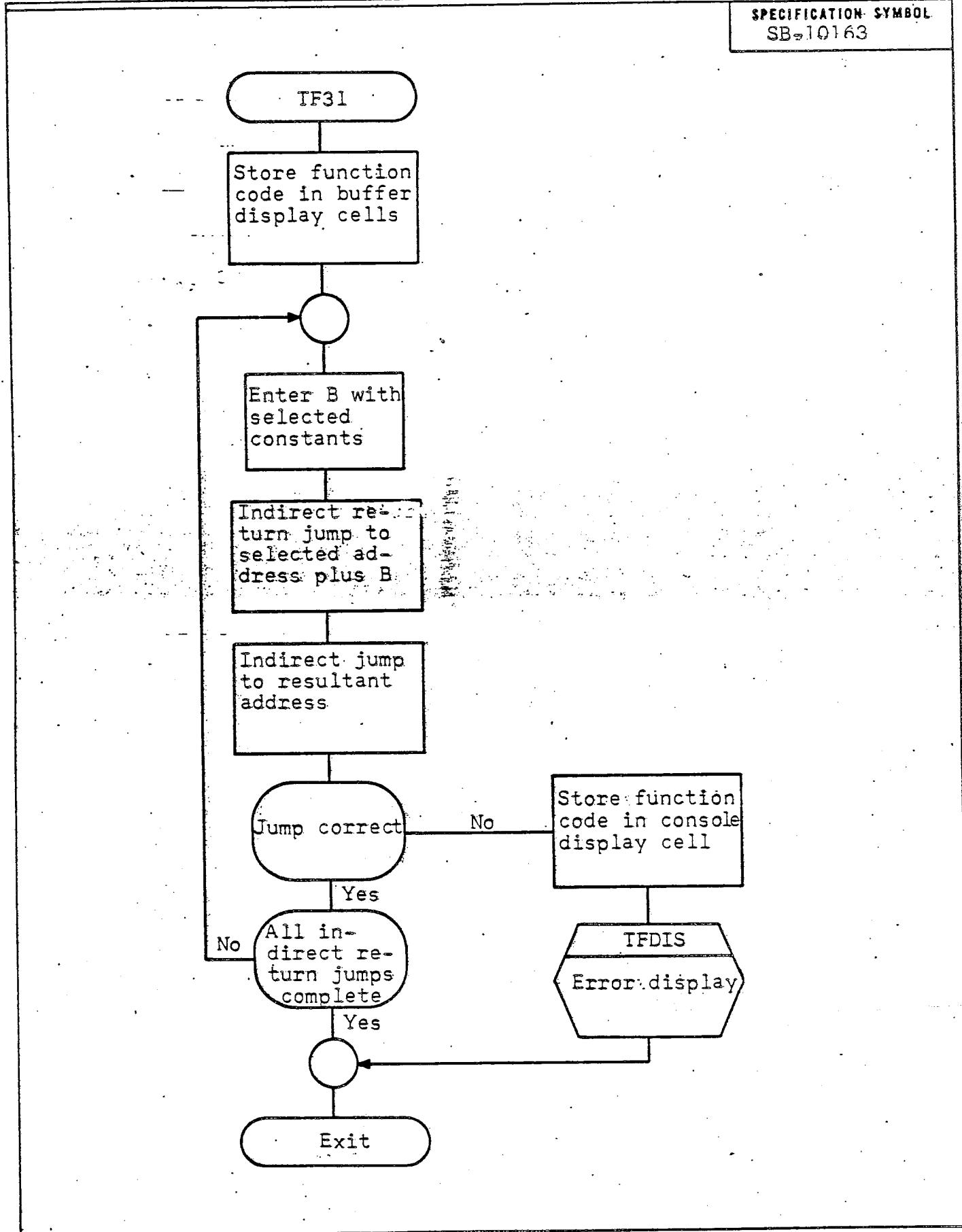
BUFF1
BUFF2
TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA - (EXEC)
TFDIS - Error Display

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:
ERROR DISPLAY
PROGRAM STOP 0 - No display in AU or AL
                 Function code (31xxxx) in CO
PROGRAM SKIP 4 - Set for console error display only
                 Not set for error typeout (Function Code 31)
PROGRAM SKIP 0 - Not set to continue test
   Set to recycle subroutine (TF31)

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TF31

Store function
code in buffer
display cells

Enter B with
selected
constants

Indirect re-
turn jump to
selected ad-
dress plus B

Indirect jump
to resultant
address

Jump correct — No → Store function
code in console
display cell

Yes

All in-
direct re-
turn jumps
complete — No

TFDIS

Error display

Yes

Exit

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SPECIFICATION SYMBOL
SB-10163

TITLE: TF32 - ENTER B (32xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF32   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: PMC modified by TLR   DATE: 8 Dec. 67

NUMBER OF L_4 OUTPUT INSTRUCTIONS: 57

DESCRIPTION:

This subroutine checks the Enter B command. An ENTB command with
a test-pattern constant is executed. Then, AL is entered with B
and AU with the test-pattern used in the 32 command. Validity is
checked by comparing AL to an associated, test-pattern constant.
If correct, the next test-pattern constant is entered into B with
an ENTB command and the above cycle is repeated until all of the
test patterns have been checked. An exit is then made to the
executive routine (COMA). If an error is detected by any validity
check, AU will contain the correct pattern, AL the incorrect
pattern, and an exit is made to the display subroutine. With
PROGRAM STOP O set, CO will contain the function code and the
error may be evaluated. Upon return to this subroutine (TF32),
an exit is made to the executive routine (COMA) to check for con-
tinuing the test or recycling this subroutine (TF32).

SPECIFICATION SYMBOL
SB-10163

TITLE:_____TF32_____

INPUT PARAMETERS (Listed Sequentially):

COMA

TEST PATTERNS

TPAT	777777	TPAT4	770000
TPAT+1	777777	TPAT4+1	770000
TPAT1	000000	TPAT5	007777
TPAT1+1	000000	TPAT5+1	007777
TPAT2	252525	TPAT6	707070
TPAT2+1	252525	TPAT6+1	707070
TPAT3	525252	TPAT7	070707
TPAT3+1	525252	TPAT7+1	070707
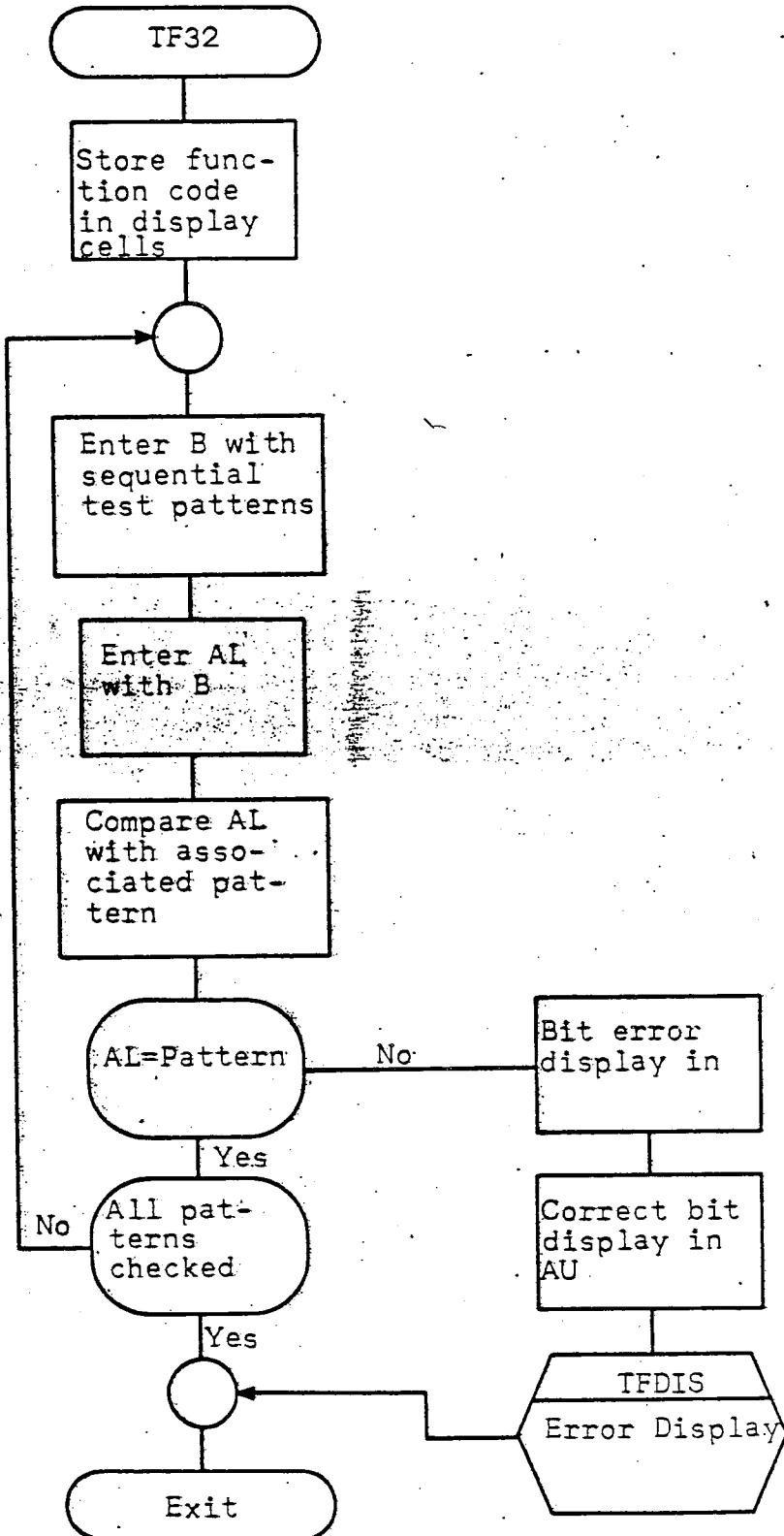
OUTPUT PARAMETERS (Listed Sequentially):

BUFF1
BUFF2
TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA – (EXEC)
TFDIS – Error Display

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:

ERROR DISPLAY
PROGRAM STOP 0 – Correct information in AU
                 Incorrect information in AL
                 Function code (32xxxx) in CO
PROGRAM SKIP 4 – Set for console error display only
                 Not set for error typeout (Function Code 32)
PROGRAM SKIP 0 – Not set to continue test
                 Set to recycle subroutine (TF32)

TF32

Store func-
tion code
in display
cells

Enter B with
sequential
test patterns

Enter AL
with B

Compare AL
with asso-
ciated pat-
tern

AL=Pattern —— No —— Bit error
display in

Yes

All pat-
terns
checked —— No

Correct bit
display in
AU

Yes

TFDIS
Error Display

Exit

TF32: ENTER B

SPECIFICATION SYMBOL
SB-10163

TITLE: TF33 - ENTER B MODIFIED BY B (33xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF33   KEY: _____   IS LABEL DUPLICATE? No

PROGRAMMER: PMC modified by TLR   DATE: 8 Dec. 67

NUMBER OF L_4 OUTPUT INSTRUCTIONS: 58

DESCRIPTION:

This subroutine checks the Enter B Modified By B command. A test-pattern constant is entered into B and an ENTBB command is executed. Validity is checked by entering AL with the constants of B, AU with the test pattern of the Enter B plus B command, and comparing AL with an associated test pattern. If correct, the next constant is entered into B and cycle is repeated until all patterns have been checked. An exit is then made to the executive routine (COMA). If an error is detected, an exit is made to the display subroutine. AU will contain the correct pattern, AL the incorrect pattern and, with PROGRAM STOP 0 set, CO will contain the function code and the error may be evaluated. Upon return to this subroutine (TF33) an exit is made to the executive routine (COMA) to check for continuing the test or recycling this subroutine (TF33).

SPECIFICATION SYMBOL
ISB-10163

TITLE: TF33

INPUT PARAMETERS (Listed Sequentially):

COMA

TEST PATTERNS

TPAT	777777	TPAT5+1	007777
TPAT+1	777777	TPAT6	707070
TPAT1	000000	TPAT7	070707
TPAT2	252525	TPAB1	000001
TPAT3	525252	TPAB1+1	777776
TPAT3+1	525252	TPAS4	000002
TPAT4	770000	TPAS5	000004
TPAT5	007777	TPAS7	777775

OUTPUT PARAMETERS (Listed Sequentially):

BUFF2
BUFF1
TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA - (EXEC)
TFDIS - Error Display
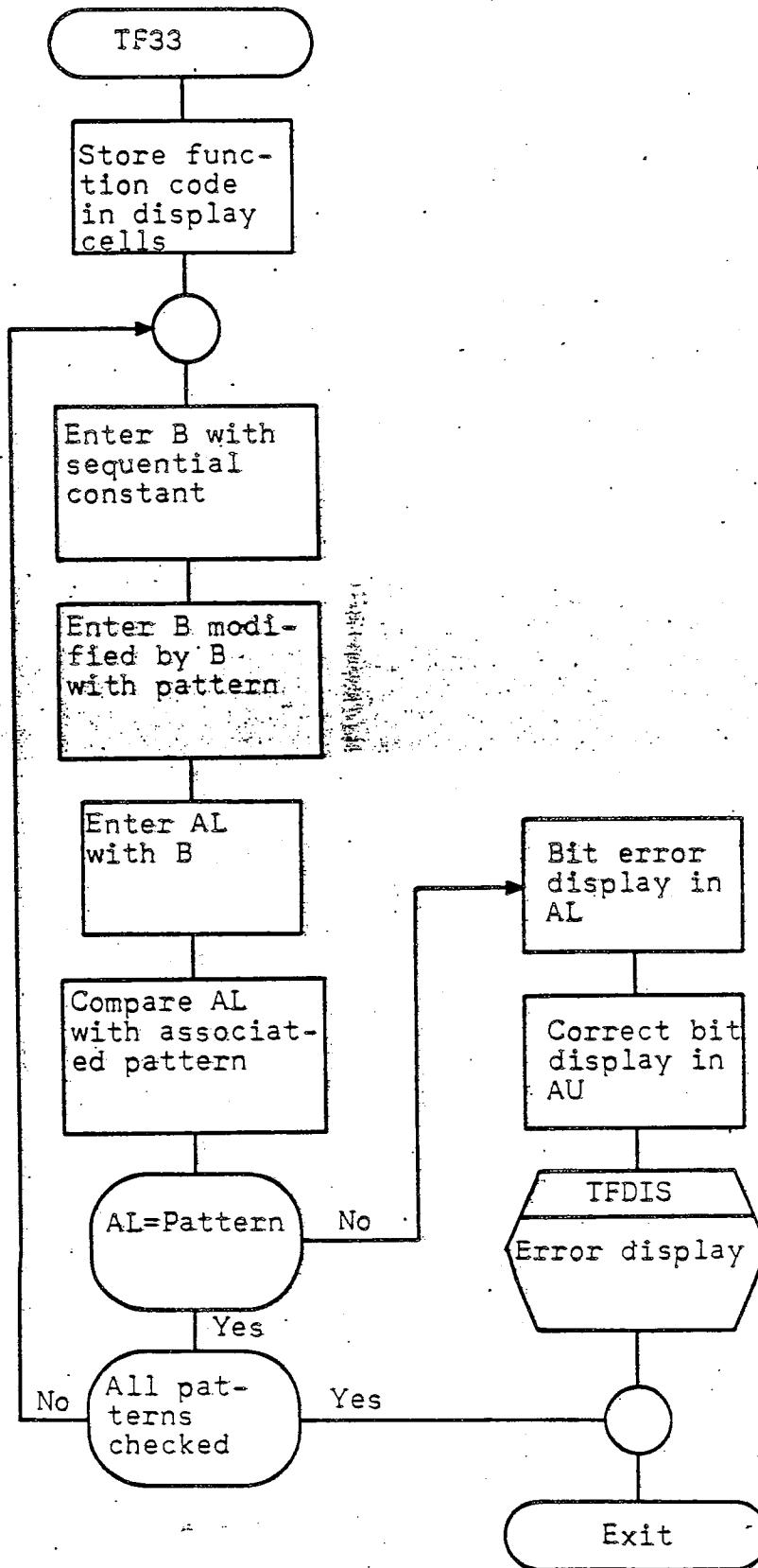
SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:

ERROR DISPLAY
PROGRAM STOP 0 - Correct information in AU
                Incorrect information in AL
                Function code (33xxxx) in CO
PROGRAM SKIP 4 - Set for console error display only
                Not set for error typeout (Function Code 33)
PROGRAM SKIP 0 - Not set to continue test
                Set to recycle subroutine (TF33)

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SPECIFICATION SHEET

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SPECIFICATION SYMBOL
SB-10163

```
                    ╭─────────────╮
                    │    TF33      │
                    ╰─────────────╯
                          │
                  ┌───────────────┐
                  │ Store func-   │
                  │ tion code     │
                  │ in display    │
                  │ cells         │
                  └───────────────┘
                          │
                         ( )
                          │
                  ┌───────────────┐
                  │ Enter B with  │
                  │ sequential    │
                  │ constant      │
                  └───────────────┘
                          │
                  ┌───────────────┐
                  │ Enter B modi- │
                  │ fied by B     │
                  │ with pattern  │
                  └───────────────┘
                          │
                  ┌───────────────┐        ┌───────────────┐
                  │ Enter AL      │        │ Bit error     │
                  │ with B        │        │ display in    │
                  └───────────────┘        │ AL            │
                          │                └───────────────┘
                  ┌───────────────┐                │
                  │ Compare AL    │        ┌───────────────┐
                  │ with associat-│        │ Correct bit   │
                  │ ed pattern    │        │ display in    │
                  └───────────────┘        │ AU            │
                          │                └───────────────┘
                    ╱AL=Pattern╲   No               │
                   (            )─────────    ╱ TFDIS ╲
                    ╲          ╱             ( Error display )
                       │ Yes                  ╲         ╱
              No  ╱ All pat- ╲   Yes               │
             ────( terns     )──────────         ( )
                  ╲ checked  ╱                     │
                                             ╭───────────╮
                                             │   Exit    │
                                             ╰───────────╯
```

TF33:   ENTER B MODIFIED BY B

SPECIFICATION SYMBOL
SB-10163

TITLE: TF34 - DIRECT JUMP (34xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF34   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: PMC modified by TLR   DATE: 8 Dec. 67

NUMBER OF L$_4$ OUTPUT INSTRUCTIONS: 24

DESCRIPTION:

This subroutine checks a series of Direct Jump commands (JP). If
no error occurs, an exit is made to the executive routine (COMA).
If an error occurs, an exit is made to the display subroutine
(AU and AL will have no error display) where, if PROGRAM STOP O
is set, the function code will be contained in CO and the error
may be evaluated. Upon return to this subroutine (TF34) an exit
is made to the executive routine (COMA) to check for continuing the
program or recycling the subroutine (TF34).

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SPECIFICATION SHEET

PROGRAM DATA PAGE (Cont)   SHEET 270 · REVISION —

SPECIFICATION SYMBOL
SB-10163

TITLE: __TF34__

INPUT PARAMETERS (Listed Sequentially):

COMA   TEST PATTERNS
                        TPAT1   000000

OUTPUT PARAMETERS (Listed Sequentially):

BUFF1
BUFF2
TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA - (EXEC)
TFDIS-Error Display

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:
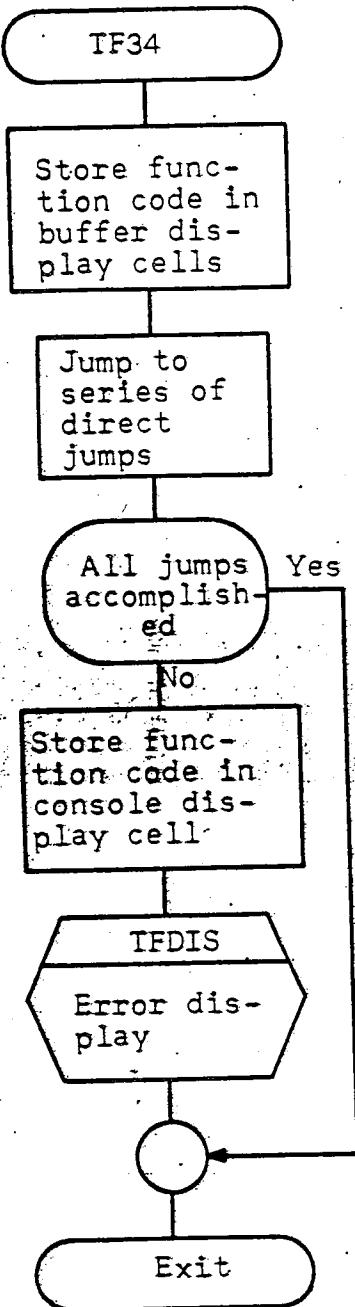
ERROR DISPLAY
PROGRAM STOP 0 - No display in AU or AL
                 Function code (34xxxx) in CO
PROGRAM SKIP 4 - Set for console error display only
                 Not set for error typeout (Function Code 34)
PROGRAM SKIP 0 - Not set to continue test
                 Set to recycle subroutine (TF34)

TF34

Store func-
tion code in
buffer dis-
play cells

Jump to
series of
direct
jumps

All jumps
accomplish-
ed   Yes

No

Store func-
tion code in
console dis-
play cell

TFDIS

Error dis-
play

Exit

TF34:   DIRECT JUMP

SPECIFICATION SYMBOL
SB-10163

TITLE: TF35 - JUMP PLUS B (35xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF35   KEY: _____   IS LABEL DUPLICATE? No

PROGRAMMER: PMC modified by TLR   DATE: 8 Dec. 67

NUMBER OF L_4 OUTPUT INSTRUCTIONS: 21

DESCRIPTION:

This subroutine checks the Jump Plus B command. B is entered
with a constant and then a JPB is executed to a test address. If
the Jump is correct the next Enter B with a constant is executed;
this cycle is repeated until the prescribed number of 35-commands
have been executed. An exit is then made to the executive routine
(COMA). If the Jump is in error, an exit is made to the display
subroutine. If PROGRAM STOP 0 is set, CO will contain the function
code and the error may be evaluated. (AL and AU will not contain
error information). Upon return to this subroutine (TF35) an
exit is made to the executive routine (COMA) to check for continu-
ing the test or recycling this subroutine (TF35).

SPECIFICATION SYMBOL
SB-10163

TITLE: TF35

INPUT PARAMETERS (Listed Sequentially):

COMA   TEST PATTERNS

                    TPAT1   000000

OUTPUT PARAMETERS (Listed Sequentially):

BUFF1
BUFF2
TFX
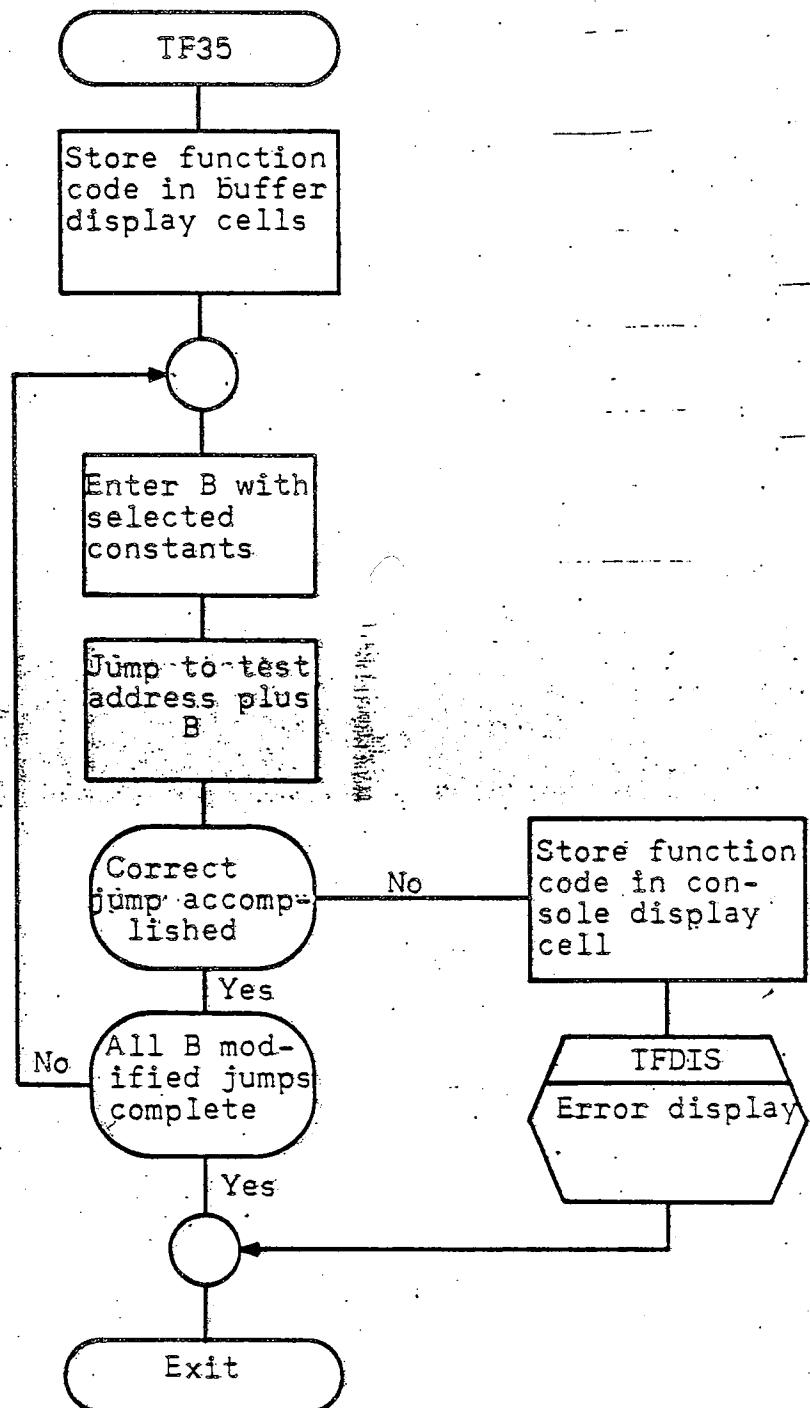
ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA – (EXEC)
TFDIS – Error Display

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:

ERROR DISPLAY
PROGRAM STOP 0 – No display in AU or AL
                 Function code (35xxxx) in CO
PROGRAM SKIP 4 – Set for console error display only
                 Not set for error typeout (Function Code 35)
PROGRAM SKIP 0 – Not set to continue test
                 Set to recycle subroutine (TF35)

```
                    ┌──────────────┐
                    │     TF35     │
                    └──────────────┘
                           │
              ┌────────────────────────┐
              │ Store function         │
              │ code in buffer         │
              │ display cells          │
              └────────────────────────┘
                           │
                          (○)
                           │
              ┌────────────────────────┐
              │ Enter B with           │
              │ selected               │
              │ constants              │
              └────────────────────────┘
                           │
              ┌────────────────────────┐
              │ Jump to test           │
              │ address plus           │
              │ B                      │
              └────────────────────────┘
                           │
                    ╭──────────────╮              ┌──────────────┐
                    │   Correct    │     No        │ Store function│
                    │ jump accomp- │──────────────▶│ code in con- │
                    │   lished     │               │ sole display │
                    ╰──────────────╯               │ cell         │
                           │ Yes                    └──────────────┘
                    ╭──────────────╮                      │
          No        │ All B mod-   │                 ⬡ TFDIS
         ◀──────────│ ified jumps  │                 Error display
                    │ complete     │
                    ╰──────────────╯
                           │ Yes                          │
                          (○)◀──────────────────────────────
                           │
                    ┌──────────────┐
                    │     Exit     │
                    └──────────────┘
```

TF35:   JUMP PLUS B

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SPECIFICATION SHEET

PROGRAM DATA PAGE

SHEET 275 | REVISION —

SPECIFICATION SYMBOL
SB-10163

TITLE: TF36 - ENTER B WITH CONSTANT (SIGN EXTENDED) (36xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF36   KEY: _____   IS LABEL DUPLICATE? No

PROGRAMMER: PMC modified by TLR   DATE: 8 Dec. 67

NUMBER OF L_4 OUTPUT INSTRUCTIONS: 56

DESCRIPTION:

This subroutine checks the Enter B With Constant (Sign Extended)
command. A ENTBK command is executed, then validity is checked
by entering AL with B and the correct, test-pattern in AU. An
Enter B with the next constant is executed if AL is equal to zero
and validity is checked by entering AL with B, AU with the asso-
ciated test-pattern, and comparing AL with the associated test-
pattern. If correct, the above cycle with compare is repeated
until all patterns have been checked. An exit is then made to
the executive routine (COMA). If an error is detected by any of
the validity checks, an exit is made to the display subroutine.
AU will contain the correct pattern, AL the incorrect pattern and,
with PROGRAM STOP O set, CO will contain the function code and the
error may be evaluated. Upon return to this subroutine (TF36), an
exit is made to the executive routine (COMA) to check for continu-
ing the test or recycling this subroutine (TF36).

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PROGRAM DATA PAGE (Cont)

SPECIFICATION SYMBOL
SB-10163

TITLE: TF36

INPUT PARAMETERS (Listed Sequentially):

COMA

TEST PATTERNS

TPAT	777777
TPAT1	000000
TPAB1	000001
TPAB2+1	000505
TPAK	002020
TPAK5	775252
TPAK6	002525
TPAK7	777070

OUTPUT PARAMETERS (Listed Sequentially):
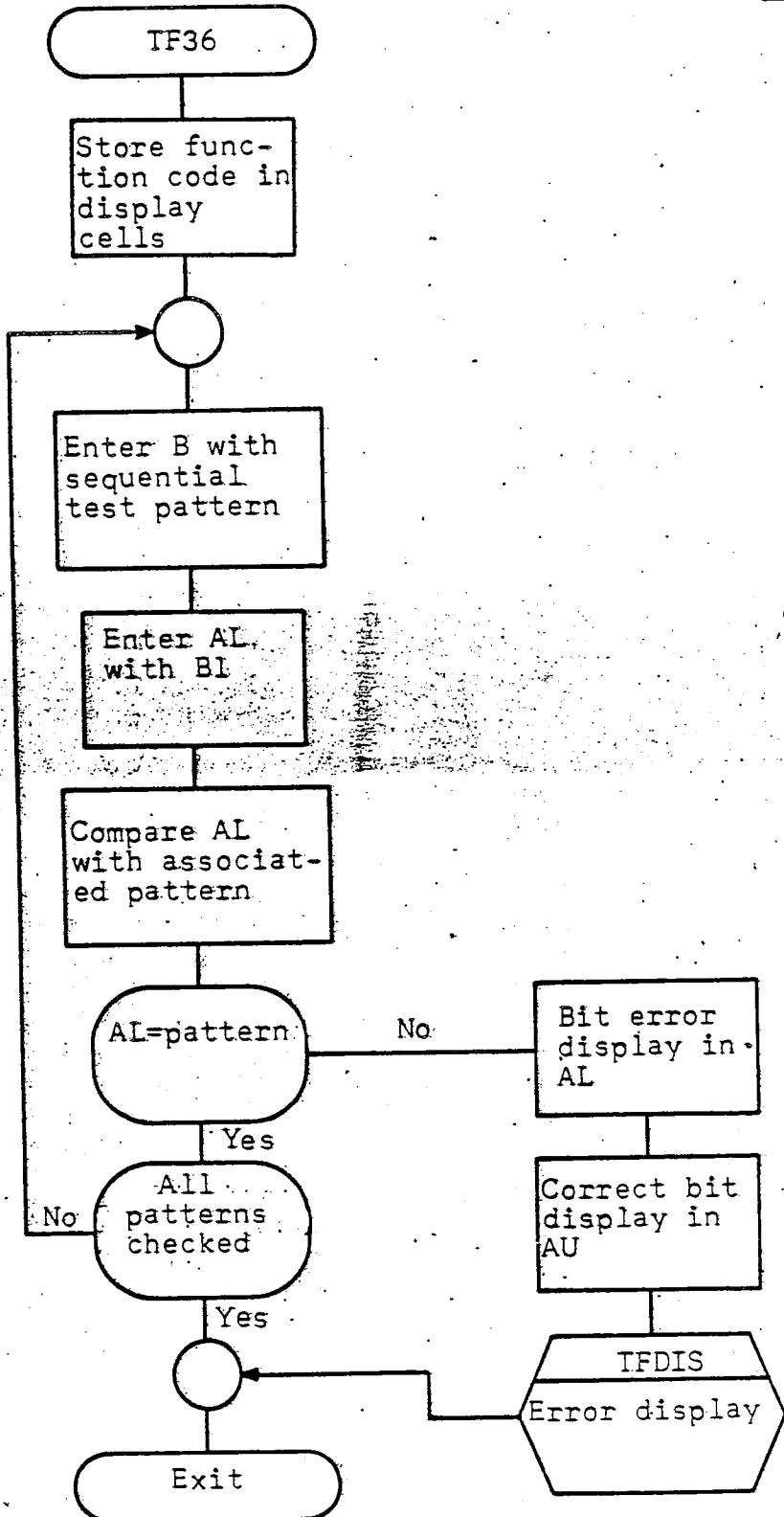
BUFF1
BUFF2
TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA - (EXEC)
TFDIS - Error Display

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:

ERROR DISPLAY
PROGRAM STOP 0 - Correct information in AU
                Incorrect information in AL
                Function code (36xxxx) in CO
PROGRAM SKIP 4 - Set for console error display only
                Not set for error typeout (Function Code 36)
PROGRAM SKIP 0 - Not set to continue test
                Set to recycle subroutine (TF36)

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SPECIFICATION SHEET

SHEET 277 REVISION —

SPECIFICATION SYMBOL
SB-10163

TF36

Store func-
tion code in
display
cells

Enter B with
sequential
test pattern

Enter AL
with BI

Compare AL
with associat-
ed pattern

AL=pattern — No → Bit error
display in
AL

Correct bit
display in
AU

Yes

All
patterns
checked — No

Yes

TFDIS

Error display

Exit

TF36: ENTER B WITH CONSTANT SIGN EXTENDED

SPECIFICATION SYMBOL
SB-10163

TITLE: TF37 - ENTER B WITH CONSTANT PLUS B (SIGN EXT.) (37xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF37   KEY: _____   IS LABEL DUPLICATE? No

PROGRAMMER: PMC modified by TLR   DATE: 8 Dec. 67

NUMBER OF L_4 OUTPUT INSTRUCTIONS: 59

DESCRIPTION:

This subroutine checks the Enter B With Constant Plus B (Sign Extended) command. B is entered with a constant, and an ENTBKB is executed using another constant. Validity is checked by entering AL with the result of the ENTBKB command, and AU with the correct, test-pattern constant; AL and the associated test pattern are compared, and if correct, the next sequential constant is entered into B, and the cycle repeated until all test patterns have been checked. An exit is then made to the executive routine (COMA). If an error is detected by any of the validity checks, an exit is made to the display subroutine. AU will contain the correct pattern, AL the incorrect pattern. If PROGRAM STOP 0 is set, CO will contain the function code and the error may be evaluated. Upon return to this subroutine (TF37) an exit is made to the executive routine (COMA) to check for continuing the test or recycling this subroutine (TF37).

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SPECIFICATION SHEET

P R O G R A M   D A T A   P A G E   (Cont) | SHEET 279 | REVISION

SPECIFICATION SYMBOL

SB-10163

TITLE: TF37

INPUT PARAMETERS (Listed Sequentially):

COMA

	TEST PATTERNS	
	TPAT1	000000
	TPAK6	002525
	TPAK7+1	000707
	TPAS1	000017
	TPAS2	000015
	TPAS3	000012
	TPAS4	000002

OUTPUT PARAMETERS (Listed Sequentially):

BUFF1
BUFF2
TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA – (EXEC)
TFDIS – Error Display

SYSTEM DATA REFERENCES:
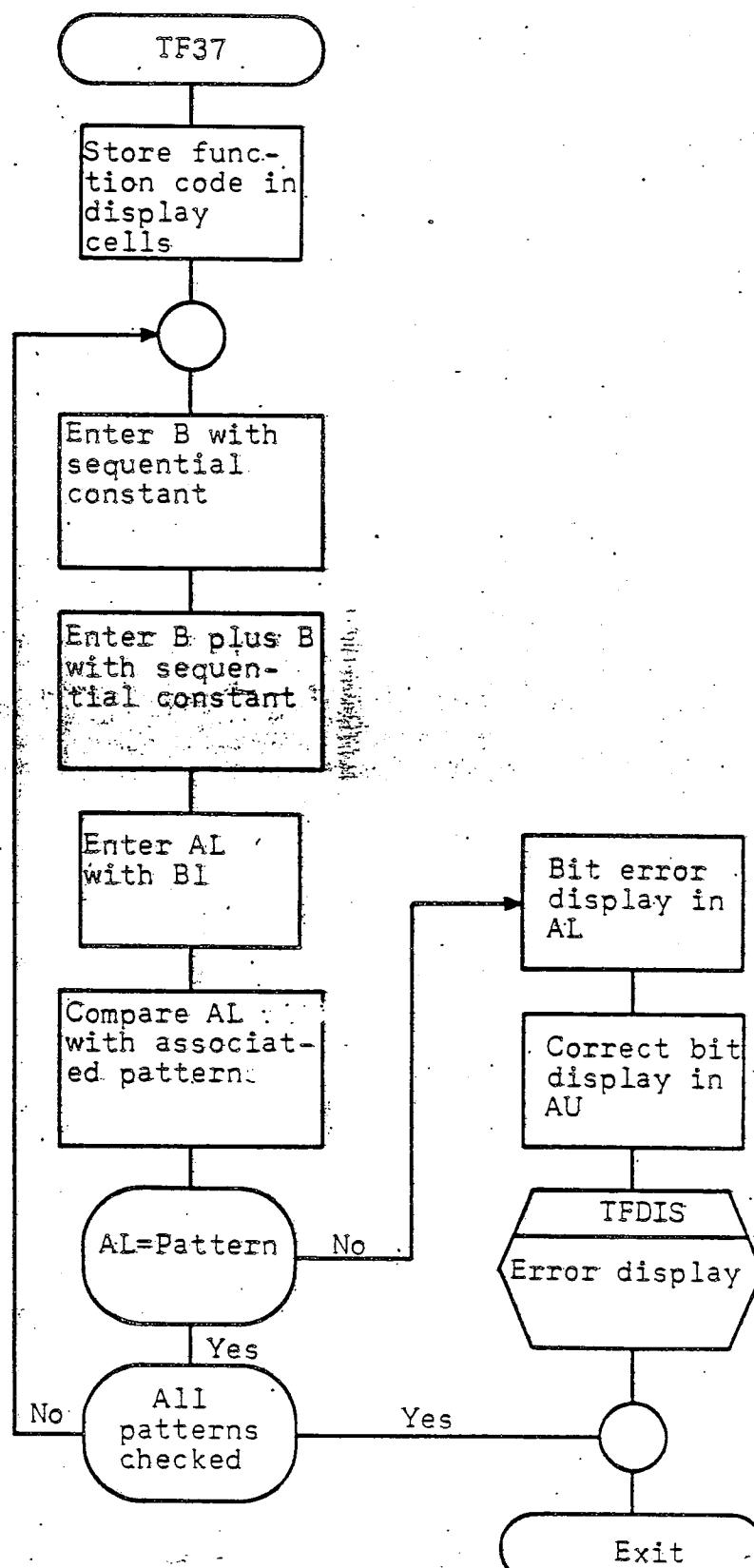
ALARMS AND/OR REMARKS:

ERROR DISPLAY
PROGRAM STOP 0 – Correct information in AU
        Incorrect information in AL
        Function code (37xxxx) in CO
PROGRAM SKIP 4 – Set for console error display only
        Not set for error typeout (Function Code 37)
PROGRAM SKIP 0 – Not set to continue test
        Set to recycle subroutine (TF37)

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SPECIFICATION SHEET

| SHEET | 280 | REVISION — |

SPECIFICATION SYMBOL
SB-10163

TF37

Store function code in display cells

Enter B with sequential constant

Enter B plus B with sequential constant

Enter AL with B1

Compare AL with associated pattern

AL=Pattern — No

Yes

All patterns checked — No

Yes

Bit error display in AL

Correct bit display in AU

TFDIS

Error display

Exit

TF37: ENTER B WITH CONSTANT PLUS B (SIGN EXT.)

SPECIFICATION SYMBOL
SB-10163

TITLE: __TF40 - CLEAR Y (40xxxx)__

DECK IDENTIFIER: __FACT__

CS-1 LABEL: __TF40__ KEY: _____ IS LABEL DUPLICATE? __No__

PROGRAMMER: __PMC modified by TLR__ DATE: __8 Dec. 67__

NUMBER OF L_4 OUTPUT INSTRUCTIONS: __33__

DESCRIPTION:

This subroutine checks the Clear Y command. A sequential test-pattern is entered into AL followed by an entry into a subroutine where AL is stored in a test cell. Then the test cell is cleared (CL command) and validity is checked by entering the contents of the test cell into AL. If correct, AL is equal to zero, an exit is made from the subroutine, and the next pattern is entered into AL. This sequence is repeated until all patterns have been checked, then as exit is made to the executive routine (COMA). If an error is detected an exit is made from the subroutine to the display subroutine. AU will contain the correct pattern, AL the incorrect pattern and, if PROGRAM STOP 0 is set, CO the function code, and the error may be evaluated. Upon return to this subroutine (TF40), an exit is made to the executive routine (COMA) to check for continuing the test or recycling this subroutine (TF40).

SPECIFICATION SYMBOL
SB-10163

TITLE:___TF40_____

INPUT PARAMETERS (Listed Sequentially):

COMA   TEST PATTERNS

TPAT	777777	TPAR TEST CELL
TPAT1	000000	
TPAT2	252525	
TPAT3	525252	
TPAT4	770000	
TPAT5	007777	
TPAT6	707070	
TPAT7	070707	

OUTPUT PARAMETERS (Listed Sequentially):

BUFF1
BUFF2
TFX

**ABNORMAL EXITS (Listed Sequentially):**

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA - (EXEC)
TEDIS - Error Display
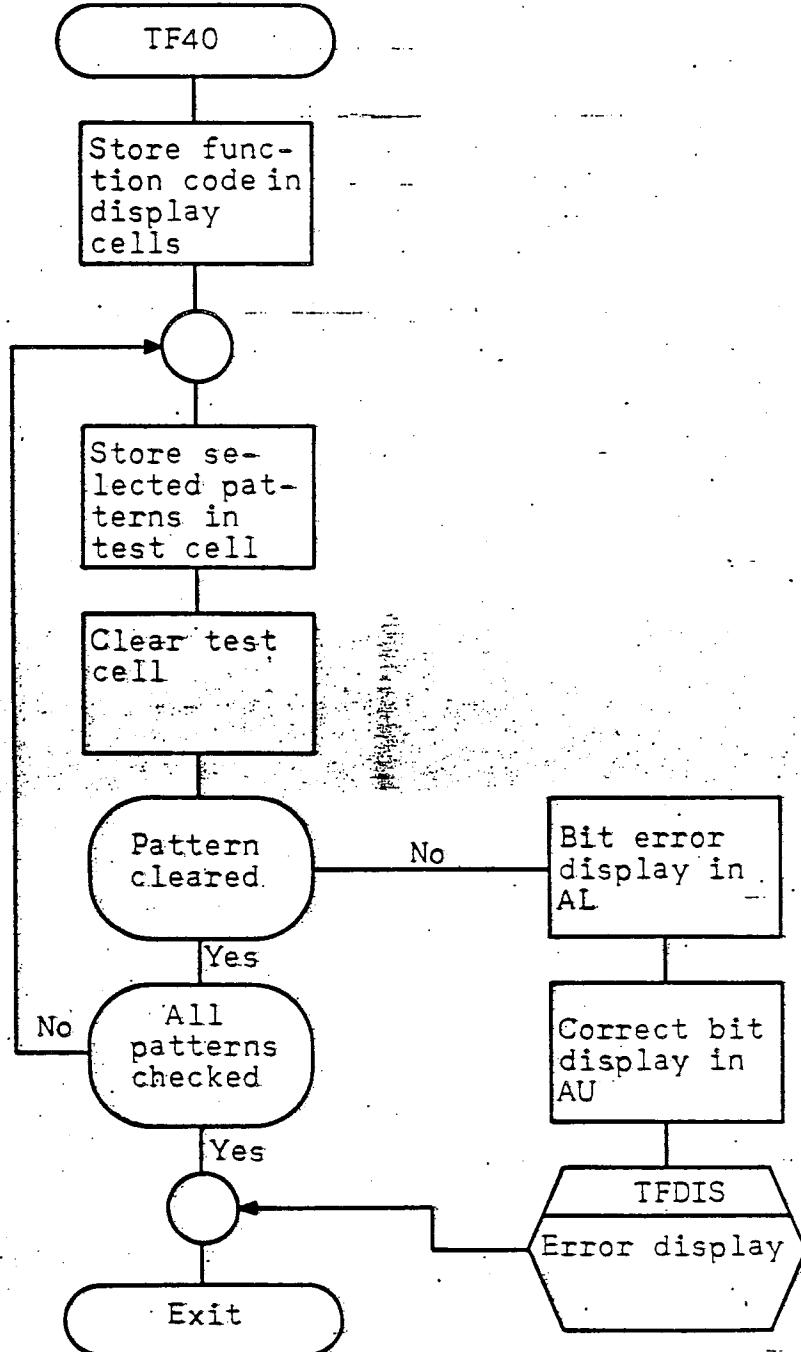
SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:

ERROR DISPLAY —
PROGRAM STOP 0 - Correct information in AU
                Incorrect information in AL
                Function code (40xxxx) in CO
PROGRAM SKIP 4 - Set for console error display only
                Not set for error typeout (Function Code 40)
PROGRAM SKIP 0 - Not set to continue test
                Set to recycle subroutine (TF40)

A-1975

```
        ┌──────────────┐
        │     TF40     │
        └──────────────┘
               │
        ┌──────────────┐
        │ Store func-  │
        │ tion code in │
        │ display      │
        │ cells        │
        └──────────────┘
               │
              ( )
               │
        ┌──────────────┐
        │ Store se-    │
        │ lected pat-  │
        │ terns in     │
        │ test cell    │
        └──────────────┘
               │
        ┌──────────────┐
        │ Clear test   │
        │ cell         │
        └──────────────┘
               │
        ╭──────────────╮          ┌──────────────┐
        │  Pattern     │   No     │ Bit error    │
        │  cleared     │─────────▶│ display in   │
        ╰──────────────╯          │ AL           │
               │ Yes             └──────────────┘
        ╭──────────────╮                 │
  No    │   All        │          ┌──────────────┐
 ◀──────│  patterns    │          │ Correct bit  │
        │  checked     │          │ display in   │
        ╰──────────────╯          │ AU           │
               │ Yes             └──────────────┘
              ( ) ◀───────────────── TFDIS
               │                  Error display
        ┌──────────────┐
        │    Exit      │
        └──────────────┘
```

TF40:   CLEAR Y

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P R O G R A M   D A T A   P A G E

SPECIFICATION SYMBOL
SB-10163

TITLE: TF41 - CLEAR Y PLUS B (41xxxx)

DECK IDENTIFIER: FACT ?

CS-1 LABEL: TF41   KEY: _____   IS LABEL DUPLICATE? No

PROGRAMMER: PMC modified by TLR   DATE: 8 Dec. 67

NUMBER OF L_4 OUTPUT INSTRUCTIONS: 52

DESCRIPTION:

This subroutine checks the Clear Y Plus B command. B is entered
with a constant, AL with a test pattern, and AU with the correct
test-pattern. Then AL plus B is stored in a test cell, followed
by a clearing of the test cell with a CLB command. Validity
is checked by entering AL with the contents of the test cell, and
if A is equal to zero, the next constant is entered into B. This
sequence is repeated until all test patterns have been checked,
then an exit is made to the executive routine (COMA). If an error
is detected by any of the validity checks, AU contains the correct
pattern, and AL the incorrect pattern, and an exit is made to the
display subroutine. If PROGRAM STOP 0 is set, CO will contain
the function code and the error may be evaluated. Upon return to
this subroutine (TF41) and exit is made to the executive routine
(COMA) to check for continuing the test or recycling this sub-
routine (TF41).

A-1971

TITLE: ___TF41___

INPUT PARAMETERS (Listed Sequentially):

COMA

TEST PATTERNS

TPAT	777777	TPAS6	000007
TPAT1	000000	TPAS7	777775
TPAT2	252525	TPAT	TEST CELLS
TPAT3	525252		
TPAT5	007777		
TPAB1+1	777776		
TPAS4	000002		
TPAS5	000004		

OUTPUT PARAMETERS (Listed Sequentially):

BUFF1
BUFF2
TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA — (EXEC)
TFDIS — Error Display
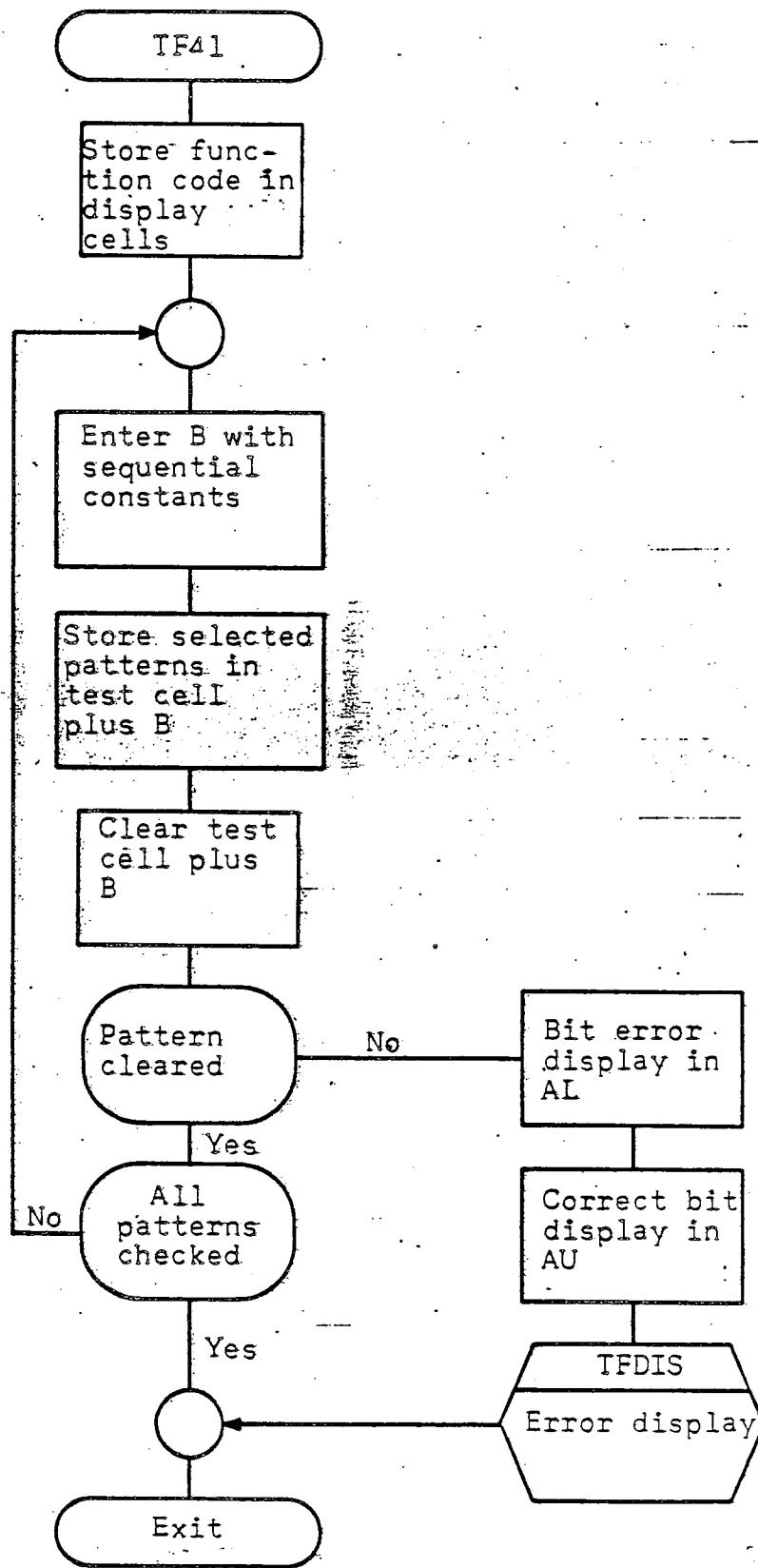
SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:

ERROR DISPLAY
PROGRAM STOP 0 — Correct information in AU
    Incorrect information in AL
    Function code (41xxxx) in CO
PROGRAM SKIP 4 — Set for console error display only
    Not set for error typeout (Function Code 41)
PROGRAM SKIP 0 — Not set for continue test
    Set to recycle subroutine (TF41)

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SPECIFICATION SHEET

SHEET 286 | REVISION —

SPECIFICATION SYMBOL
SB-10163

```
                          ( TF41 )
                             │
                    ┌────────────────┐
                    │ Store func-    │
                    │ tion code in   │
                    │ display        │
                    │ cells          │
                    └────────────────┘
                             │
                            ( )◄──────────────┐
                             │                │
                    ┌────────────────┐        │
                    │ Enter B with   │        │
                    │ sequential     │        │
                    │ constants      │        │
                    └────────────────┘        │
                             │                │
                    ┌────────────────┐        │
                    │ Store selected │        │
                    │ patterns in    │        │
                    │ test cell      │        │
                    │ plus B         │        │
                    └────────────────┘        │
                             │                │
                    ┌────────────────┐        │
                    │ Clear test     │        │
                    │ cell plus      │        │
                    │ B              │        │
                    └────────────────┘        │
                             │                │
                      ( Pattern  )    No   ┌────────────────┐
                      ( cleared  )────────►│ Bit error      │
                             │             │ display in     │
                            Yes            │ AL             │
                      ( All      )         └────────────────┘
              No      ( patterns )                  │
         ┌────────────( checked  )         ┌────────────────┐
         │                 │               │ Correct bit    │
         │                Yes              │ display in     │
         │                 │               │ AU             │
         │                ( )◄──┐          └────────────────┘
         │                 │    │                  │
         │              ( Exit )│            ╱───────────╲
         │                      │           │   TFDIS     │
         │                      └───────────│ Error display│
                                             ╲───────────╱
```

TF41:   CLEAR Y+B

SPECIFICATION SYMBOL
SB-10163

TITLE: TS41 - RIGHT SHIFT AU (5041XX)

DECK IDENTIFIER: FACT

CS-1 LABEL: TS41   KEY: 1218   IS LABEL DUPLICATE? No

PROGRAMMER: FWS modified by TLR   DATE: 8 Dec. 67

NUMBER OF L_4 OUTPUT INSTRUCTIONS: 29

DESCRIPTION:

This subroutine checks Right Shift AU command with its sign extension and end-off capabilities.

First the quantity 200000 is entered into AU and shifted to check the positive sign extension, that each bit can pass a one, and the end-off shift from 2^0 bit position.

Second, the quantity 400000 is entered into AU and shifted right to check negative sign extension.

Error displays are listed under alarms.

SPECIFICATION SYMBOL
SB-10163

TITLE: TS41

INPUT PARAMETERS (Listed Sequentially):

TC02 = 200000
TS415 = 400000
TS424 = 000020

OUTPUT PARAMETERS (Listed Sequentially):

BUFF1
BUFF2
BUFF3
BUFF4
TEX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA - (EXEC)
TSDIS - Error Display

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:

ERROR DISPLAY
CO/C1 = 504101
PROGRAM STOP O
AU = Error
AL = B Count (Shift Count)
    If AL = 1-20, bit was lost right shifting AL number of times
      from AU 2^{17}.
    If AL = 20, all bits should have shifted off the end and did not.
   If AL = 21, AU should equal all ones from negative sign extension.
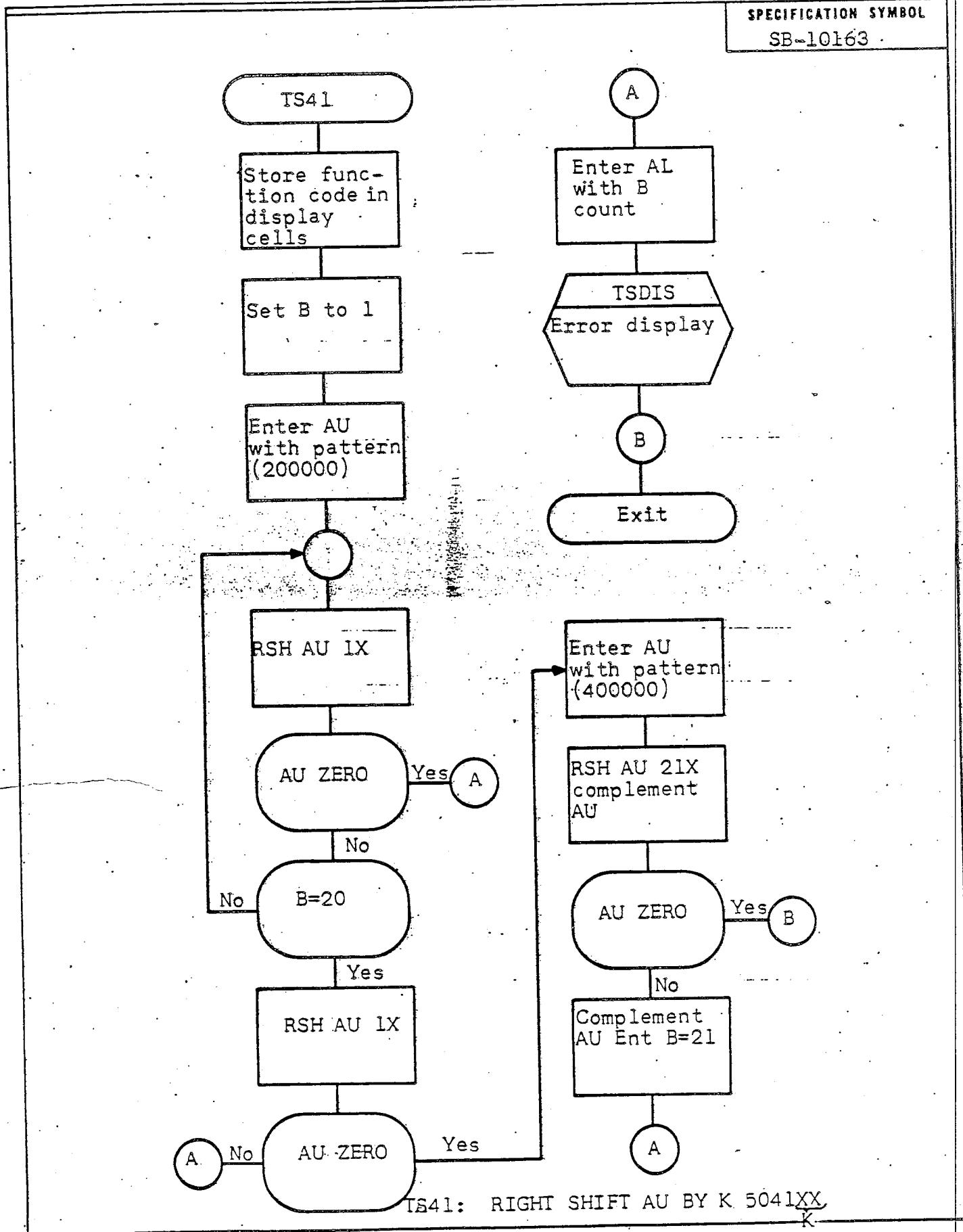
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ALARMS AND/OR REMARKS: (Con't)

PROGRAM SKIP 4 - Set for console error display only.
                 Not set for error typeout (Function Code 5041).
PROGRAM SKIP 0 - Set to recycle subroutine (TS41)
                 Not set to continue test

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SPECIFICATION SHEET

SHEET 290	REVISION —

SPECIFICATION SYMBOL
SB-10163

```
   ( TS41 )                          ( A )

 ┌──────────────┐              ┌──────────────┐
 │ Store func-  │              │ Enter AL     │
 │ tion code in │              │ with B       │
 │ display      │              │ count        │
 │ cells        │              └──────────────┘
 └──────────────┘                     │
        │                      ┌──────────────┐
 ┌──────────────┐              /   TSDIS      \
 │ Set B to 1   │              \ Error display /
 └──────────────┘              └──────────────┘
        │                             │
 ┌──────────────┐                   ( B )
 │ Enter AU     │                     │
 │ with pattern │              ┌──────────────┐
 │ (200000)     │              (    Exit      )
 └──────────────┘              └──────────────┘
        │
       ( ○ )
        │
 ┌──────────────┐              ┌──────────────┐
 │ RSH AU 1X    │              │ Enter AU     │
 └──────────────┘              │ with pattern │
        │                      │ (400000)     │
   ( AU ZERO ) ──Yes──( A )    └──────────────┘
        │                             │
        No                     ┌──────────────┐
        │                      │ RSH AU 21X   │
No ( B=20 )                    │ complement   │
        │                      │ AU           │
       Yes                     └──────────────┘
 ┌──────────────┐                     │
 │ RSH AU 1X    │                ( AU ZERO ) ──Yes──( B )
 └──────────────┘                     │
        │                             No
                                      │
                               ┌──────────────┐
                               │ Complement   │
                               │ AU Ent B=21  │
                               └──────────────┘
                                      │
( A ) ──No── ( AU ZERO ) ──Yes──    ( A )
```

TS41:   RIGHT SHIFT AU BY K 5041XX

K

SPECIFICATION SYMBOL
SB-10163

TITLE: TF42 - STORE B (42xxxx)

DECK IDENTIFIER: FAGT

CS-1 LABEL: TF42   KEY: _____   IS LABEL DUPLICATE? No

PROGRAMMER: PMC modified by TLR   DATE: 8 Dec. 67

NUMBER OF L_4 OUTPUT INSTRUCTIONS: 56

DESCRIPTION:

This subroutine checks the Store B command. B is entered with a
test pattern then B is stored in a test cell using a STRB command.
Validity is checked by entering AL with the contents of the test
cell, AU with the test pattern, and comparing AL and an associated
test pattern. If correct, the next test pattern is entered into
B and the sequence is repeated until all patterns have been checked.
An exit is then made to the executive routine (COMA). If an error
is detected by any of the validity checks an exit is made to the
display subroutine. AU will contain the correct pattern, AL the
incorrect pattern and , if PROGRAM STOP O is set, CO the function
code, and the error may be evaluated. Upon return to this sub-
routine (TF42) an exit is made to the executive routine (COMA) to
check for continuing the test or recycling this subroutine (TF42).

SPECIFICATION SYMBOL
SB-10163

TITLE: TF42

INPUT PARAMETERS (Listed Sequentially):

COMA

TEST PATTERNS

TPAT	777777	TPAT5	007777
TPAT+1	777777	TPAT5+1	007777
TPAT1	000000	TPAT6	707070
TPAT2	252525	TPAT6+1	707070
TPAT2+1	252525	TPAT7	070707
TPAT3	525252	TPAT7+1	070707
TPAT3+1	525252	TPAR	TEST CELL
TPAT4	770000		
TPAT4+1	770000		

OUTPUT PARAMETERS (Listed Sequentially):

BUFF1
BUFF2
TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA - (EXEC)
TFDIS - Error Display

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:

ERROR DISPLAY
PROGRAM STOP 0 - Correct information in AU
                Incorrect information in AL
                Function code (42xxxx) in CO
PROGRAM SKIP 4 - Set for console error display only
                 Not set for error typeout (Function Code)
PROGRAM SKIP 0 - Not set to continue test
                 Set to recycle subroutine (TF42)

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SPECIFICATION SHEET

SHEET 293   REVISION ─

SPECIFICATION SYMBOL
SB-10163

TF42

Store function code in display cell

Enter B with sequential patterns

Store pattern in test area

Storage area check for correct pattern ──No──→ Bit error display in AL

Yes

All patterns checked ──No──

Correct bit display in AU

Yes

TFDIS
Error display

Exit

TF42:   STORE B

SPECIFICATION SYMBOL.
SB-10163

TITLE: TS42 - RIGHT SHIFT AL (5043XX)

DECK IDENTIFIER: FACT

CS-1 LABEL: TS42   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: FWS modified by TLR   DATE: 8 Dec. 67

NUMBER OF L_4 OUTPUT INSTRUCTIONS: 30

DESCRIPTION:

This subroutine checks Right Shift AL command with its sign extension and end off capabilities.

First the quantity 200000 is entered into AL and shifted right to check the positive sign extension, that each bit can pass a one, and the end-off shift from the 2^0 bit position.

Second, the quantity 400000 is entered into AL and shifted right to check negative sign extension.

Error displays are listed under alarms.

SPECIFICATION SYMBOL
SB-10163

TITLE: TS42

INPUT PARAMETERS (Listed Sequentially):

TCO2 = 200000
TS424 = 000020
TS415 = 400000

OUTPUT PARAMETERS (Listed Sequentially):

BUFF1
BUFF2
BUFF3
BUFF4
TEX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA - (EXEC)
TSDIS - Error Display

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:
ERROR DISPLAY
PROGRAM STOP O.
AL=Error
AU = B Count (Shift Count)
    If AU = 1-20, bit was lost right shifting AU number of times
      from AL 2^{17}.
If AU = 20, all bits should have shifted off the end and did not.
If AU = 21, AL should be all ones from negative sign extension.
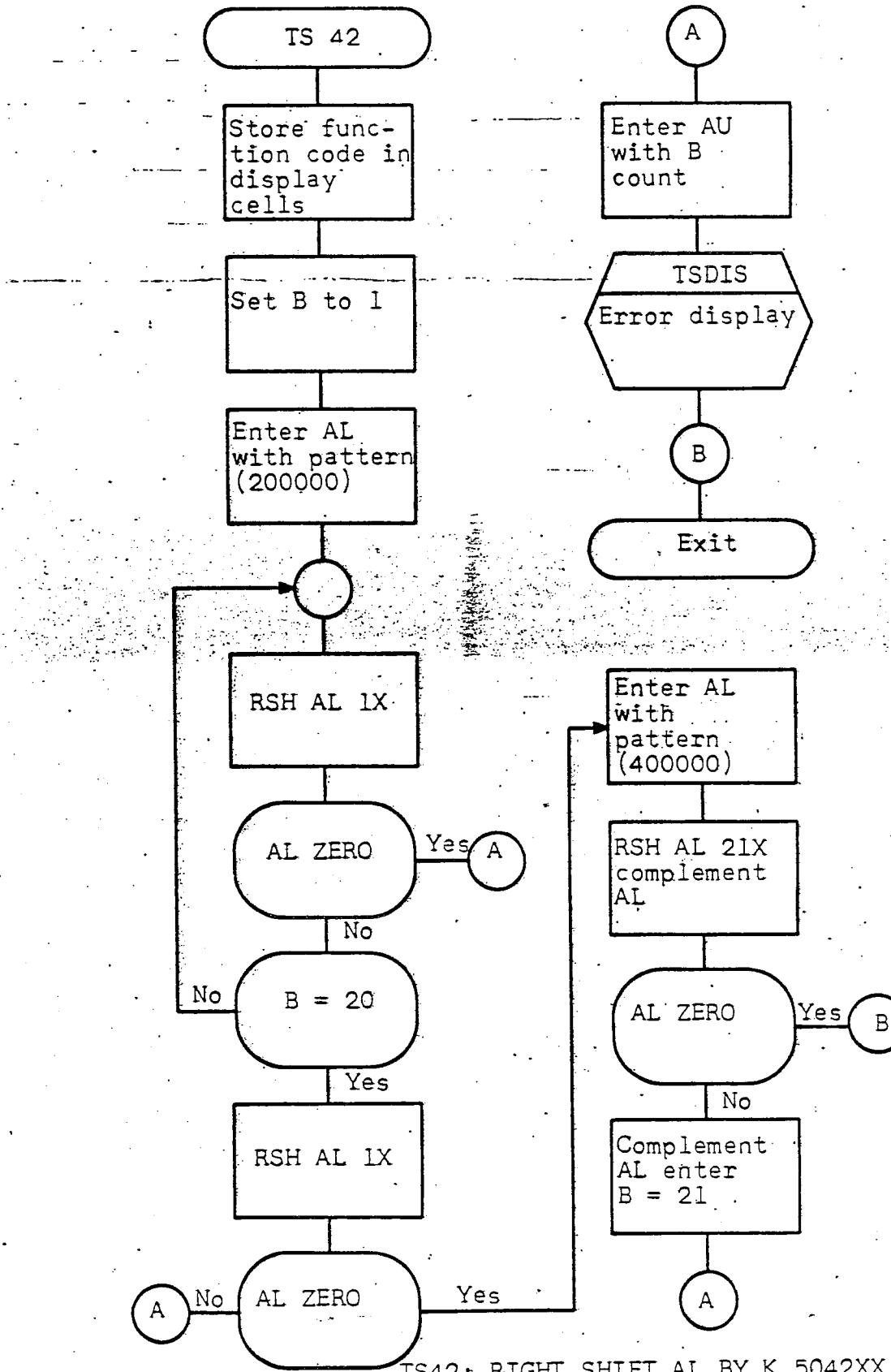
ALARMS AND/OR REMARKS: (Con't)

PROGRAM SKIP 4 - Set for console error display only
                 Not set for error typeout (Function Code 5042)
PROGRAM SKIP 0 - Set to recycle subroutine (TS42)
                 Not set to continue test

SPECIFICATION SYMBOL
SB-10I63

```
        ┌──────────────┐                        ╭───╮
        │    TS 42     │                        │ A │
        ╰──────────────╯                        ╰─┬─╯
               │                                  │
        ┌──────────────┐                   ┌──────────────┐
        │ Store func-  │                   │ Enter AU     │
        │ tion code in │                   │ with B       │
        │ display      │                   │ count        │
        │ cells        │                   └──────────────┘
        └──────────────┘                          │
               │                            ╱─────────────╲
        ┌──────────────┐                   │    TSDIS      │
        │ Set B to 1   │                   │ Error display │
        │              │                    ╲─────────────╱
        └──────────────┘                          │
               │                                ╭───╮
        ┌──────────────┐                        │ B │
        │ Enter AL     │                        ╰─┬─╯
        │ with pattern │                   ┌──────────────┐
        │ (200000)     │                   │    Exit      │
        └──────────────┘                   └──────────────┘
               │
             ◯
        ┌──────────────┐            ┌──────────────┐
        │ RSH AL 1X    │            │ Enter AL     │
        │              │            │ with         │
        └──────────────┘            │ pattern      │
               │                    │ (400000)     │
          ╭─────────╮    Yes  ╭───╮ └──────────────┘
          │ AL ZERO │─────────│ A │        │
          ╰─────────╯         ╰───╯ ┌──────────────┐
               │ No                 │ RSH AL 21X   │
          ╭─────────╮               │ complement   │
     No   │ B = 20  │               │ AL           │
          ╰─────────╯               └──────────────┘
               │ Yes                      │
        ┌──────────────┐            ╭─────────╮  Yes ╭───╮
        │ RSH AL 1X    │            │ AL ZERO │──────│ B │
        │              │            ╰─────────╯      ╰───╯
        └──────────────┘                 │ No
               │                   ┌──────────────┐
   ╭───╮ No ╭─────────╮  Yes       │ Complement   │
   │ A │────│ AL ZERO │────────────│ AL enter     │
   ╰───╯    ╰─────────╯            │ B = 21       │
                                   └──────────────┘
                                          │
                                        ╭───╮
                                        │ A │
                                        ╰───╯
```

TS42: RIGHT SHIFT AL BY K 5042XX

K

SPECIFICATION SYMBOL
SB-10163

TITLE: TF43 - STORE B MODIFIED BY B (43xxxx)

DECK IDENTIFIER: FAGT

CS-1 LABEL: TF43   KEY: _____   IS LABEL DUPLICATE? No

PROGRAMMER: PMC modified by TLR   DATE: 8 Dec. 67

NUMBER OF L$_4$ OUTPUT INSTRUCTIONS: 50

DESCRIPTION:

This subroutine checks the Store B Modified By B command. B is
entered with a test-pattern constant and STRBB (test cell) command
is executed. Validity is checked by entering AU with the test pattern
AL with the contents of the test cell, and AL is then compared to
the test pattern. If correct, the next test-pattern constant is
entered into B and the sequence repeated until all patterns have
been checked. An exit is then made to the executive routine (COMA).
If an error is detected by any of the validity checks. AU will
contain the correct pattern, AL the incorrect pattern, and an exit
will be made to the display subroutine. If PROGRAM STOP O is set,
CO will contain the function code and the error may be evaluated.
Upon return to this subroutine (TF43) an exit will be made to the
executive routine (COMA) to check for continuing the test or re-
cycling this subroutine (TF43).

SPECIFICATION SYMBOL
SB-10163

TITLE:____TF43_____

INPUT PARAMETERS (Listed Sequentially):

COMA	TEST PATTERNS	
	TPAT1	000000
	TPAB1	000001
	TPAB1+1	777776
	TPAS4	000002
	TPAS5	000004
	TPAS6	000007
	TPAS7	777775
	TPAR	TEST CELLS

OUTPUT PARAMETERS (Listed Sequentially):

BUFF1
BUFF2
TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA - (EXEC)
TFDIS - Error Display

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:
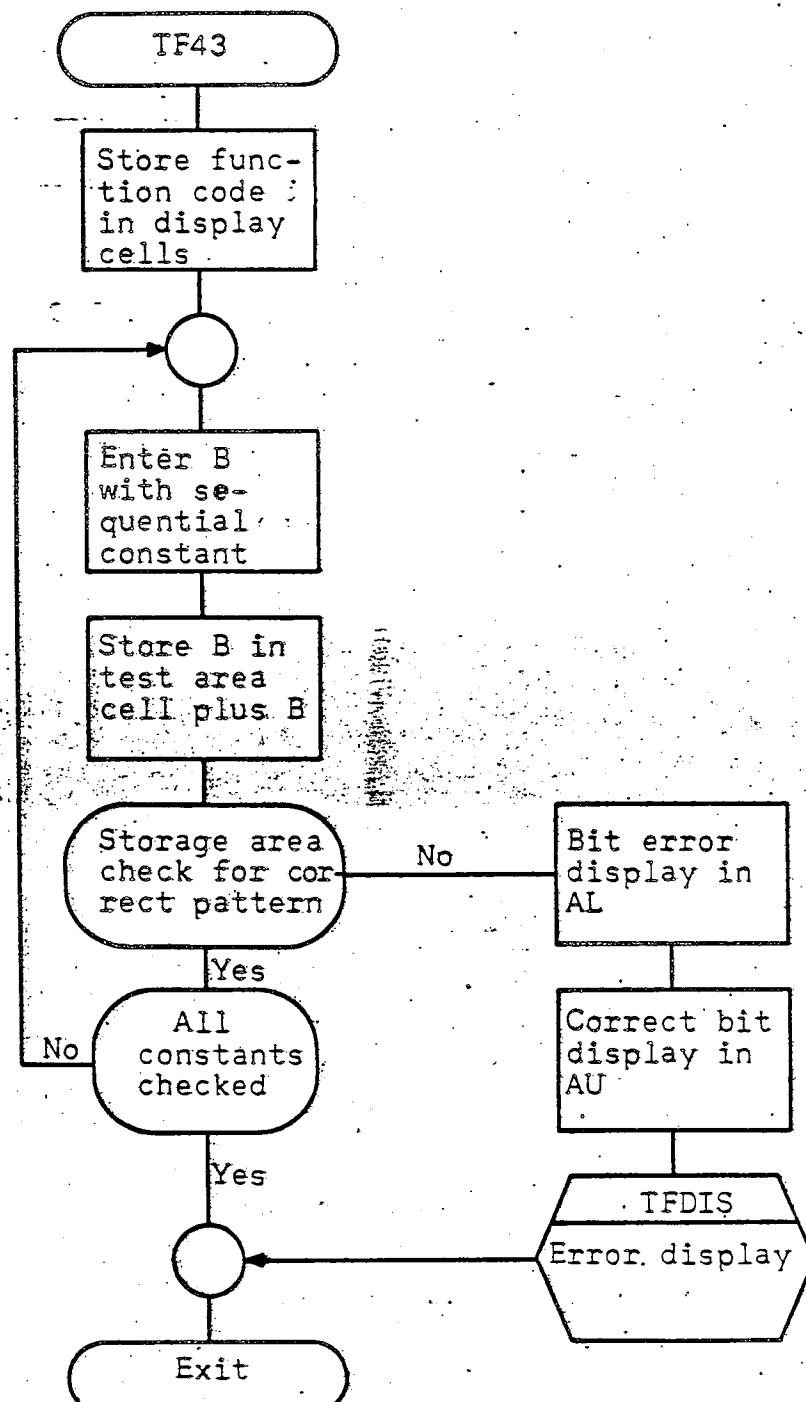
ERROR DISPLAY
PROGRAM STOP 0 - Correct information in AU
                 Incorrect information in AL
                 Function code in CO
PROGRAM SKIP 4 - Set for console error display only
                 Not set for error typeout (Function Code 43)
PROGRAM SKIP 0 - Not set to continue test
                 Set to recycle subroutine (TF43)

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SPECIFICATION SHEET

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SPECIFICATION SYMBOL
SB-10163

```
                        ┌─────────────┐
                        (    TF43     )
                        └──────┬──────┘
                        ┌──────┴──────┐
                        │ Store func- │
                        │ tion code   │
                        │ in display  │
                        │ cells       │
                        └──────┬──────┘
                              ( )◄──────────────┐
                        ┌──────┴──────┐         │
                        │ Enter B     │         │
                        │ with se-    │         │
                        │ quential    │         │
                        │ constant    │         │
                        └──────┬──────┘         │
                        ┌──────┴──────┐         │
                        │ Store B in  │         │
                        │ test area   │         │
                        │ cell plus B │         │
                        └──────┬──────┘         │
                        ┌──────┴───────┐  No   ┌──────────────┐
                        │ Storage area │───────│ Bit error    │
                        │ check for cor│       │ display in   │
                        │ rect pattern │       │ AL           │
                        └──────┬───────┘       └──────┬───────┘
                              │ Yes                   │
                        ┌──────┴──────┐        ┌──────┴───────┐
               No       │   All       │        │ Correct bit  │
          ┌─────────────│ constants   │        │ display in   │
          │             │ checked     │        │ AU           │
          │             └──────┬──────┘        └──────┬───────┘
          │                    │ Yes                  │
          │                   ( )◄───────────   ╱TFDIS      ╲
          │                    │              ╱ Error display ╲
          │             ┌──────┴──────┐        ╲             ╱
          │             (    Exit     )          ╲─────────╱
          │             └─────────────┘
```

TF43:   STORE B MODIFIED BY B

SPECIFICATION SYMBOL
SB-10163

TITLE: TS43 - RIGHT SHIFT A (5043XX)

DECK IDENTIFIER: FACT

CS-1 LABEL: TS43   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: FWS modified by TLR   DATE: 8 Dec. 67

NUMBER OF L_4 OUTPUT INSTRUCTIONS: 40

DESCRIPTION:

This subroutine checks Right Shift A command with its sign extension and end-off capabilities (RSHA command).

First the quantity 200000 is entered into AU and shifted right to check the positive sign extension, that each bit can pass a one, and the AU 2^0 to AL 2^{17} transfer. The bit is then shifted through AL to check the positive sign extension, that each bit can pass a one, and the end-off shift from 2^0 of this register.

Second, the quantity 400000 is entered into AU and shifted right to check the negative sign extension of both registers.

Error displays are listed under alarms.

SPECIFICATION SYMBOL

SB-10163

TITLE: _____TS43_____

INPUT PARAMETERS (Listed Sequentially):

    TCO2 = 200000
    TS415 = 400000
    TS424 = 000020
    TSR430 = 000021
    TPAT = 777777

OUTPUT PARAMETERS (Listed Sequentially):

    BUFF1
    BUFF2
    BUFF3
    BUFF4
    TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

    COMA - (EXEC)
    TSDIS - Error Display

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:

    ERROR DISPLAY
    PROGRAM STOP 0
    CO/C1 = 504301
    AL = B Count, if B less than 21
    AU = B Count, if B more than 20
    To determine lost bit, use B Count shifting right from AU 2^{17}, or
    AL and AU should equal all ones for right shift with negative sign
    extension.
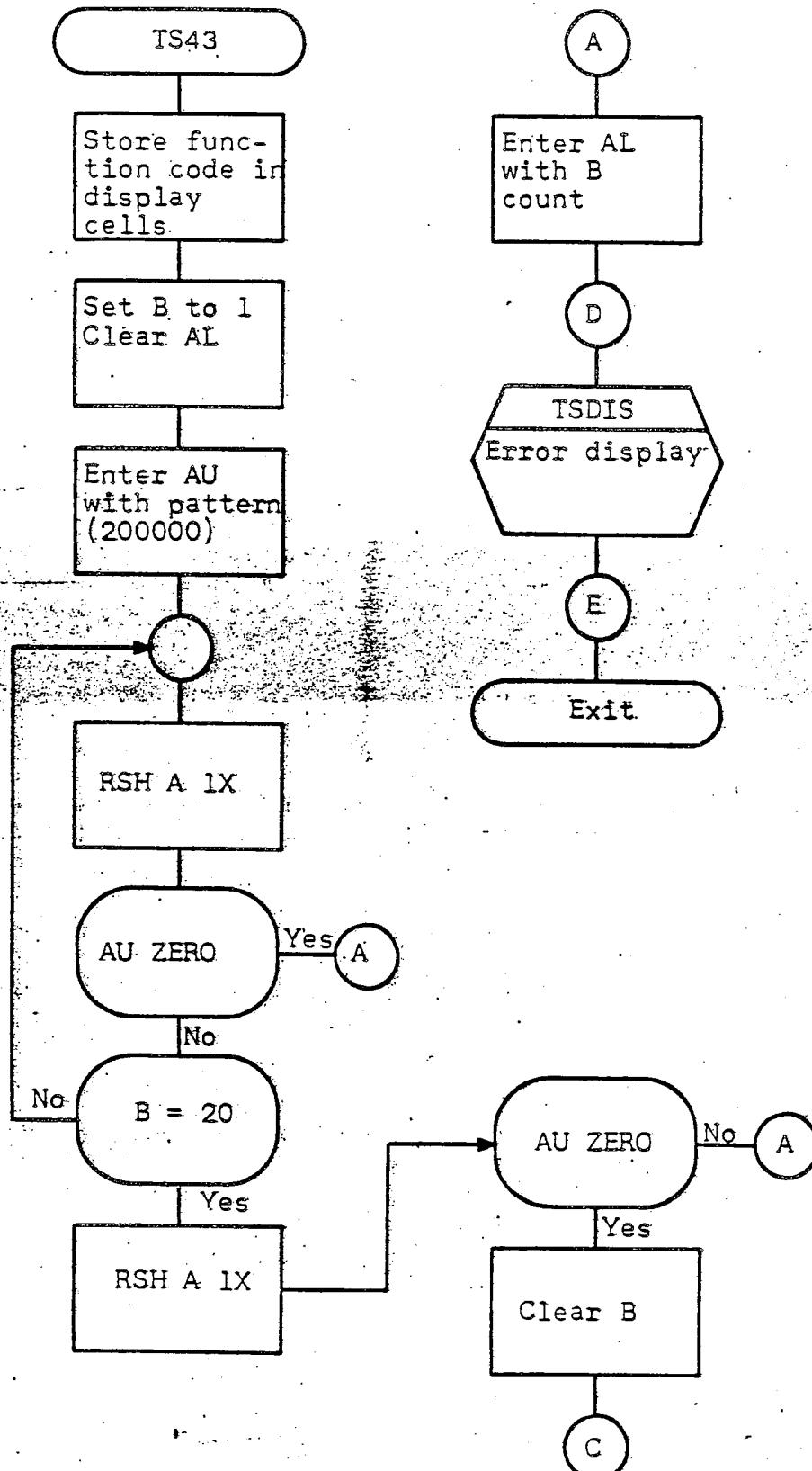
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SPECIFICATION SHEET

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SPECIFICATION SYMBOL

SB-10163

ALARMS AND/OR REMARKS: (Con't.)

PROGRAM SKIP 4 - Set for console error display only
            Not set for error typeout (Function Code 5043)
PROGRAM SKIP O - Set to recycle subroutine (TS43)
            Not set to continue test

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SPECIFICATION SYMBOL
SB-10163

```
        ( TS43 )                          ( A )

    ┌─────────────┐              ┌─────────────┐
    │ Store func- │              │ Enter AL    │
    │ tion code in│              │ with B      │
    │ display     │              │ count       │
    │ cells       │              └─────────────┘
    └─────────────┘                     │
           │                          ( D )
    ┌─────────────┐                     │
    │ Set B to 1  │              ┌─────────────┐
    │ Clear AL    │              │   TSDIS      │
    │             │              │ Error display│
    └─────────────┘              └─────────────┘
           │                            │
    ┌─────────────┐                   ( E )
    │ Enter AU    │                     │
    │ with pattern│                 ( Exit )
    │ (200000)    │
    └─────────────┘
           │
          ( ● )
           │
    ┌─────────────┐
    │  RSH A 1X   │
    └─────────────┘
           │
      ( AU ZERO )  ──Yes──( A )
           │
          No
      ( B = 20 ) ──No──          ( AU ZERO ) ──No──( A )
           │                          │
          Yes                        Yes
    ┌─────────────┐            ┌─────────────┐
    │  RSH A 1X   │───────────→│   Clear B   │
    └─────────────┘            └─────────────┘
                                      │
                                    ( C )
```
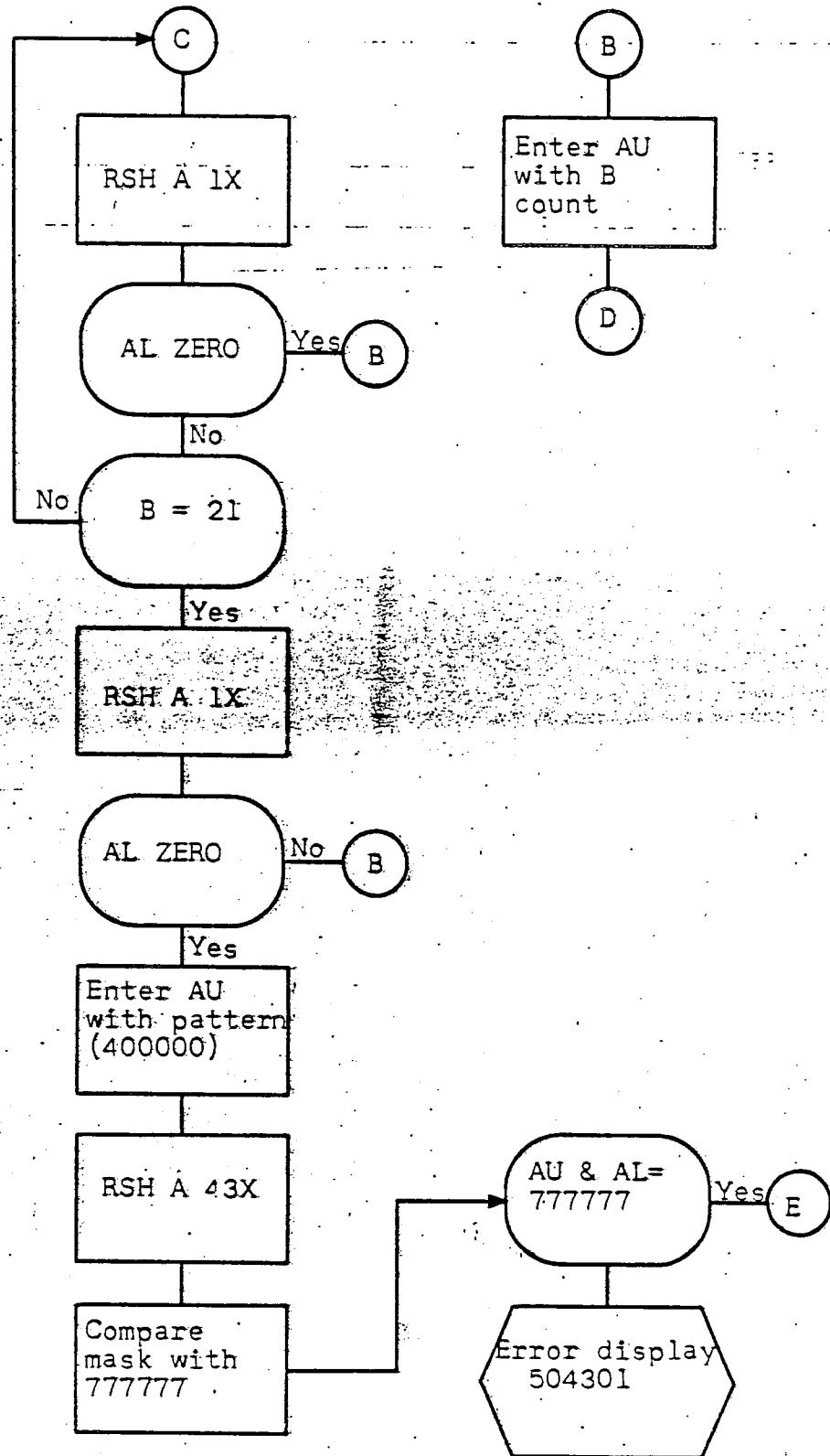
TS43: RIGHT SHIFT A BY K 5043XX
                                 ──
                                  K

SPECIFICATION SYMBOL
SB-10163

```
         ┌──►( C )                           ( B )
         │     │                               │
         │  ┌──┴──────┐                    ┌────┴─────┐
         │  │ RSH A 1X │                    │ Enter AU │
         │  └──┬──────┘                    │ with B   │
         │     │                            │ count    │
         │  ╭──┴───╮                        └────┬─────┘
         │ ( AL ZERO )──Yes──( B )               │
         │  ╰──┬───╯                           ( D )
         │    No
         │  ╭──┴───╮
    No───┤ ( B = 21 )
         │  ╰──┬───╯
         │    Yes
         │  ┌──┴──────┐
         │  │ RSH A 1X │
         │  └──┬──────┘
         │  ╭──┴───╮
         │ ( AL ZERO )──No──( B )
         │  ╰──┬───╯
              Yes
           ┌──┴───────┐
           │ Enter AU │
           │ with pattern │
           │ (400000)  │
           └──┬───────┘
           ┌──┴──────┐               ╭──────────╮
           │ RSH A 43X │              ( AU & AL= )──Yes──( E )
           └──┬──────┘               ( 777777  )
           ┌──┴──────┐               ╰────┬─────╯
           │ Compare  │              ┌─────┴──────┐
           │ mask with │─────────────│ Error display │
           │ 777777   │              │   504301   │
           └──────────┘              └────────────┘
```

TS43: RIGHT SHIFT A BY K 5043XX
                                $\overline{K}$

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PROGRAM DATA PAGE

TITLE: TF44 - STORE A LOWER (44xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF44   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: PMC modified by   DATE: 8 Dec. 67

NUMBER OF L$_4$ OUTPUT INSTRUCTIONS: 50

DESCRIPTION:

This subroutine checks the Store A Lower command. AL is entered
with a test-pattern constant them AL is stored in a test cell using
a STRAL command. Validity is checked by entering AU with the con-
tents of the test cell and executing a compare mask. If correct,
A is equal to zero, the next, test-pattern constant is entered into
AL and the sequence repeated until all patterns have been checked.
An exit is then made to the executive routine (COMA). If an error
is detected by any of the validity checks a left shift A is executed
and AU will contain the correct pattern, AL the incorrect pattern,
and an exit is made to the display subroutine. With PROGRAM STOP O
set, CO will contain the function code and the error may be evaluated.
Upon return to this subroutine (TF44) an exit is made to the execu-
tive routine (COMA) to check for continuing the test or recycling
this subroutine (TF44).

SPECIFICATION SYMBOL
SB-10163

TITLE: ___ TF44 ___

INPUT PARAMETERS (Listed Sequentially):

COMA

TEST PATTERNS

TPAT	777777
TPAT1	000000
TPAT2	252525
TPAT3	525252
TPAT4	770000
TPAT5	007777
TPAT6	707070
TPAT7	070707
TCO1	777777

OUTPUT PARAMETERS (Listed Sequentially):

BUFF1
BUFF2
TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA - (EXEC)
TFDIS - Error Display

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:

ERROR DISPLAY
PROGRAM STOP 0 - Correct information in AU
                 Incorrect information in AL
                 Function code (44xxxx) in CO
PROGRAM SKIP 4 - Set for console error display only
                 Not set for error typeout (Function Code 44)
PROGRAM SKIP 0 - Not set to continue test
                 Set to recycle subroutine (TF44)
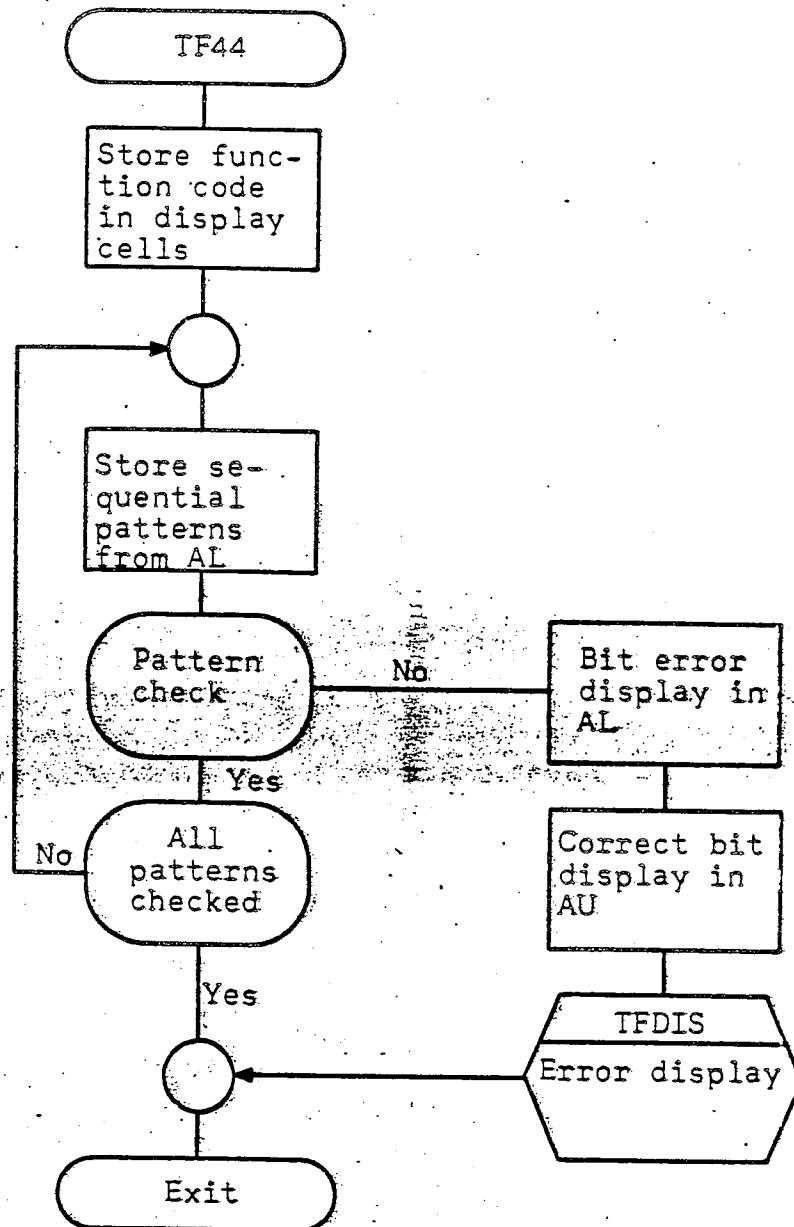
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SPECIFICATION SHEET

SHEET 308   REVISION —

SPECIFICATION SYMBOL
SB-10163

```
                    ( TF44 )
                        |
              +------------------+
              | Store func-      |
              | tion code        |
              | in display       |
              | cells            |
              +------------------+
                        |
                       ( )
                        |
              +------------------+
              | Store se-        |
              | quential         |
              | patterns         |
              | from AL          |
              +------------------+
                        |
                  ( Pattern )      No    +------------------+
                  ( check   )----------->| Bit error        |
                        |                | display in       |
                       Yes               | AL               |
                        |                +------------------+
          No    ( All      )                     |
        +-------( patterns  )           +------------------+
        |       ( checked   )           | Correct bit      |
        |            |                   | display in       |
        |           Yes                  | AU               |
        |            |                   +------------------+
        |           ( )                          |
        |            |              /    TFDIS       \
        |          ( )<-------------\  Error display  /
        |            |              _____/
        |            |
        |        ( Exit )
```

TF44:   STORE A LOWER

SPECIFICATION SYMBOL

SB-10163

TITLE: TS44 - SCALE FACTOR (5044XX)

DECK IDENTIFIER: FACT

CS-1 LABEL: TS44   KEY: 1218   IS LABEL DUPLICATE? No

PROGRAMMER: FWS modified by TLR   DATE: 8 Dec. 67

NUMBER OF L₄ OUTPUT INSTRUCTIONS: 53

DESCRIPTION:

This subroutine checks Scale Factor of the A Register. Both positive and negative constants are used and all normalizing counts from 1 to 41 are checked.

Error displays are listed under alarms.

SPECIFICATION SYMBOL

SB-10163

TITLE: TS44

INPUT PARAMETERS (Listed Sequentially):
TPAT1 = 000000
TPAB1 = 000001
TCO2 = 200000
TPAT = 777777
TS447 = 000041
TPAB = 777776
TSR44 = 577777

OUTPUT PARAMETERS (Listed Sequentially):
BUFF1
BUFF2
TFX
TSH = AU PATTERN STORE
TSCOT = AL PATTERN STORE
TS446 = B COUNT STORE

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):
COMA — (EXEC)
TSDIS — Error Display

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:
ERROR DISPLAY
PROGRAM STOP O
CO/C1 = 504442
AU and AL equal normalized positive pattern
   If AU = 200000, AL should be cleared.
   If AL = 200000, AU should = 200000.
AU and AL equal normalized negative pattern
   If AU = 577777, AL should be all ones.
   If AL = 577777, AU should = 577777

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SPECIFICATION SHEET

| SHEET | 311 | REVISION | — |

SPECIFICATION SYMBOL
SB-10163
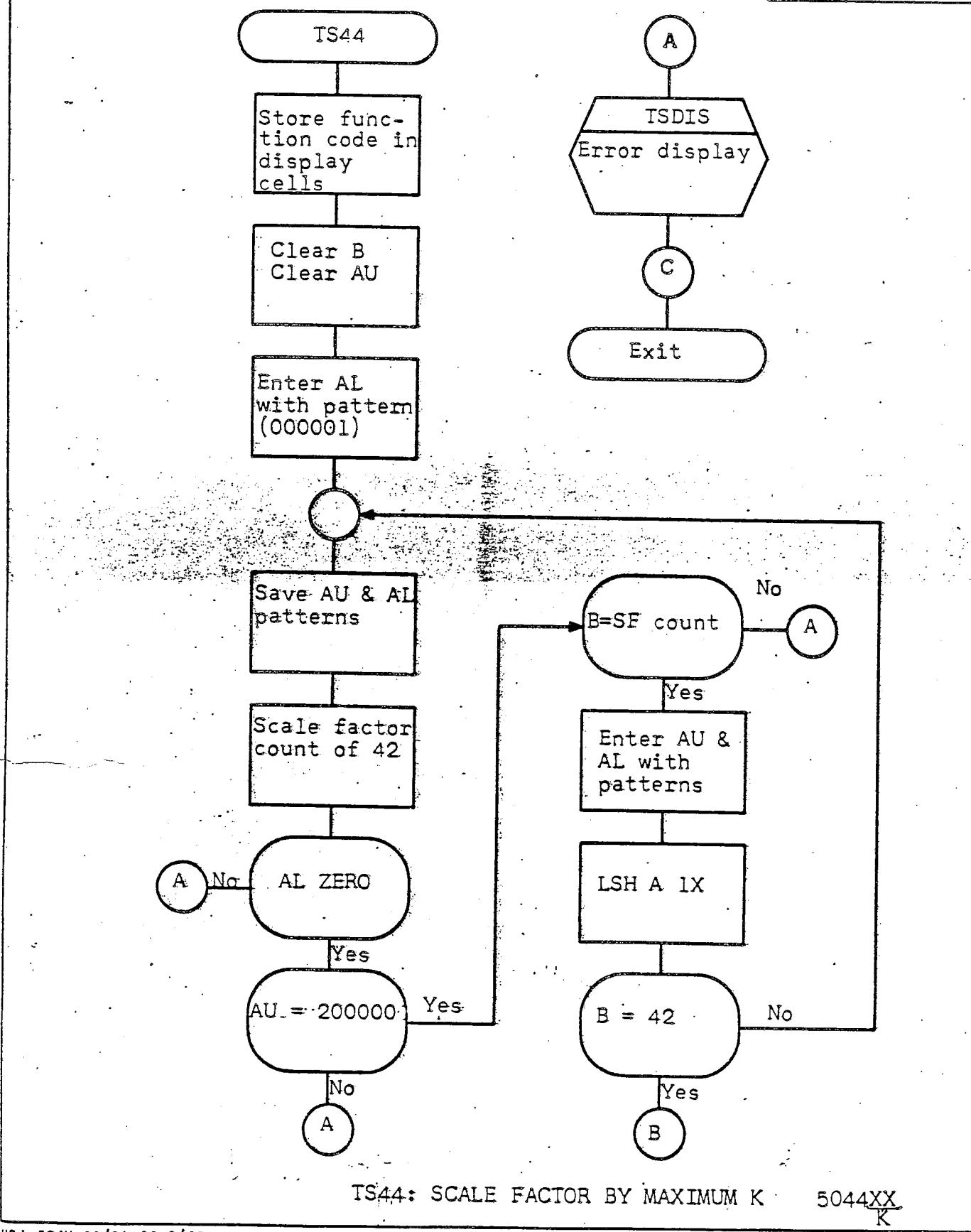
ALARMS AND/OR REMARKS: (Con't)

PROGRAM SKIP 4 - Set for console error display only
                 Not set for error typeout (Function Code 5044)
PROGRAM SKIP 0 - Set to recycle subroutine (TS44)
                 Not set to continue test

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SPECIFICATION SHEET
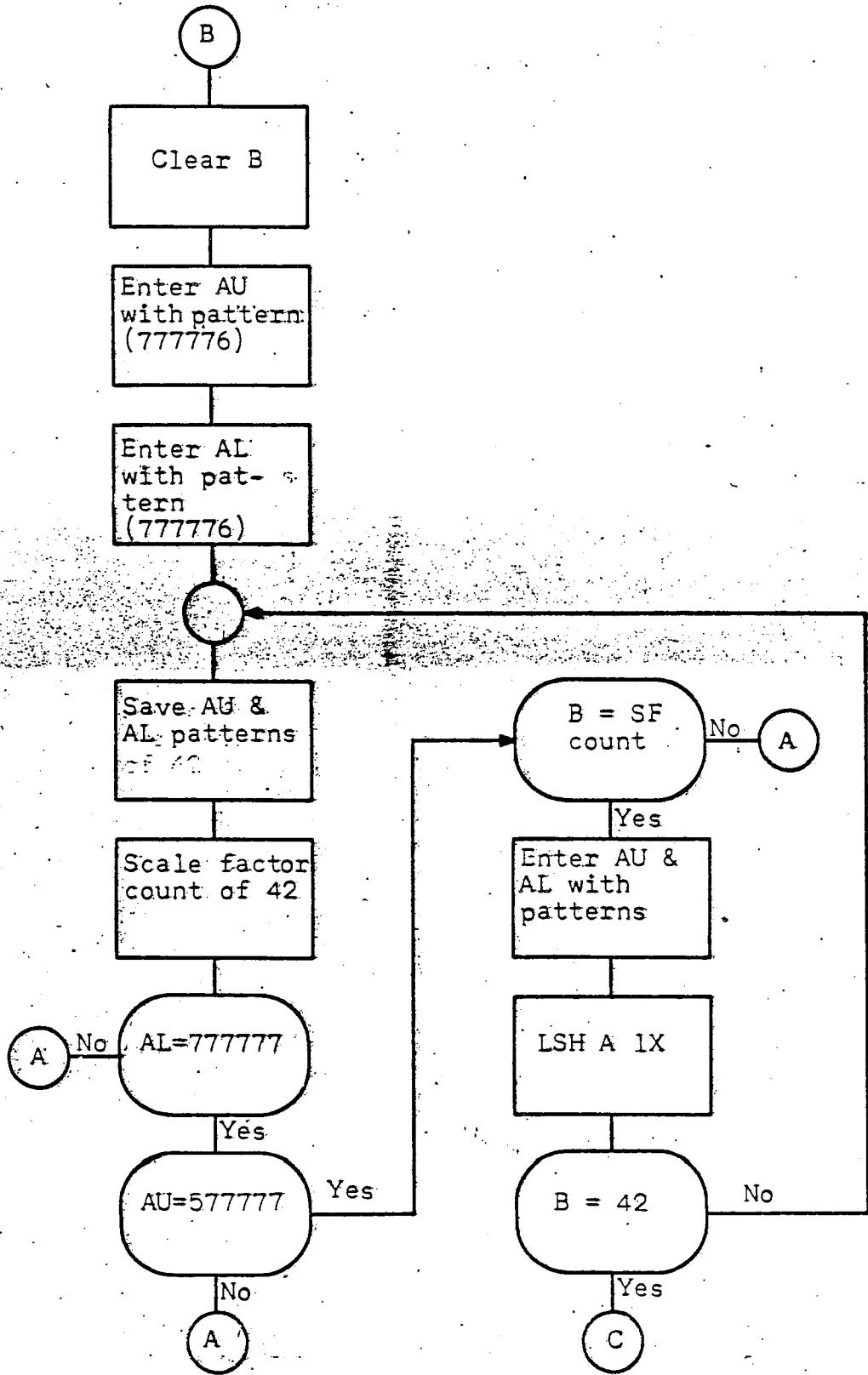
| SHEET 312 | REVISION — |

SPECIFICATION SYMBOL
SB-10163

(TS44)

Store function code in display cells

Clear B
Clear AU

Enter AL with pattern (000001)

○

Save AU & AL patterns

Scale factor count of 42

(A)—No— AL ZERO

Yes

AU = 200000 —Yes→

No

(A)

(A)

TSDIS
Error display

(C)

(Exit)

B=SF count —No— (A)

Yes

Enter AU & AL with patterns

LSH A 1X

B = 42 —No→

Yes

(B)

TS44: SCALE FACTOR BY MAXIMUM K   5044XX
K

(B)

```
┌─────────────┐
│   Clear B   │
└─────────────┘

┌─────────────┐
│ Enter AU    │
│ with pattern│
│ (777776)    │
└─────────────┘

┌─────────────┐
│ Enter AL    │
│ with pat-   │
│ tern        │
│ (777776)    │
└─────────────┘
```

```
┌─────────────┐        ┌───────────┐  No
│ Save AU &   │        │  B = SF   │─────(A)
│ AL patterns │   ┌───▶│  count    │
│ of 42       │   │    └───────────┘
└─────────────┘   │          │ Yes
                  │    ┌─────────────┐
┌─────────────┐   │    │ Enter AU &  │
│ Scale factor│   │    │ AL with     │
│ count of 42 │   │    │ patterns    │
└─────────────┘   │    └─────────────┘
                  │          │
     No  ┌───────────┐  │    ┌─────────────┐
(A)─────│ AL=777777 │  │    │  LSH A 1X   │
        └───────────┘  │    └─────────────┘
              │ Yes     │          │
        ┌───────────┐ Yes│    ┌───────────┐   No
        │ AU=577777 │───┘    │  B = 42   │─────
        └───────────┘        └───────────┘
              │ No                 │ Yes
            (A)                   (C)
```

TS44:   SCALE FACTOR BY MAXIMUM K 5044XX
                                       ‾K‾

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SPECIFICATION SHEET

P R O G R A M   D A T A   P A G E

SHEET 314	REVISION —

TITLE: TF45 - STORE A LOWER MODIFIED BY B (45xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF45   KEY: _____   IS LABEL DUPLICATE? No

PROGRAMMER: PMC modified by TLR   DATE: 8 Dec. 67

NUMBER OF L$_4$ OUTPUT INSTRUCTIONS: _____

DESCRIPTION:

This subroutine checks the Store A Lower Modified By B command. B is
entered with a constant and AL with a test-pattern constant. Then
a STRALB command is executed. Validity is checked by entering AU
with the contents of the test cell and executing a compare mask.
If correct, A is equal to zero, the next constant is entered into
B and the cycle is repeated until all test patterns have been checked.
An exit is then made to the executive routine (COMA). If an error
is detected by any of the validity checks, a left shift A is executed
and AU will contain the correct pattern, AL the incorrect pattern.
An exit is then made to the display subroutine where, with PROGRAM
STOP O set, CO will contain the function code and the error may be
evaluated. Upon return to this subroutine (TF45) an exit is made
to the executive routine (COMA) to check for continuing the test or
recycling this subroutine (TF45).

A-1974

SPECIFICATION SYMBOL
SB-10163

TITLE: __TF45__

INPUT PARAMETERS (Listed Sequentially):

COMA

TEST PATTERNS

TPAT	777777	TPAR	TEST CELLS
TPAT1	000000		
TPAT2	252525		
TPAT3	525252		
TPAT4	770000		
TPAT5	007777		
TPAT6	707070		
TPAT7	070707		
TCO1	777777		

OUTPUT PARAMETERS (Listed Sequentially):

BUFF1
BUFF2
TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA - (EXEC)
TFDIS - Error Display

SYSTEM DATA REFERENCES:
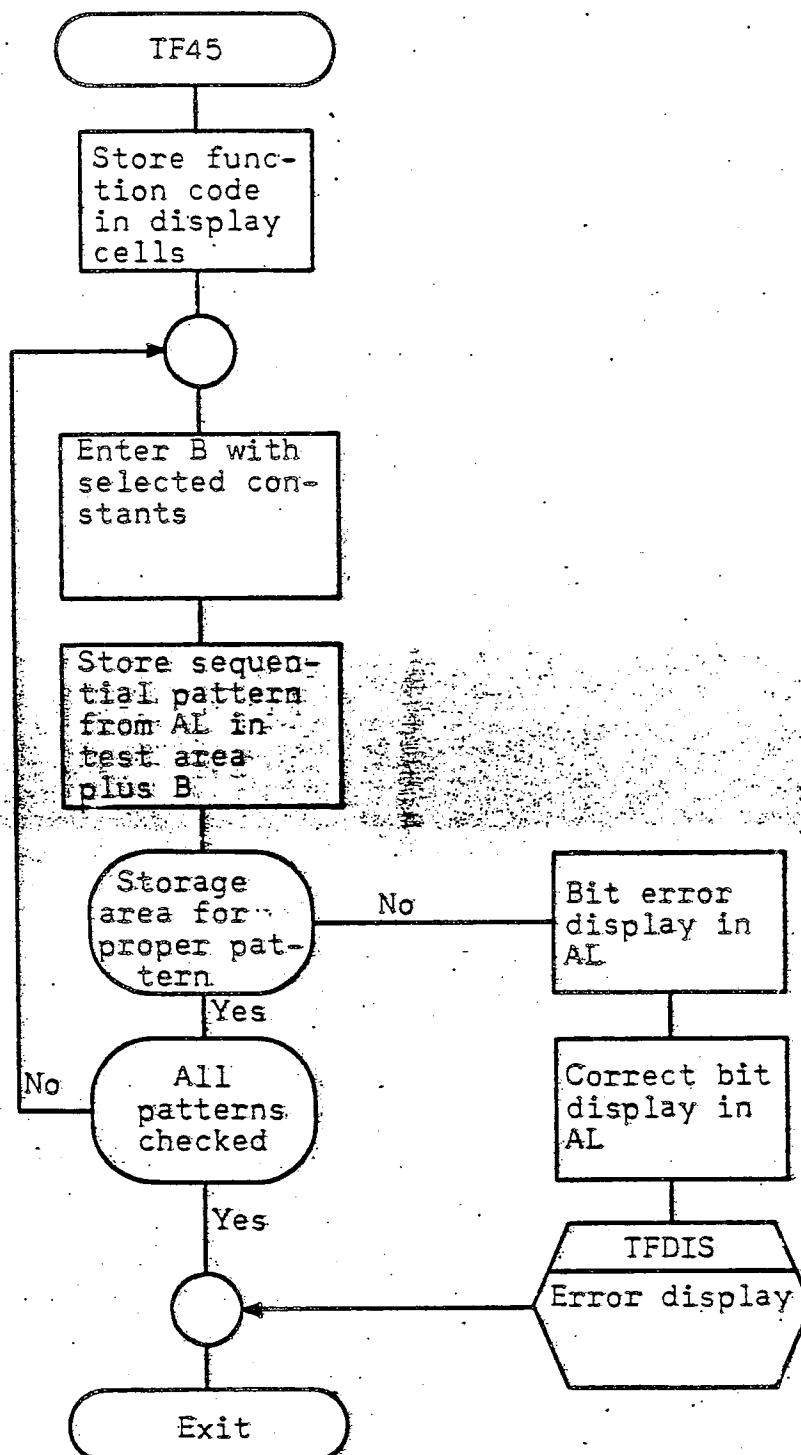
ALARMS AND/OR REMARKS:

ERROR DISPLAY

PROGRAM STOP 0 - Correct information in AU
                 Incorrect information in AL
                 Function code (45xxxx) in CO

PROGRAM SKIP 4 - Set for console error display only
                 Not set for error typeout (Function Code 45)

PROGRAM SKIP 0 - Set to continue test
                 Not set to recycle subroutine (TF45)

TF45

Store function code in display cells

Enter B with selected constants

Store sequential pattern from AL in test area plus B

Storage area for proper pattern — No → Bit error display in AL

Yes

All patterns checked

No

Correct bit display in AL

Yes

TFDIS
Error display

Exit

TF45: STORE AL MODIFIED BY B

SPECIFICATION SYMBOL
SB-10163

TITLE: TS45 - LEFT SHIFT AU (5045XX)

DECK IDENTIFIER: FACT

CS-1 LABEL: TS45   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: FWS modified by TLR   DATE: 8 Dec. 67

NUMBER OF L_4 OUTPUT INSTRUCTIONS: 30

DESCRIPTION:

This subroutine checks Left Shift AU command with its end around capabilities.

First, the quantity 000001 is entered into AU and left shifted one bit at a time until it should be in bit 2^{17} position. AU is then tested for its avility to pass a one without picking up a bit.

Secondly, one more left shift is executed to check the end around feature from bit 2^{17} to bit 2^0.

Error displays are listed under alarms.

TITLE:____TS45_____

INPUT PARAMETERS (Listed Sequentially):

TPAB1 = 000001
TSR430 = 21
TS455 = 400000
TCO1 = 777777

OUTPUT PARAMETERS (Listed Sequentially):

BUFF1
BUFF2
BUFF3
BUFF4
TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA - (EXEC)
TSDIS - Error Display

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:

ERROR DISPLAY
PROGRAM STOP O
CO/C1 - 504501
AU = Error

If AL = 1=21, bit was lost while shifting that count from 2^0.
If AL = 400000, AU should equal 400000 unless bits picked up.
If AL = 000001, AU should equal 000001 unless end around failed.
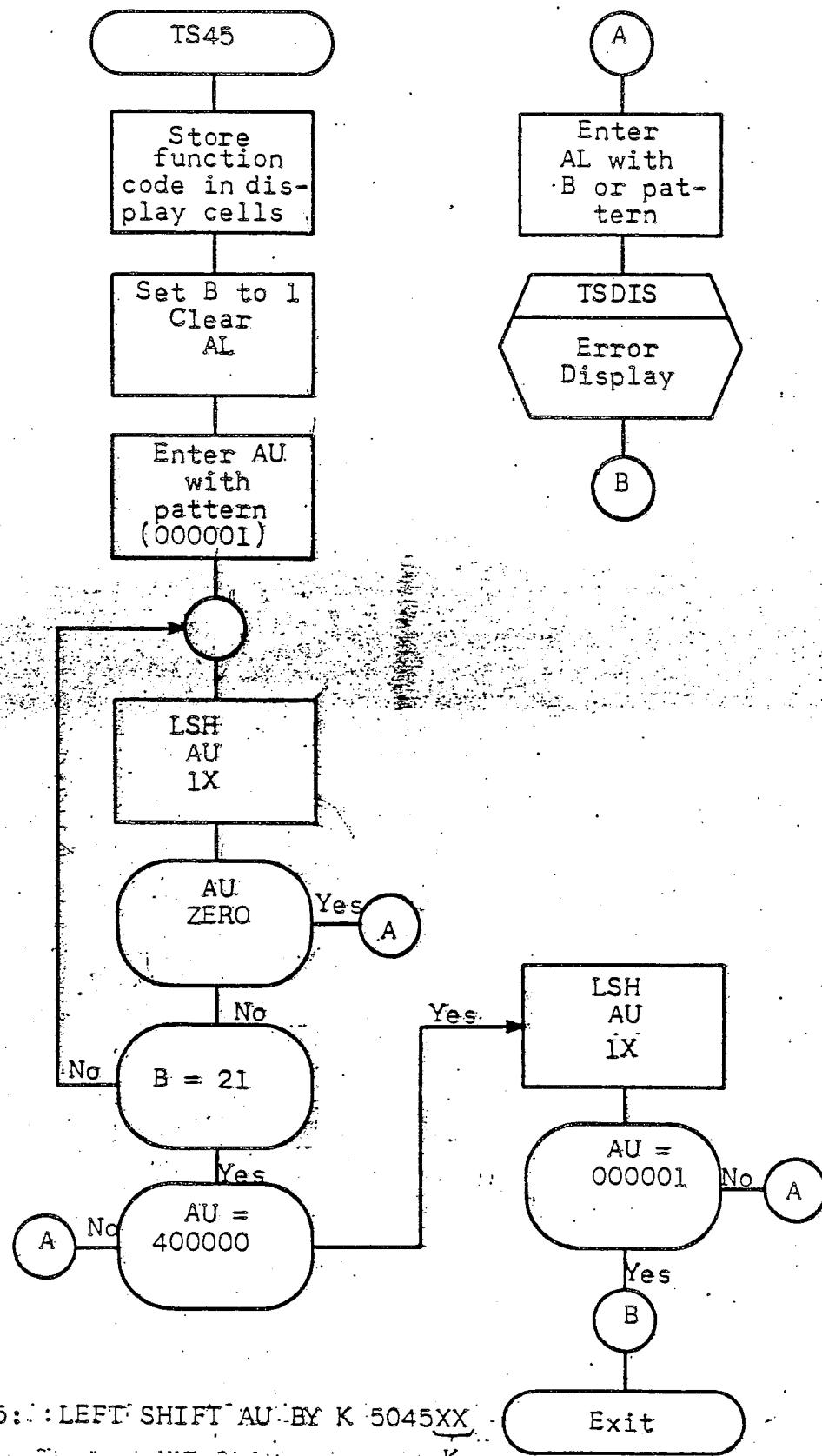
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SPECIFICATION SHEET

SHEET 319	REVISION ‿

SPECIFICATION SYMBOL

SB-10163

ALARMS AND/OR REMARKS: (Con't)

PROGRAM SKIP 4 - Set for console error display only
                 Not set for error typeout (Function Code 5045)
PROGRAM SKIP O - Set to recycle subroutine (TS45)
                 Not set to continue test.

```
        ( TS45 )                              ( A )

   ┌──────────────┐                    ┌──────────────┐
   │    Store     │                    │    Enter     │
   │   function   │                    │   AL with    │
   │ code in dis- │                    │  B or pat-   │
   │  play cells  │                    │     tern     │
   └──────┬───────┘                    └──────┬───────┘
          │                                   │
   ┌──────┴───────┐                    ┌──────┴───────┐
   │  Set B to 1  │                    │    TSDIS     │
   │    Clear     │                   ╱                ╲
   │      AL      │                  │     Error        │
   └──────┬───────┘                   ╲   Display      ╱
          │                            └──────┬───────┘
   ┌──────┴───────┐                           │
   │   Enter AU   │                         ( B )
   │     with     │
   │   pattern    │
   │  (000001)    │
   └──────┬───────┘
          │
         (○)───────┐
          │        │
   ┌──────┴───────┐│
   │     LSH      ││
   │     AU       ││
   │     1X       ││
   └──────┬───────┘│
          │        │
       (  AU  )  Yes
       ( ZERO )────( A )
          │
          No
       ( B = 21 )──No──┐
          │
         Yes                    Yes    ┌──────────────┐
       (  AU  = )───────────────────▶ │     LSH      │
  ( A )──No──( 400000 )                │     AU       │
                                       │     1X       │
                                       └──────┬───────┘
                                              │
                                          (  AU  = )──No──( A )
                                          ( 000001 )
                                              │
                                             Yes
                                            ( B )
                                              │
                                         ( Exit )
```

TS45: LEFT SHIFT AU BY K 5045XX

K

SPECIFICATION SYMBOL
SB-10163

TITLE: TF46 - STORE A UPPER (46xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF46   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: PMC modified by TLR   DATE: 8 Dec. 67

NUMBER OF L_4 OUTPUT INSTRUCTIONS: 49

DESCRIPTION:

This subroutine checks the Store A Upper command. AU is entered
with a test pattern and stored in a test cell using a STRAU command.
Validity is then checked by entering AL with the contents of the
test cell and comparing AL with the test pattern. If correct,
the next pattern is entered into AU and the cycle is repeated until
all patterns have been checked. An exit is then made to the
executive routine (COMA). If an error is detected by any of the
validity checks, AU will contain the correct pattern, AL the in-
correct pattern, and an exit is made to the display subroutine.
With PROGRAM STOP 0 set, CO will contain function code and the
error may be evaluated. Upon return to this subroutine (TF46)
an exit is made to the executive routine (COMA) to check for
continuing the test or recycling this subroutine (TF46).

SPECIFICATION SYMBOL
SB-10163

TITLE: TF46

INPUT PARAMETERS (Listed Sequentially):
  COMA

TEST PATTERNS	
TPAT	777777
TPAT1	000000
TPAT2	252525
TPAT3	525252
TPAT4	770000
TPAT5	007777
TPAT6	707070
TPAT7	070707
TPAR	TEST CELL

OUTPUT PARAMETERS (Listed Sequentially):

  BUFF1

  BUFF2

  TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

  COMA - (EXEC)

  TFDIS - Error Display

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:
ERROR DISPLAY

PROGRAM STOP 0 - correct information in AU
                incorrect information in AL
                function code (46xxxx) in CO

PROGRAM SKIP 4 - set for console error display only
                not set for error typeout (Function Code 46)

PROGRAM SKIP 0 - not set to continue test
                set to recycle subroutine (TF46)

| SPECIFICATION SYMBOL |
| SB-10163 |

```
                    ╭──────────────╮
                    │     TF46     │
                    ╰──────┬───────╯
                           │
                ┌──────────┴──────────┐
                │      Store          │
                │    function         │
                │  code in dis-       │
                │   play cells        │
                └──────────┬──────────┘
                           │
                          ╭─╮
                  ┌──────▶ ╰─╯
                  │        │
                  │ ┌──────┴──────┐
                  │ │  Store se-  │
                  │ │  quential   │
                  │ │  patterns   │
                  │ │  from AU    │
                  │ └──────┬──────┘               ┌──────────────┐
                  │    ╭───┴────╮                 │     Bit      │
                  │   ╱ Patterns ╲      No        │ error dis-   │
                  │  ╱   check     ╲──────────────│  play  in    │
                  │   ╲            ╱               │     AL       │
                  │    ╲──────────╱                └──────┬───────┘
                  │        │ Yes                          │
                  │    ╭───┴────╮                  ┌──────┴───────┐
                  │   ╱   All    ╲  No             │   Correct    │
                  └──╱  patterns  ╲                │ bit display  │
                     ╲  checked   ╱                │     in       │
                      ╲──────────╱                 │     AU       │
                          │ Yes                    └──────┬───────┘
                         ╭─╮          ┌──────────────╮    │
                         ╰─╯◀─────────│    TFDIS     ╲    │
                          │           │    Error      ╲───┘
                ┌─────────┴────────╮  │   Display     ╱
                │      Exit        │  │              ╱
                ╰──────────────────╯  └─────────────╱
```

TF46: STORE A UPPER

SPECIFICATION SYMBOL
SB-10163

TITLE: TS46 LEFT SHIFT AL (5046xx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TS46   KEY: 1218   IS LABEL DUPLICATE? No

PROGRAMMER: FWS modified by TLR   DATE: 8 Dec. 67

NUMBER OF L4 OUTPUT INSTRUCTIONS: 31

DESCRIPTION:

This subroutine checks the Left Shift AL command with its end-around capabilities.

First, the quantity 000001 is entered into AL and left-shifted one bit at a time until it should be in the bit 2^{17} position. AL is then tested for its ability to pass a one without picking up.

Secondly, one more left shift is executed to check the end-around feature from bit 2^{17} to bit 2^0.

Error displays are listed under alarms.

TITLE: TS46

INPUT PARAMETERS (Listed Sequentially):

TPAT1 = 000000
TPAB1 = 000001
TSR430 = 000021
TS455 = 400000

OUTPUT PARAMETERS (Listed Sequentially):

BUFF1

BUFF2

BUFF3

BUFF4
TFX
ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA (EXEC)

TSDIS – Error Display
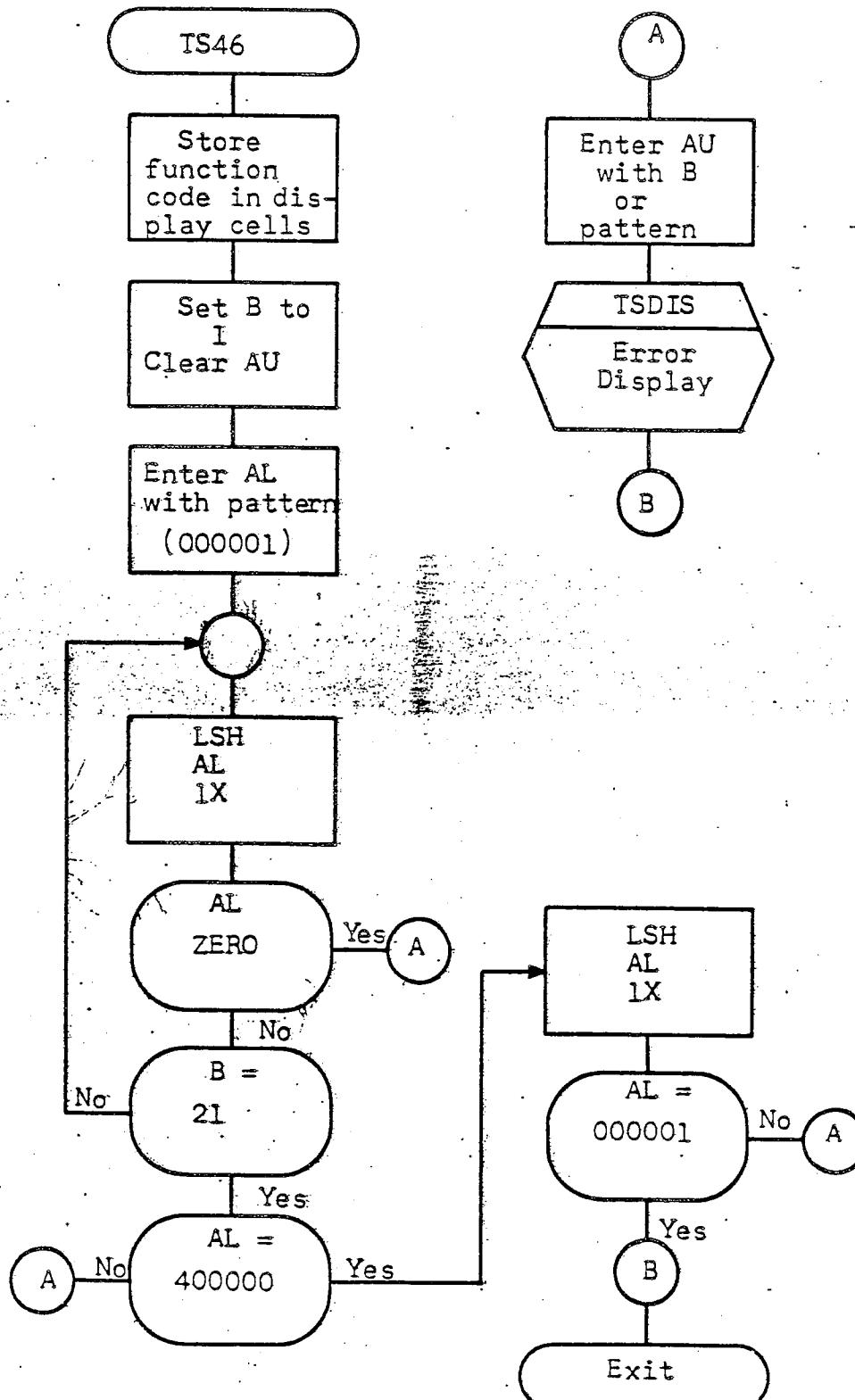
SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:

ERROR DISPLAY
PROGRAM STOP 0
CO/C1 = 504601
AL = Error
AU = 1-21, but was lost while shifting that count from 2^0.
AU = 400000, AL should equal 400000 unless bits were picked up.
AU = 000001, AL should equal 000001 unless end-around failed.
PROGRAM SKIP 4 - set for console error display only
              not set for error typeout (Function Code 5046)
PROGRAM SKIP 0 - set to recycle subroutine (TS46)
              not set to continue test

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TS46

Store function code in display cells

Set B to I
Clear AU

Enter AL with pattern (000001)

LSH AL 1X

AL ZERO — Yes → (A)

No

B = 21 → No

Yes

AL = 400000 — No ← (A)

Yes →

(A) Enter AU with B or pattern

TSDIS
Error Display

(B)

LSH AL 1X

AL = 000001 — No → (A)

Yes

(B)

Exit

TS46: LEFT SHIFT AL BY K
5046XX
K

UDI-596V 22/31-02 9/63

SPECIFICATION SYMBOL
SB-10163

TITLE: TF47 - STORE A UPPER MODIFIED BY B (47xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF47   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: PMC modified by TLR   DATE: 8 Dec. 67

NUMBER OF L₄ OUTPUT INSTRUCTIONS: 56

DESCRIPTION:

This subroutine checks the Store A Upper Modified By B command.
B is entered with a constant, and AU with a test-pattern constant.
A STRAUB command is then executed and AU is stored in a test cell.
Validity is checked by entering AL with the content of the test
cell and comparing AL and the test-pattern constant. If correct,
the next constant is entered into B and the cycle is repeated
until all test patterns have been checked. An exit is then made
to the executive routine (COMA). If an error is detected by any
of the validity checks, AU will contain the correct pattern, AL
the incorrect pattern, and an exit is made to the display sub-
routine. With PROGRAM STOP 0 set, CO will contain the function
code and the error may be evaluated. Upon return to this sub-
routine (TF47), an exit is made to the executive routine (COMA)
to check for continuing the test or recycling this subroutine (TF47).

SPECIFICATION SYMBOL
SB-10163

TITLE: TF47

INPUT PARAMETERS (Listed Sequentially):

COMA

TEST PATTERNS	
TPAT	777777
TPAT1	000000
TPAT2	252525
TPAT3	525252
TPAT4	770000
TPAT5	007777
TPAT6	707070
TPAT7	070707
TPAR	TEST CELL

OUTPUT PARAMETERS (Listed Sequentially):

BUFF1

BUFF2

TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA - (EXEC)
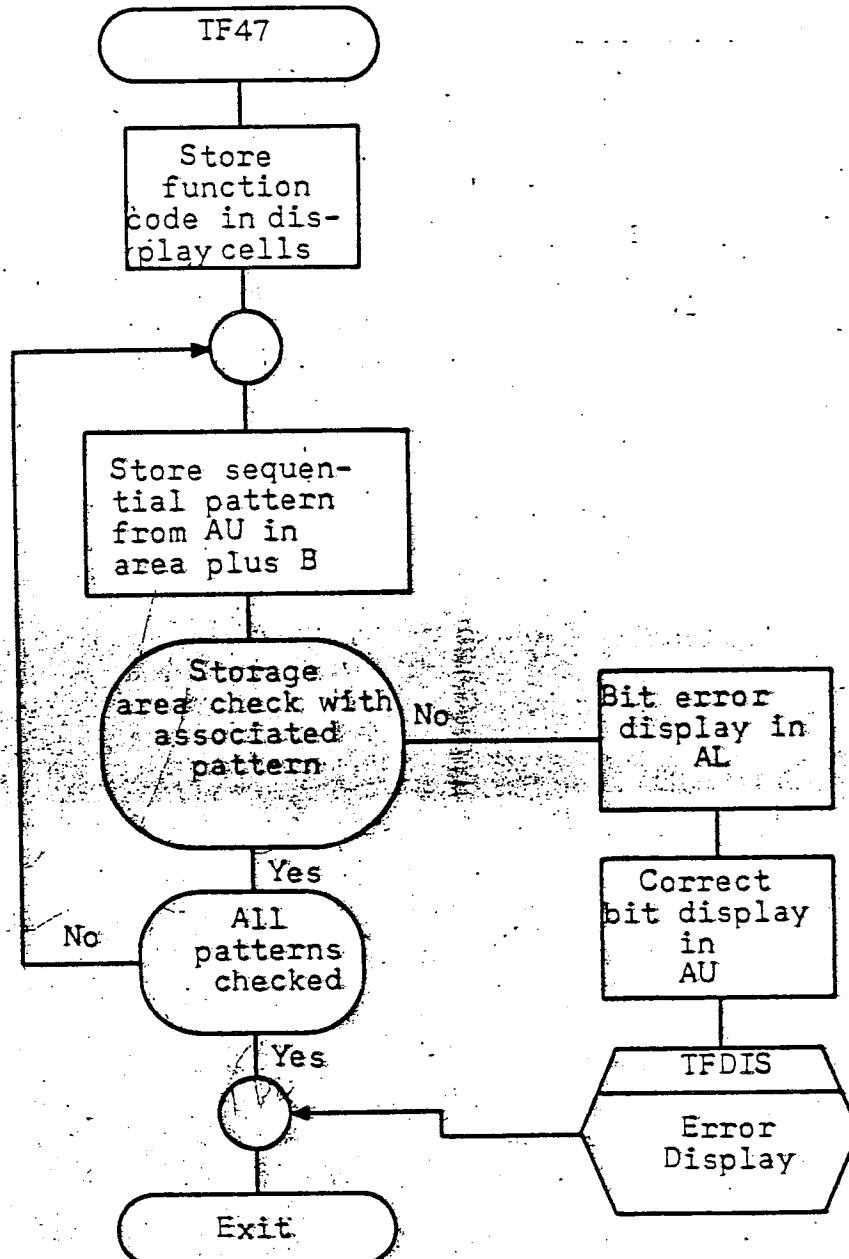
TFDIS - Error Display

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:

ERROR DISPLAY

PROGRAM STOP 0 - correct information in AU
incorrect information in AL
function code (47xxxx) in CO

PROGRAM SKIP 4 - set for console error display only
not set for error type out (Function Code 47)

PROGRAM SKIP 0 - not set to continue test
set to recycle subroutine (TF47)

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```
                    ┌──────────────┐
                    │     TF47     │
                    └──────┬───────┘
                           │
                    ┌──────┴───────┐
                    │    Store     │
                    │   function   │
                    │ code in dis- │
                    │  play cells  │
                    └──────┬───────┘
                           │
                          ( )◄─────────────┐
                           │               │
                    ┌──────┴───────┐       │
                    │Store sequen- │       │
                    │tial pattern  │       │
                    │from AU in    │       │
                    │area plus B   │       │
                    └──────┬───────┘       │
                           │               │
                   ┌───────┴────────┐  No  ┌──────────────┐
                   │    Storage     ├─────►│  Bit error   │
                   │area check with │      │ display in   │
                   │  associated    │      │     AL       │
                   │    pattern     │      └──────┬───────┘
                   └───────┬────────┘             │
                        Yes│                ┌──────┴───────┐
                   ┌───────┴────────┐       │   Correct    │
              No   │      All       │       │ bit display  │
          ┌────────┤    patterns    │       │     in       │
          │        │    checked     │       │     AU       │
          │        └───────┬────────┘       └──────┬───────┘
          │             Yes│                       │
          │               ( )◄────────┐     ┌──────┴───────┐
          │                │          │     │    TFDIS     │
          │         ┌──────┴───────┐  └─────┤    Error     │
          │         │     Exit     │        │   Display    │
          │         └──────────────┘        └──────────────┘
          └────────────────────────────────────┘
```

TF47: STORE A UPPER MODIFIED BY B .

SPECIFICATION SYMBOL

SB-10163

TITLE: TS 47 - LEFT SHIFT A (5047XX)

DECK IDENTIFIER: FACT

CS-1 LABEL: TS47   KEY: 1218   IS LABEL DUPLICATE? No

PROGRAMMER: FWS modified by TLR   DATE: 8 Dec. 67

NUMBER OF L$_4$ OUTPUT INSTRUCTIONS: 26

DESCRIPTION:

This subroutine check Left Shift A command with its end-around capabilities.

First, the quantity 000001 is entered into AL and left shifted 22 times and AL checked equal to zero.

Second, A is shifted 22 more times and AU checked equal to zero; AL checked equal to 000001 for end-around check.

Error displays listed under alarms.

SPECIFICATION SYMBOL
SB-10163

TITLE: TS47

INPUT PARAMETERS (Listed Sequentially):

TPAT1 = 000000
TPAB1 = 000001

OUTPUT PARAMETERS (Listed Sequentially):

BUFF1

BUFF2

BUFF3

BUFF4

TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA (EXEC)

TSDIS - Error Display

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:
ERROR DISPLAY
PROGRAM STOP 0
C0/C1 = 504722
$AU = 000001$ AL should equal 000000, bit picked up in AL
$AL = 000001$ AU should equal 000001, shifting from AL 2^{29}
to AU 2^0.
$AU = 000000$ AL should equal 000001, checking end around
$AU = 000001$ AL should equal 000001, checking end around

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SPECIFICATION SHEET

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SPECIFICATION SYMBOL

SB-10163
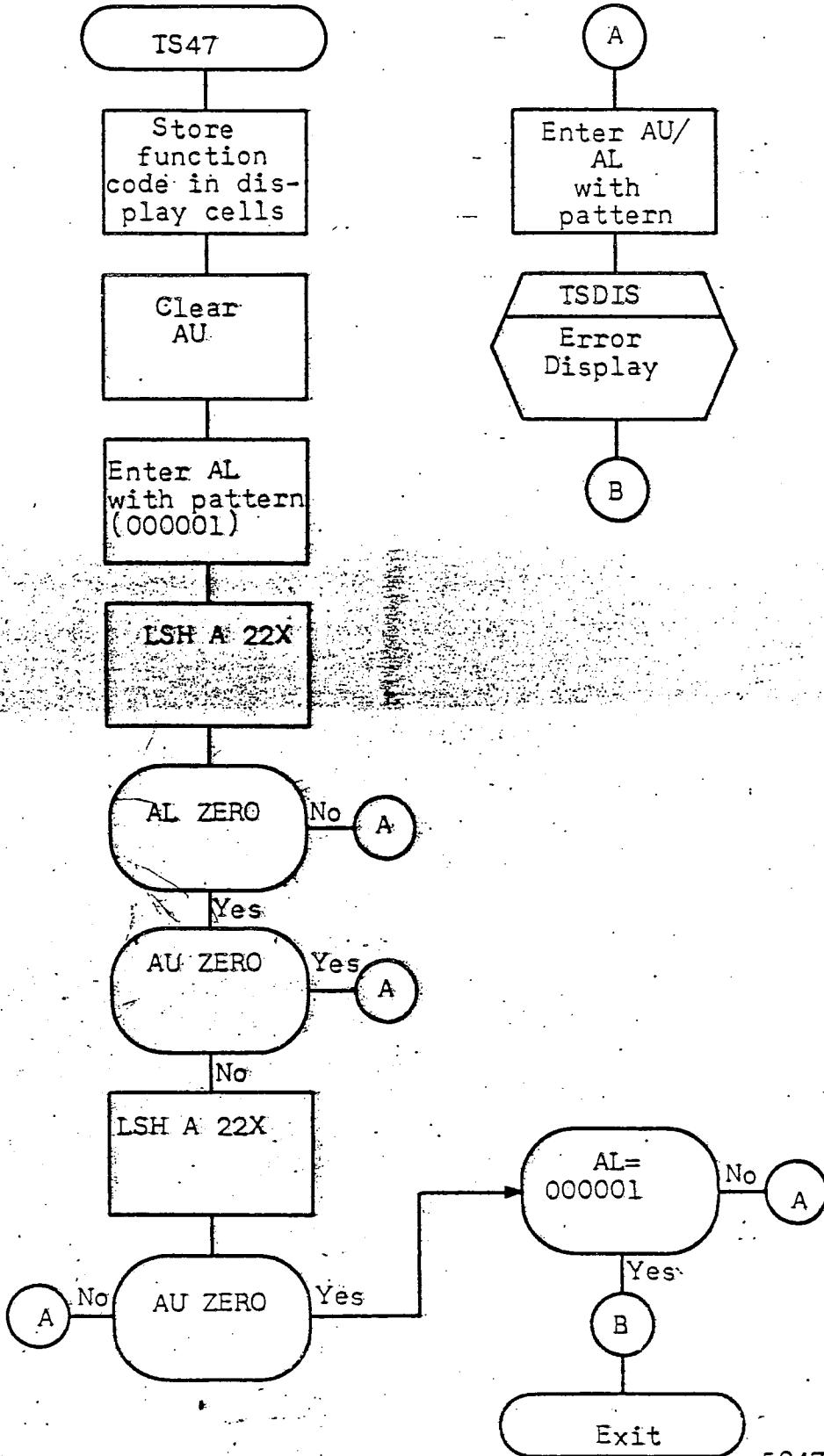
ALARMS AND/OR REMARKS (Continued):

    PROGRAM SKIP 4 - set for console error display only
                      not set for error typeout (Function Code 5047)
    PROGRAM SKIP 0 - set to recycle subroutine (TS47)
                      not set to continue test

Due to the interacting of these displays, the Maintenance
Engineer should OP STEP through this routine to determine more
clearly which feature failed.

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SPECIFICATION SYMBOL
SB-10163

TS47

Store function code in display cells

Clear AU

Enter AL with pattern (000001)

LSH A 22X

AL ZERO → No → A

Yes

AU ZERO → Yes → A

No

LSH A 22X

A ← No ← AU ZERO → Yes

A

Enter AU/ AL with pattern

TSDIS
Error Display

B

AL= 000001 → No → A

Yes

B

Exit

TS 47:   LEFT SHIFT A BY K

5047XX
K

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SPECIFICATION SHEET

PROGRAM DATA PAGE

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SPECIFICATION SYMBOL
SB-10163

TITLE: TF51 - SELECTIVE SET (51xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF51   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: PMC modified by TLR   DATE: 8 Dec. 67

NUMBER OF L_4 OUTPUT INSTRUCTIONS: 38

DESCRIPTION:

This subroutine checks the Selective Set command. AL is entered with a test-pattern constant, and a SLSET command is executed. Validity is checked by a subroutine where AL is compared to a test-pattern constant. If correct, an exit is made to another 51 command and validity is again checked by the subroutine. On this exit from the subroutine AL is entered with a new, test-pattern constant, and another SLSET command and validity check are performed. This sequence is repeated until all patterns have been checked. An exit is then made to the executive routine (COMA). If an error is detected by any of the validity checks, AL will contain the incorrect pattern and AU will contain the correct pattern. An exit is then made to the display subroutine where, with PROGRAM STOP 0 set, CO will contain the function code and the error may be evaluated. Upon return to this subroutine (TF51) an exit is made to the executive routine (COMA) to check for continuing the test or recycling this subroutine (TF51).

	SPECIFICATION SYMBOL
	SB-10163

TITLE: **TF51**

INPUT PARAMETERS (Listed Sequentially):
COMA

TEST PATTERNS

TPAT	777777
TPAT1	000000
TPAT2	252525
TPAT3	525252
TPAT6	707070.
TPAT7	070707
TPAB1	000001
TPAB1+1	777776

OUTPUT PARAMETERS (Listed Sequentially):
BUFF1

BUFF2

TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA (EXEC)

TFDIS - Error Display

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:
ERROR DISPLAY

PROGRAM STOP 0 - correct information in AU
incorrect information in AL
function code (51xxxx) in CO

PROGRAM SKIP 4 - set for console error display only
not set for error typeout (Function Code 51)

PROGRAM SKIP 0 - not set to continue test
set to recycle subroutine (TF51)

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SPECIFICATION SYMBOL
SB-10163

```
        ╭─────────╮
        │  TF51   │
        ╰────┬────╯
        ┌────┴──────┐
        │Store func-│
        │tion code  │
        │in display │
        │cells      │
        └────┬──────┘
          ┌──┴──┐
     ┌───▶│     │
     │    └──┬──┘
     │  ┌────┴──────┐
     │  │Enter AL   │
     │  │with sequen│
     │  │tial test  │
     │  │pattern    │
     │  └────┬──────┘
     │  ┌────┴──────┐
     │  │Selective  │
     │  │set with   │
     │  │associated │
     │  │pattern    │
     │  └────┬──────┘
     │    ╭──┴──╮    No    ┌──────────┐
     │   ╱ Set   ╲─────────│Bit error │
     │   ╲ valid ╱         │display in│
     │    ╰──┬──╯          │AL        │
     │       │Yes          └────┬─────┘
     │    ╭──┴──╮  No       ┌────┴─────┐
     │   ╱ All   ╲          │Correct bit│
     └──╱patterns ╲         │display in │
        ╲checked  ╱         │AU         │
         ╰──┬──╯            └────┬──────┘
            │Yes                 │
          ┌─┴─┐              ╭───┴────╮
          │   │◀─────────────│ TFDIS  │
          └─┬─┘              │ Error  │
        ╭───┴───╮            │ display│
        │ Exit  │            ╰────────╯
        ╰───────╯
```

TF51:   SELECTIVE SET

SPECIFICATION SYMBOL

SB-10163

TITLE: TS51 - SKIP ON NO BORROW (505100)

DECK IDENTIFIER: FACT

CS-1 LABEL: TS51   KEY: 1218   IS LABEL DUPLICATE? No

PROGRAMMER: FMS modified by TLR   DATE: 8 Dec. 67

NUMBER OF L_4 OUTPUT INSTRUCTIONS: 35

DESCRIPTION:

This subroutine checks the Skip On No Borrow command which is used after an Add A or Subt A function. It establishes whether or not a borrow condition exists, since no end around borrow correction is logically available in this machine.

Add A and Subt A commands are executed with and without borrow generation and the borrow FF checked to determine failure.

Error displays are listed under alarms.

SPECIFICATION SYMBOL
SB-10163

TITLE: TS51

INPUT PARAMETERS (Listed Sequentially):
 TPAT2 = 252525
 TPAT3 = 525252

OUTPUT PARAMETERS (Listed Sequentially):
 BUFF1

 BUFF2

 BUFF3

 BUFF4

 TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

 COMA (EXEC)

 TSDIS — Error Display

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:
 ERROR DISPLAY
 PROGRAM STOP 0
 CO/C1 = 505100

 If A = 525252525253, it should not have skipped and did.
 If A = 252525252525 or
        000000000000, it should have skipped and didn't.

     PROGRAM SKIP 4 - set for console error display only
                    not set for error typeout (Function Code 5051)
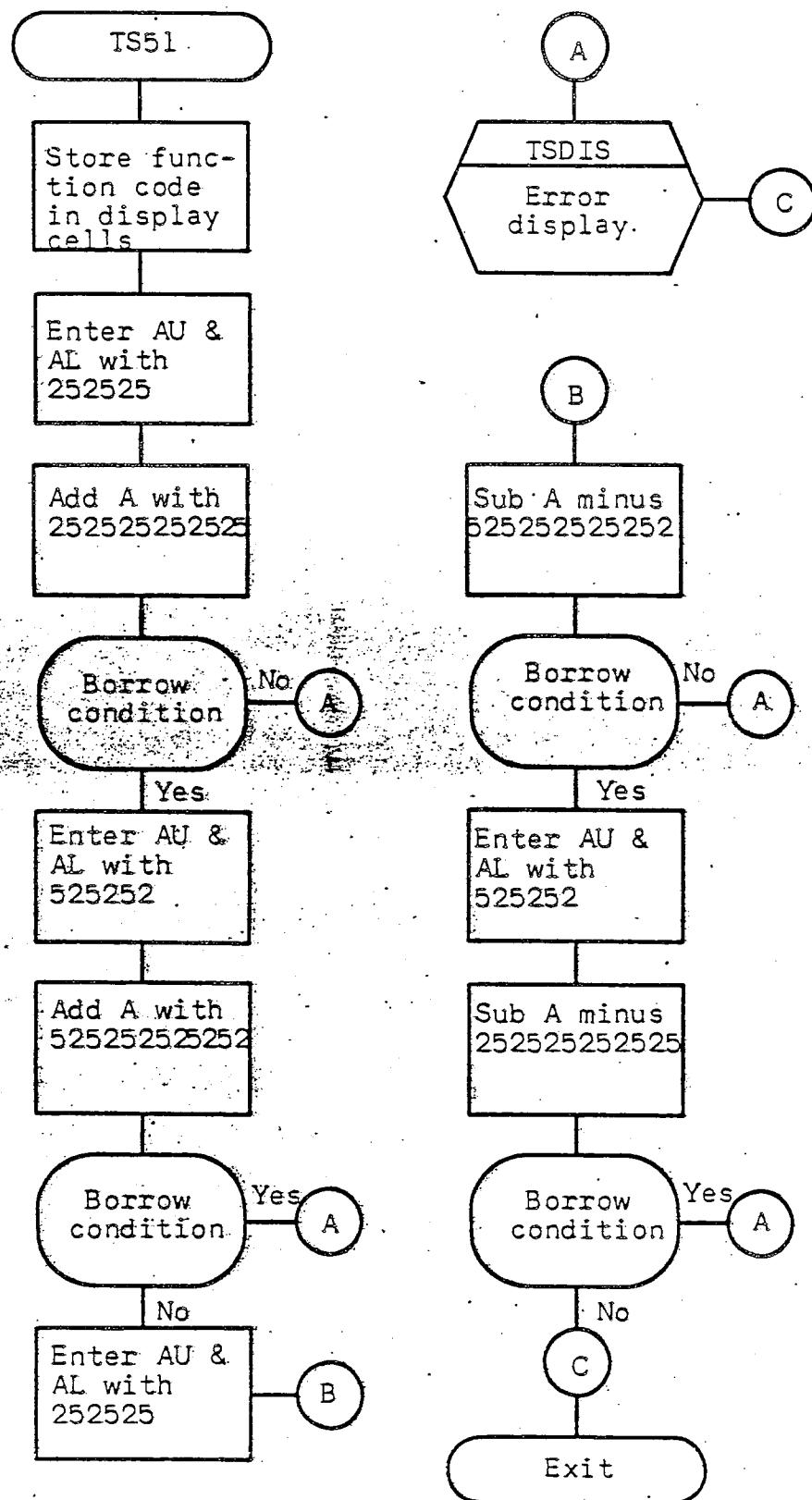
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SB-10163

ALARMS AND/OR REMARKS (Continued):

PROGRAM SKIP 0 - set to recycle subroutine (TS51)
not set to continue test

SPECIFICATION SYMBOL
SB-10163

```
        ( TS51 )                          ( A )

   ┌─────────────┐                  ┌──────────────┐
   │ Store func- │                  │    TSDIS     │
   │ tion code   │                  │   Error      │──( C )
   │ in display  │                  │   display.   │
   │ cells       │                  └──────────────┘
   └─────────────┘

   ┌─────────────┐                          ( B )
   │ Enter AU &  │
   │ AL with     │                  ┌──────────────┐
   │ 252525      │                  │ Sub A minus  │
   └─────────────┘                  │ 525252525252 │
                                    └──────────────┘
   ┌─────────────┐
   │ Add A with  │                  ┌──────────────┐
   │ 252525252525│                  │   Borrow     │─No─( A )
   └─────────────┘                  │  condition   │
                                    └──────────────┘
   ┌──────────────┐                        │ Yes
   │   Borrow     │─No─( A )        ┌──────────────┐
   │  condition   │                 │ Enter AU &   │
   └──────────────┘                 │ AL with      │
         │ Yes                      │ 525252       │
   ┌─────────────┐                  └──────────────┘
   │ Enter AU &  │
   │ AL with     │                  ┌──────────────┐
   │ 525252      │                  │ Sub A minus  │
   └─────────────┘                  │ 252525252525 │
                                    └──────────────┘
   ┌─────────────┐
   │ Add A with  │                  ┌──────────────┐
   │ 525252525252│                  │   Borrow     │─Yes─( A )
   └─────────────┘                  │  condition   │
                                    └──────────────┘
   ┌──────────────┐                        │ No
   │   Borrow     │─Yes─( A )              ( C )
   │  condition   │
   └──────────────┘                       ( Exit )
         │ No
   ┌─────────────┐
   │ Enter AU &  │
   │ AL with     │──( B )
   │ 252525      │
   └─────────────┘
```

TS51:   SKIP ON NO BORROW 505100

SPECIFICATION SYMBOL
SB-10163

TITLE: TF52 -SELECTIVE CLEAR (52xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF52.   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: PMC modified by TLR   DATE: 8 Dec. 67

NUMBER OF L$_4$ OUTPUT INSTRUCTIONS: 33

DESCRIPTION:

This subroutine tests the performance of the Selective Clear in-
struction (Function Code 52). A Lower is entered with a test
pattern and the Selective Clear command is executed. Then through
use of the Jump AL zero and Jump AL non zero commands the SLCL
execution is checked for validity. If the execution was proper
the next, sequential test pattern is checked in the afore-mentioned
manner until all patterns have been used. If all checks prove
correct an exit is made to the executive routine (COMA). Should
the validity check on any pattern detect an error, A Upper is
entered with the correct information. A Lower contains the in-
correct information and an exit is made to the display subroutine
(TSDIS). Upon returning to this subroutine (TF52) an exit is
made, to the executive routine (COMA) to check for continuance of
the test or the recycling of this subroutine (TF52).

SPECIFICATION SYMBOL
SB-10163

TITLE: **TF52**

INPUT PARAMETERS (Listed Sequentially):
COMA

TEST PATTERNS	
TPAT	777777
TPAT1	000000
TPAT2	252525
TPAT3	525252
TPAT6	707070
TPAT7	070707
TPAB1	000001
TPAB1+1	777776

OUTPUT PARAMETERS (Listed Sequentially):

BUFF1

BUFF2

TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):
COMA (EXEC)

TSDIS - Error Display

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:
ERROR DISPLAY - PROGRAM STOP 0 set
correct information in AU
incorrect information in AL
function code (52xxxx) in CO

PROGRAM SKIP 4 - set for console error display only
not set for error typeout (Function
Code 52)

PROGRAM SKIP 0 not set - continue test; if set -
recycle subroutine (TF52)

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SPECIFICATION SHEET

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SPECIFICATION SYMBOL
SB-10163

```
            ( TF52 )
               |
      +--------------------+
      | Store func-        |
      | tion code          |
      | in display         |
      | cells              |
      +--------------------+
               |
             ( O )<-----------+
               |              |
      +--------------------+  |
      | Enter AL           |  |
      | with sequen-       |  |
      | tial test          |  |
      | pattern            |  |
      +--------------------+  |
               |              |
      +--------------------+  |
      | Selective          |  |
      | clear with         |  |
      | associated         |  |
      | pattern            |  |
      +--------------------+  |
               |
          ( AL = 0 )---No--->[ Bit error display in AL ]
               |Yes                       |
          ( All                 [ Correct bit display in AU ]
            patterns            |
            checked )--No               |
               |Yes            < TFDIS  Error display >
             ( O )<--------------------+
               |
            ( Exit )
```

TF52:   SELECTIVE CLEAR

SPECIFICATION SYMBOL
SB-10163

TITLE: TS52 - SKIP ON OVERFLOW (505200)

DECK IDENTIFIER: FACT

CS.1 LABEL: TS52   KEY: 1218   IS LABEL DUPLICATE? No

PROGRAMMER: FWS modified by TLR   DATE: 8 Dec. 67

NUMBER OF L_4 OUTPUT INSTRUCTIONS: 26

DESCRIPTION:

This subroutine checks the Skip On Overflow command. It is used after any arithmetic function to establish whether an overflow condition existed as a result of that arithmetic process.

A divide instruction is executed first for no overflow and again to check when an overflow does exist.

Error displays are listed under alarms.

SPECIFICATION SYMBOL
_SB-10163

TITLE: TS52

INPUT PARAMETERS (Listed Sequentially):

TPAT1 = 000000
TPAB1 = 000001

OUTPUT PARAMETERS (Listed Sequentially):

BUFF1

BUFF2

BUFF3

BUFF4

TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA (EXEC)

TSDIS - Error Display

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:
ERROR DISPLAY
PROGRAM STOP 0
CO/CI = 505200
If A = 000000003777, it skipped when an overflow didn't exist.
If A = 000001000000, is should have skipped and didn't.
If A = to either of these, the divide instruction failed.
      PROGRAM SKIP 4 - set for console error display only
                  not set for error typeout (Function Code
              5052)
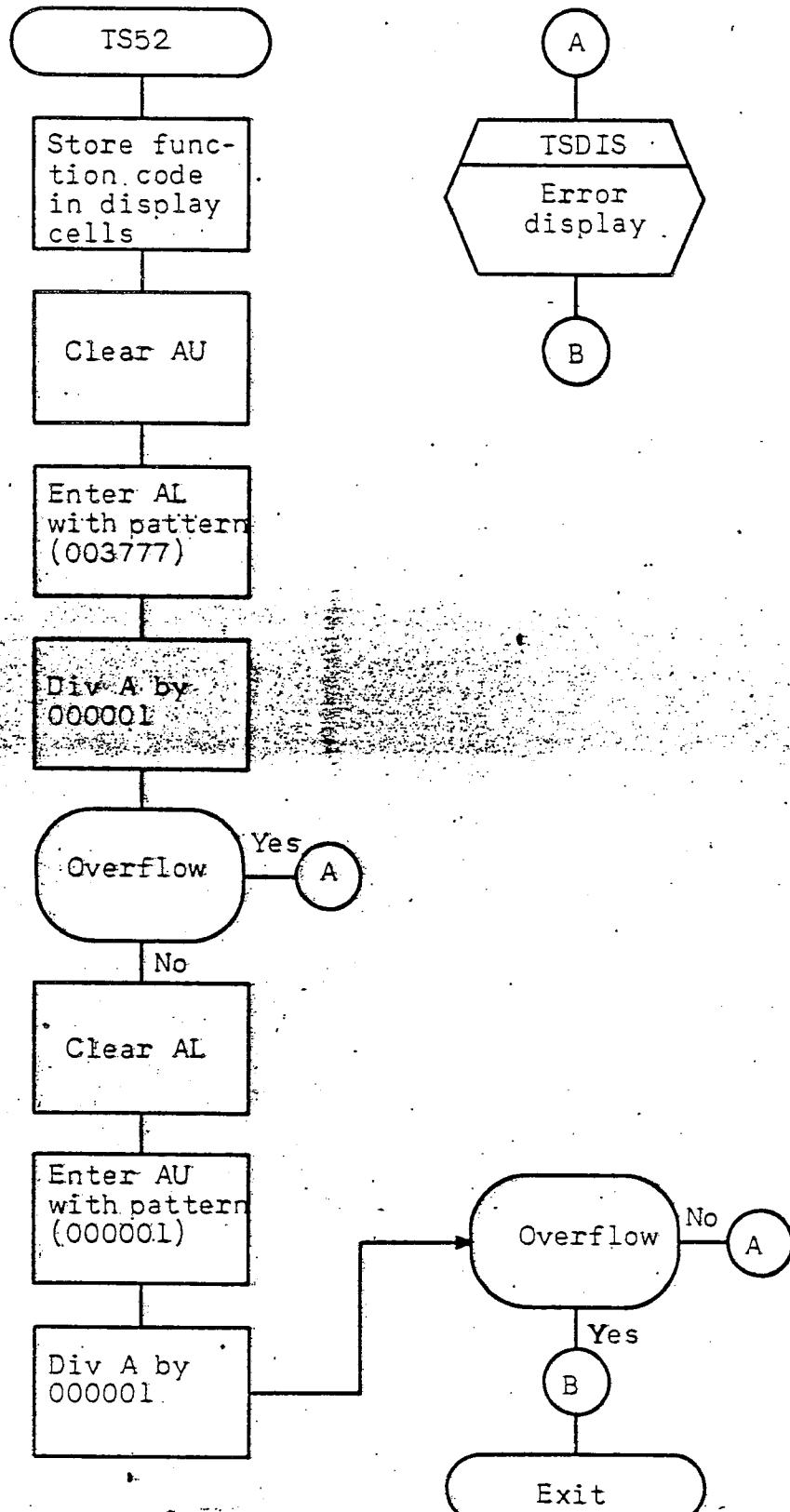
ALARMS AND/OR REMARKS (Continued):

> PROGRAM SKIP 0 - set to recycle subroutine
> not set to continue test (TS52)

TS52

Store func-
tion code
in display
cells

Clear AU

Enter AL
with pattern
(003777)

Div A by
000001

Overflow — Yes → A

No

Clear AL

Enter AU
with pattern
(000001)

Div A by
000001

A

TSDIS
Error
display

B

Overflow — No → A

Yes

B

Exit

TS52:   SKIP ON OVERFLOW 505200

SPECIFICATION SYMBOL
SB-10163

TITLE: TF53 - SELECTIVE COMPLEMENT (53xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF53   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: PMC modified by TLR   DATE: 8 Dec. 67

NUMBER OF L_4 OUTPUT INSTRUCTIONS: 38

DESCRIPTION:

This subroutine checks the Selective Complement command. AL is
entered with a test-pattern constant. A SLCP command is executed
using another test-pattern constant. Next, validity is checked
by comparing the results in AL with an associated, test-pattern
constant, and if correct, the next, test-pattern constant is
entered into AL. This sequence is repeated until all test
patterns have been checked. An exit is then made to the executive
routine (COMA). If an error is detected by any of the validity
checks, the incorrect pattern is in AL, and the correct pattern
is in AU. Following that an exit is made to the display sub-
routine, where with PROGRAM STOP 0 set, CO will contain the
function code and the error may be evaluated. Upon return to
this subroutine (TF53) an exit is made to the executive routine
(COMA) to check for program continuance or the recycling of
this subroutine.

SPECIFICATION SYMBOL
SB-10163

TITLE: TF53

INPUT PARAMETERS (Listed Sequentially):

COMA

TEST PATTERNS	
TPAT	777777
TPAT+1	777777
TPAT1	000000
TPAT2	252525
TPAT3	525252
TPAT3+1	525252
TPAT6	707070
TPAT7	070707

OUTPUT PARAMETERS (Listed Sequentially):

BUFF1

BUFF2

TFX

ABNORMAL EXITS (Listed Sequentially):

**NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):**

COMA (EXEC)

TFDIS - Error Display

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:
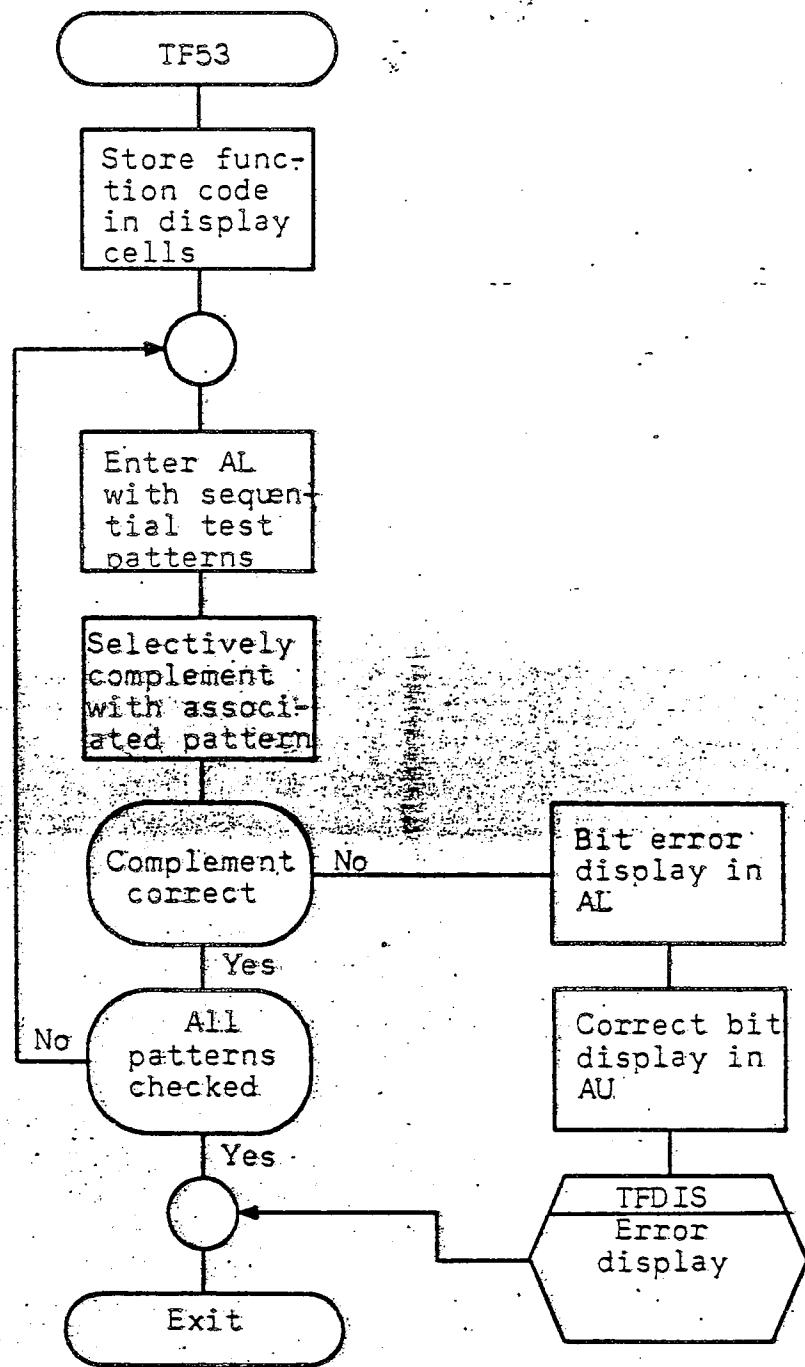
ERROR DISPLAY - PROGRAM STOP 0 set
      correct information in AU
      incorrect information in AL
      function code (53xxxx) in CO
      PROGRAM SKIP 4 - set for console error display only
             not set for error typeout (Function
             Code 53)
      PROGRAM SKIP 0 not set - continue test; if set -
             recycle subroutine (TF53)

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SPECIFICATION SHEET

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SPECIFICATION SYMBOL
SB-10163

```
                    ┌──────────────────┐
                    │       TF53        │
                    └──────────────────┘
                             │
                    ┌──────────────────┐
                    │ Store func-      │
                    │ tion code        │
                    │ in display       │
                    │ cells            │
                    └──────────────────┘
                             │
                            ( )
                             │
                    ┌──────────────────┐
                    │ Enter AL         │
                    │ with sequen-     │
                    │ tial test        │
                    │ patterns         │
                    └──────────────────┘
                             │
                    ┌──────────────────┐
                    │ Selectively      │
                    │ complement       │
                    │ with associ-     │
                    │ ated pattern     │
                    └──────────────────┘
                             │
                    ┌──────────────────┐        ┌──────────────┐
                    │ Complement   No  │───────▶│ Bit error    │
                    │ correct          │        │ display in   │
                    └──────────────────┘        │ AL           │
                          │ Yes                 └──────────────┘
                    ┌──────────────────┐        ┌──────────────┐
           No       │ All              │        │ Correct bit  │
          ◀─────────│ patterns         │        │ display in   │
                    │ checked          │        │ AU           │
                    └──────────────────┘        └──────────────┘
                          │ Yes                         │
                         ( )◀──────────────────┐  ┌──────────────┐
                          │                     └──│ TFDIS        │
                    ┌──────────────────┐           │ Error        │
                    │       Exit        │           │ display      │
                    └──────────────────┘           └──────────────┘
```

TF53:   SELECTIVE COMPLEMENT

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TITLE: TS53 - SKIP ON NO OVERFLOW (505300)

DECK IDENTIFIER: FACT

CS-1 LABEL: TS53   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: FWS modified by TLR   DATE: 8 December 1967

NUMBER OF L_4 OUTPUT INSTRUCTIONS: 26

DESCRIPTION:

This subroutine checks the Skip On No Overflow command. AU, AL, and the Overflow registers are cleared, and AU is entered with a test-pattern constant. A Divide A command is executed using a test-pattern constant which results in an overflow. A SKPNOV command is executed. Validity is checked by not skipping the next instruction but instead, entering AL and AU with the next constants and executing another Divide A command. This 2nd Divide A command results in a no overflow condition. Another SKPNOV command is executed and validity is checked. If correct, the subroutine exits to the executive routine (COMA). If the validity check detects an error, AU will contain the remainder, AL the quotient, and the subroutine exits to the display subroutine. If PROGRAM STOP 0 is set, CO will contain the function code, and the error can be evaluated. Upon return to this subroutine (TS53) an exit is made to the executive routine (COMA) to check for program continuance or the recycling of this subroutine.

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SPECIFICATION SHEET

P R O G R A M   D A T A   P A G E   (Cont)

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352	—

SPECIFICATION SYMBOL
SB-10163

TITLE: TS53

INPUT PARAMETERS (Listed Sequentially):
COMA

TEST PATTERNS
TPAT1   000000
TPAB1   000001

OUTPUT PARAMETERS (Listed Sequentially):
BUFF1

BUFF2

BUFF3

BUFF4
TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA (EXEC)

TSDIS - Error Display
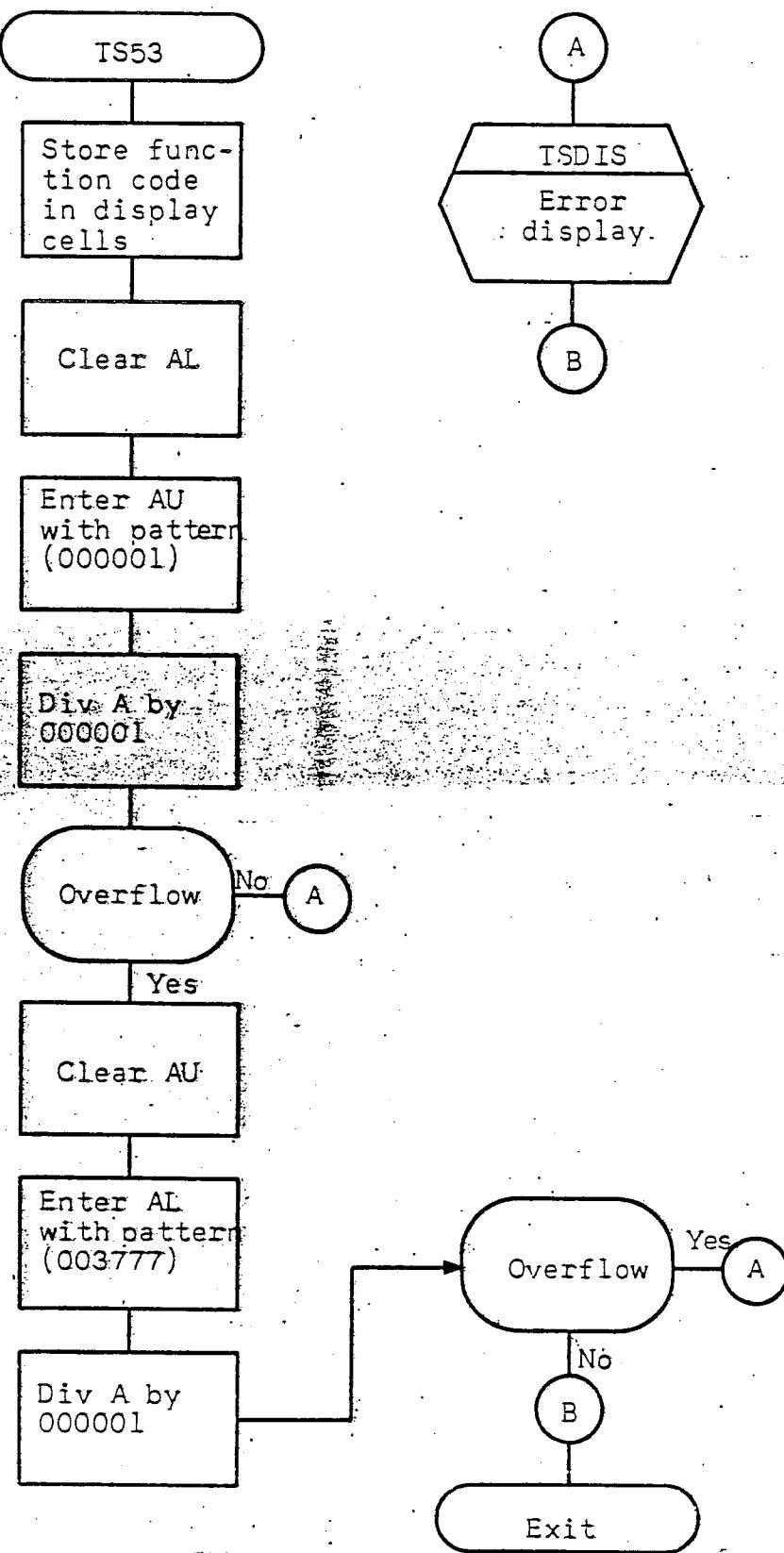
SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:
ERROR DISPLAY - PROGRAM STOP 0 set
                    remainder in AU
                    quotient in AL
                    function code (505300) in CO
                    PROGRAM SKIP 4 - set for console error display only
                                not set for error typeout (Function
                                Code 5053)
                    PROGRAM SKIP 0 not set - continue test; if set -
                                recycle subroutine (TS53)

SPECIFICATION SYMBOL
SB-10163

```
        ┌──────────────┐                      ( A )
        │     TS53     │                        │
        └──────────────┘               ┌─────────────────┐
               │                        │      TSDIS      │
        ┌──────────────┐               ╱      Error        ╲
        │ Store func-  │               ╲     display.       ╱
        │ tion code    │               └─────────────────┘
        │ in display   │                        │
        │ cells        │                      ( B )
        └──────────────┘
               │
        ┌──────────────┐
        │   Clear AL   │
        └──────────────┘
               │
        ┌──────────────┐
        │  Enter AU    │
        │ with pattern │
        │  (000001)    │
        └──────────────┘
               │
        ┌──────────────┐
        │  Div A by    │
        │   000001     │
        └──────────────┘
               │
          ╭──────────╮      ┌───┐
          │ Overflow │─No──( A )
          ╰──────────╯
               │ Yes
        ┌──────────────┐
        │   Clear AU   │
        └──────────────┘
               │
        ┌──────────────┐
        │  Enter AL    │
        │ with pattern │              ╭──────────╮    ┌───┐
        │  (003777)    │              │ Overflow │─Yes─( A )
        └──────────────┘              ╰──────────╯
               │                           │
        ┌──────────────┐                   │ No
        │  Div A by    │─────────────────┌───┐
        │   000001     │                 ( B )
        └──────────────┘                   │
                                    ╭──────────────╮
                                    │     Exit     │
                                    ╰──────────────╯
```

TS53:   SKIP ON NO OVERFLOW 505300

PROGRAM DATA PAGE

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SPECIFICATION SYMBOL
SB-10163

TITLE: TS54 - SKIP ON ODD PARITY (505400)

DECK IDENTIFIER: FACT

CS-1 LABEL: TS54   KEY: _____   IS LABEL DUPLICATE? No

PROGRAMMER: FWS modified by TLR   DATE: 8 December 1967

NUMBER OF L₄ OUTPUT INSTRUCTIONS: _____ 36

DESCRIPTION:

This subroutine checks the Skip On Odd Parity command. First,
the routine checks that no skip is executed if parity is even,
and secondly, that a skip is executed when parity is odd. A
test-pattern constant with even parity is entered into AU and
AL, and a SKPODD command is executed. Validity is checked, and
if correct, AL is left shifted one place. This process is
repeated on all combination of bits of the two patterns until B
is equal to 21. If AL is positive, a new, test-pattern constant
with even parity is entered into AL, and the above sequence is
repeated. This time, however, when B becomes equal to 21, AL
will be negative, and a test-pattern with odd parity is entered
into AL. A SKPODD command is executed, and validity is checked.
If correct, AL will be left shifted one place and the above
sequence will be repeated until B is equal to 21. If AL is
positive, another test-pattern with odd parity is entered into
AL and the above sequence is repeated until B is equal to 21
and AL is negative. An exit is then made to the executive
routine (COMA). If an error is detected by the validity checks,
AU and AL will contain the parity patterns and an exit is made
to the display subroutine. With PROGRAM STOP 0 set, CO will
contain the function code, and the error may be evaluated.
Upon return to this subroutine (TS54), an exit is made to the
executive routine (COMA) to check for program continuance or the
recycling of this subroutine.

SPECIFICATION SYMBOL
SB-10163

TITLE: TS54

INPUT PARAMETERS (Listed Sequentially):
COMA

TEST PATTERNS
TPAT   777777
TPAB6+1   000021

OUTPUT PARAMETERS (Listed Sequentially):

BUFF1

BUFF2

BUFF3

BUFF4

TFX

ABNORMAL EXITS (Listed Sequentially):

**NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):**

COMA (EXEC)

TSDIS - Error Display

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:
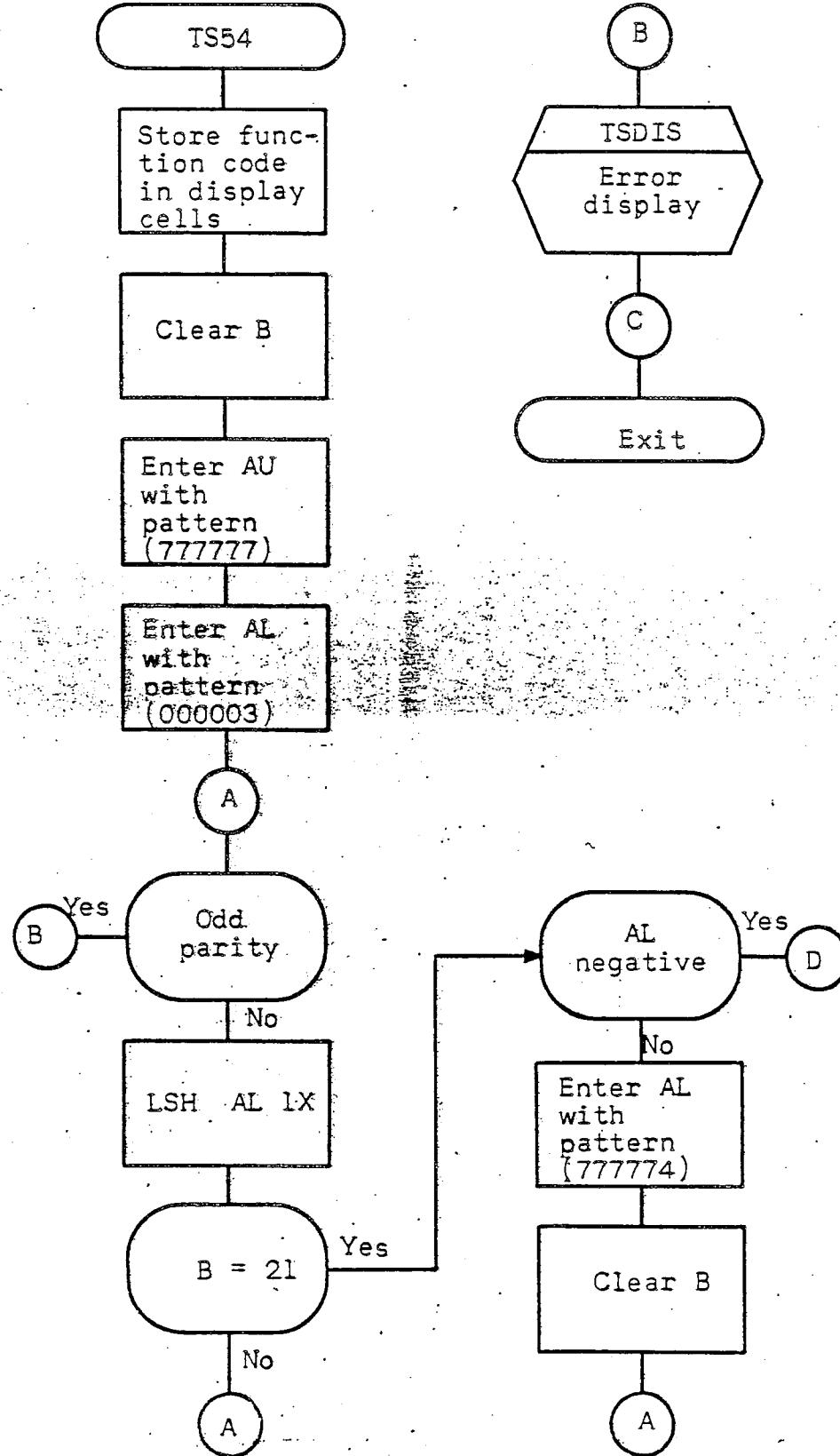
ERROR DISPLAY - PROGRAM STOP 0 set
                parity pattern in AU
                parity pattern in AL
   function code (505400) in CO
                PROGRAM SKIP 4 - set for console display only
                                 not set for error typeout (Function
                                 code 5054).
                PROGRAM SKIP 0 not set - continue test; if set -
                                         recycle subroutine (TS54)
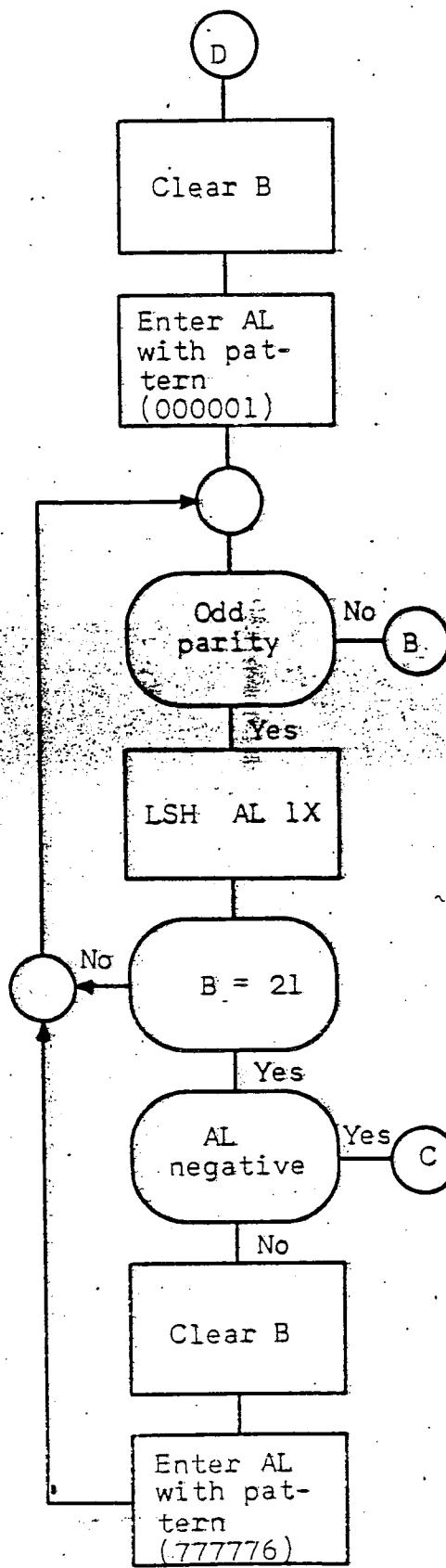
```
        ( TS54 )                          ( B )
           |                               |
  +----------------+              +------------------+
  | Store func-    |              |     TSDIS        |
  | tion code      |              |     Error        |
  | in display     |              |     display      |
  | cells          |              +------------------+
  +----------------+                      |
           |                             ( C )
  +----------------+                      |
  |                |              +------------------+
  |   Clear B      |              (      Exit        )
  |                |              +------------------+
  +----------------+
           |
  +----------------+
  | Enter AU       |
  | with           |
  | pattern        |
  | (777777)       |
  +----------------+
           |
  +----------------+
  | Enter AL       |
  | with           |
  | pattern        |
  | (000003)       |
  +----------------+
           |
         ( A )
           |
  Yes    Odd                            AL        Yes
( B )----parity                       negative --------( D )
           |                             |
          No                            No
  +----------------+              +----------------+
  |                |              | Enter AL       |
  |  LSH  AL 1X    |              | with           |
  |                |              | pattern        |
  +----------------+              | (777774)       |
           |                      +----------------+
         B = 21 ---Yes--------->          |
           |                      +----------------+
          No                      |                |
         ( A )                    |   Clear B      |
                                  |                |
                                  +----------------+
                                          |
                                        ( A )
```

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```
                    ( D )
                      |
              +---------------+
              |   Clear B     |
              +---------------+
                      |
              +---------------+
              |  Enter AL     |
              |  with pat-    |
              |  tern         |
              |  (000001)     |
              +---------------+
                      |
                     ( )
                      |
                 (  Odd   )  No
                 ( parity ) ------ ( B )
                      |
                     Yes
              +---------------+
              |  LSH  AL 1X   |
              +---------------+
                      |
      No           (       )
     ( ) --------- ( B = 21 )
                      |
                     Yes
                 (   AL    )  Yes
                 (negative) ------ ( C )
                      |
                     No
              +---------------+
              |   Clear B     |
              +---------------+
                      |
              +---------------+
              |  Enter AL     |
              |  with pat-    |
              |  tern         |
              |  (777776)     |
              +---------------+
```

TS54:   SKIP ON ODD PARITY
        505400

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PROGRAM DATA PAGE

SPECIFICATION SYMBOL
SB-10163

TITLE: TF55 - INDIRECT JUMP (55xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF55   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: PMC modified by TLR   DATE: 8 December 1967

NUMBER OF L_4 OUTPUT INSTRUCTIONS: 21

DESCRIPTION:

This subroutine checks the Indirect Jump command. The subroutine consists of an IJP to a series of Indirect Jumps, and if all jump commands are completed and correct, an exit is made to the executive routine (COMA). If an error occurs, an exit is made to the display subroutine, where with PROGRAM STOP 0 set, CO will contain the function code, and the error may be evaluated. (No display in AU or AL). Upon return to this subroutine (TF55) an exit is made to the executive routine (COMA) to check for program continuance or the recycling of this sburoutine.

A-1974

SPECIFICATION SYMBOL
SB-10163

TITLE: TF55

INPUT PARAMETERS (Listed Sequentially):
  COMA

TEST PATTERNS
TPAT1   000000

OUTPUT PARAMETERS (Listed Sequentially):
  BUFF1

  BUFF2

  TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):
  COMA (EXEC)
 TFDIS - Error Display

SYSTEM DATA REFERENCES:
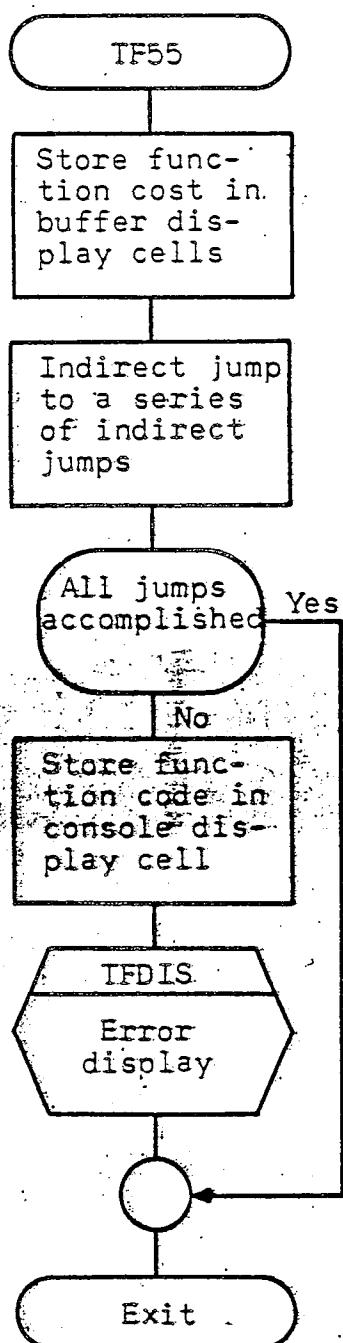
ALARMS AND/OR REMARKS:
  ERROR DISPLAY - PROGRAM STOP 0 set
                  (no display in AU or AL)
                  function code (55xxxx) in CO
                  PROGRAM SKIP 4 - set for console error display only
                                   not set for error typeout (Function
                                   Code 55)
                  PROGRAM SKIP 0 not set - continue test; if set -
                                           recycle subroutine (TF55)

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SPECIFICATION SHEET

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SPECIFICATION SYMBOL
SB-10163

```
                    ╭──────────────╮
                    │     TF55      │
                    ╰──────────────╯
                           │
                    ┌──────────────┐
                    │ Store func-  │
                    │ tion cost in │
                    │ buffer dis-  │
                    │ play cells   │
                    └──────────────┘
                           │
                    ┌──────────────┐
                    │ Indirect jump│
                    │ to a series  │
                    │ of indirect  │
                    │ jumps        │
                    └──────────────┘
                           │
                    ╭──────────────╮
                    │  All jumps   │── Yes ──┐
                    │ accomplished │         │
                    ╰──────────────╯         │
                          │ No               │
                    ┌──────────────┐         │
                    │ Store func-  │         │
                    │ tion code in │         │
                    │ console dis- │         │
                    │ play cell    │         │
                    └──────────────┘         │
                           │                 │
                    ⬡──────────────⬡         │
                    │    TFDIS      │         │
                    │    Error      │         │
                    │   display     │         │
                    ⬡──────────────⬡         │
                           │                 │
                          (○)◄───────────────┘
                           │
                    ╭──────────────╮
                    │    Exit       │
                    ╰──────────────╯
```

TF55:   INDIRECT JUMP

SPECIFICATION SYMBOL
SB-10163

TITLE: TS55- SKIP ON EVEN PARITY (505500)

DECK IDENTIFIER: FACT

CS-1 LABEL: TS55   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: FWS modified by TLR   DATE: 8 December 1967

NUMBER OF L_4 OUTPUT INSTRUCTIONS: 36

DESCRIPTION:

This subroutine checks the Skip On Even Parity, command. It
first checks that no skip is executed with odd parity, and
secondly, that a skip is executed with even parity. AU is
entered with a test-pattern constant and AL with an odd-parity
constant. SKPEVN command is executed and validity is checked.
If correct, (odd parity) no skip is executed and AL is left
shifted one place. This process is repeated until B is equal
to 21. If AL is positive, a different odd-parity constant is
entered into AL and the above sequence is repeated until B is
equal to 21 and AL is negative. AL is then entered with an even-
parity constant, and a SKPEVN executed. If correct, (even
parity) a skip is executed and AL is left shifted one place.
This process is repeated until B is equal to 21. If AL is
positive, a new even-parity constant is entered into AL, and
the above sequence is repeated until B is equal to 21 and AL is
negative. An exit is then made to the executive routine (COMA).
If an error is detected by any of the validity checks, an exit
is made to the display subroutine. AU and AL will contain the
parity patterns and if PROGRAM STOP 0 is set, CO will contain
the function code, and the error may be evaluated. Upon return
to this subroutine (TS55) an exit is made to the executive
routine (COMA) to check for program continuance or the recycling
of this subroutine.

A-1974

SPECIFICATION SYMBOL
SB-10163

TITLE: TS55

INPUT PARAMETERS (Listed Sequentially):
COMA

TEST PATTERNS
TPAT   777777
TPAB6+1   000021

OUTPUT PARAMETERS (Listed Sequentially):
BUFF1

BUFF2

BUFF3

BUFF4

TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA (EXEC)

TSDIS - Error Display

SYSTEM DATA REFERENCES:
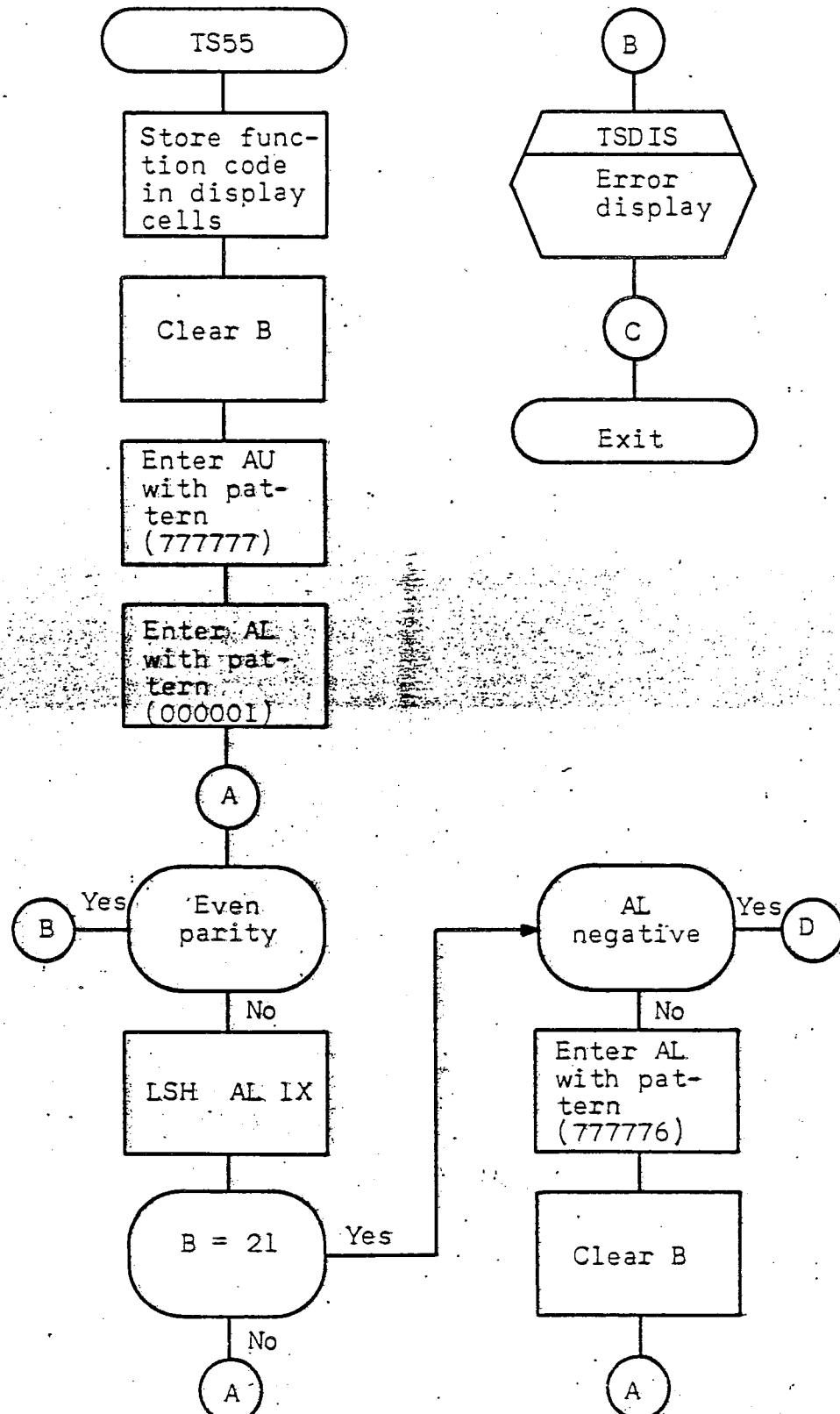
ALARMS AND/OR REMARKS:
ERROR DISPLAY - PROGRAM STOP 0 set
              parity pattern in AU
              parity pattern in AL
              function code (505500) in CO
              PROGRAM SKIP 4 - set for console error display only
                      not set for error typeout (Function
                      Code 5055)
              PROGRAM SKIP 0 not set - continue test; if set -
                      recycle subroutine (TS55)
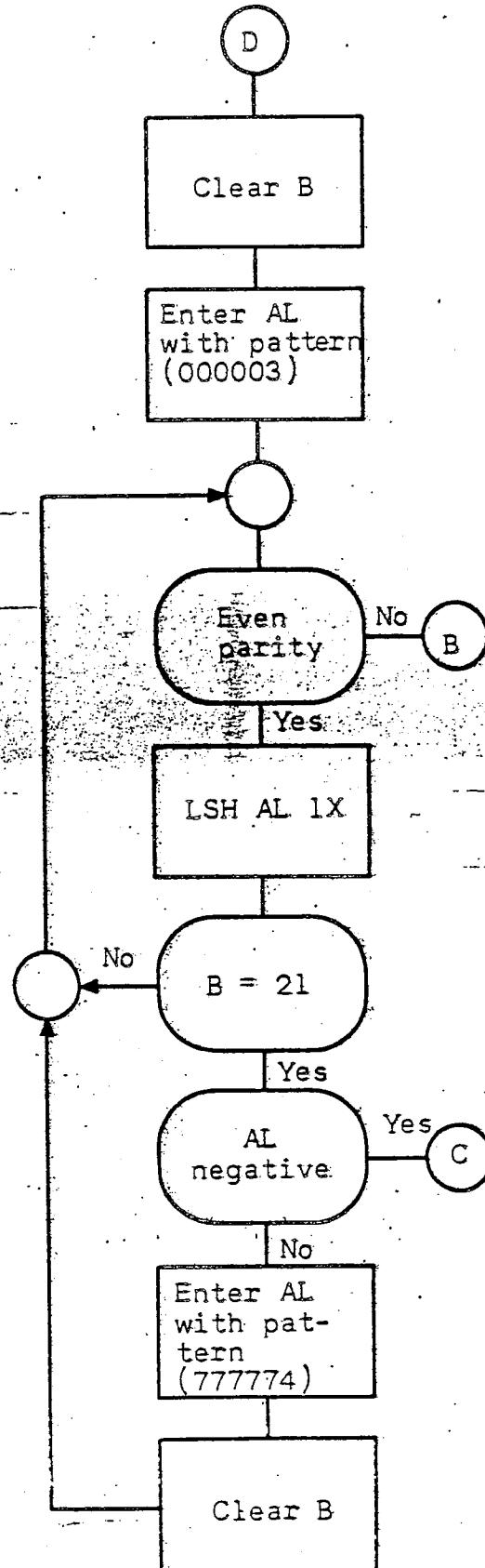
SPECIFICATION SYMBOL
SB-10163

```
        ( TS55 )                          ( B )

     +-------------+                  /---------------\
     | Store func- |                 /    TSDIS         \
     | tion code   |                |     Error          |
     | in display  |                |     display        |
     | cells       |                 \                  /
     +-------------+                  \---------------/
            |                                |
     +-------------+                       ( C )
     |   Clear B   |                         |
     +-------------+                  /-------------\
            |                         (    Exit      )
     +-------------+                  \-------------/
     | Enter AU    |
     | with pat-   |
     | tern        |
     | (777777)    |
     +-------------+
            |
     +-------------+
     | Enter AL    |
     | with pat-   |
     | tern        |
     | (000001)    |
     +-------------+
            |
          ( A )
            |
 Yes    /  Even  \                      /   AL    \  Yes
(B)----<   parity >            +------>(  negative  )----(D)
         \       /             |        \         /
            | No               |            | No
     +-------------+           |     +-------------+
     |             |           |     | Enter AL    |
     | LSH  AL IX  |           |     | with pat-   |
     |             |           |     | tern        |
     +-------------+           |     | (777776)    |
            |                  |     +-------------+
       /         \   Yes       |            |
      (  B = 21   )------------+     +-------------+
       \         /                   |             |
            | No                     |   Clear B   |
          ( A )                      +-------------+
                                            |
                                          ( A )
```

TS55:   SKIP ON EVEN PARITY   505500

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SPECIFICATION SYMBOL
SB-10163

(D)

Clear B

Enter AL
with pattern
(000003)

○

(Even parity) No ──> (B)

Yes

LSH AL 1X

(B = 21) No ──> ○

Yes

(AL negative) Yes ──> (C)

No

Enter AL
with pat-
tern
(777774)

Clear B

TS55: SKIP ON EVEN
PARITY 505500
(continued)

SPECIFICATION SYMBOL
SB-10163

TITLE: TF56 - B SKIP (56xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF56   KEY: _____   IS LABEL DUPLICATE? No

PROGRAMMER: PMC modified by TLR   DATE: 8 December 1967

NUMBER OF L₄ OUTPUT INSTRUCTIONS: 41

DESCRIPTION:

This subroutine checks the B Skip command. First, B is cleared.
Then, a BSK command is executed. If B is not equal to a test-
pattern constant, a jump back to the B Skip command is executed.
This process is repeated until B is equal to the test-pattern constant.
Validity is checked by entering AL with the contents of B and AU
with the correct test pattern. A compare of AL and an associated
test pattern is executed; if correct, B is cleared and the above
sequence is repeated using a different, test-pattern constant until
all BSK commands have been completed. An exit is then made to the
executive routine (COMA). If an error is detected by any of the
validity checks, AU will contain the correct pattern, AL the in-
correct pattern, and an exit is made to the display subroutine.
If PROGRAM STOP 0 is set, CO will contain the function code and
the error may be evaluated. Upon return to this subroutine (TF56)
an exit is made to the executive routine (COMA) to check for
continuing the test or recycling this subroutine (TF56).

SPECIFICATION SYMBOL
SB-10163

TITLE: TF56

INPUT PARAMETERS (Listed Sequentially):
COMA

TEST PATTERNS	
TPAT5	007777
TPAT5+1	007777
TPAB2+1	000505
TPAS3	000002
TPAK	002020

OUTPUT PARAMETERS (Listed Sequentially):
BUFF1
BUFF2
TEX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA (EXEC)
TFDIS - Error Display

SYSTEM DATA REFERENCES:
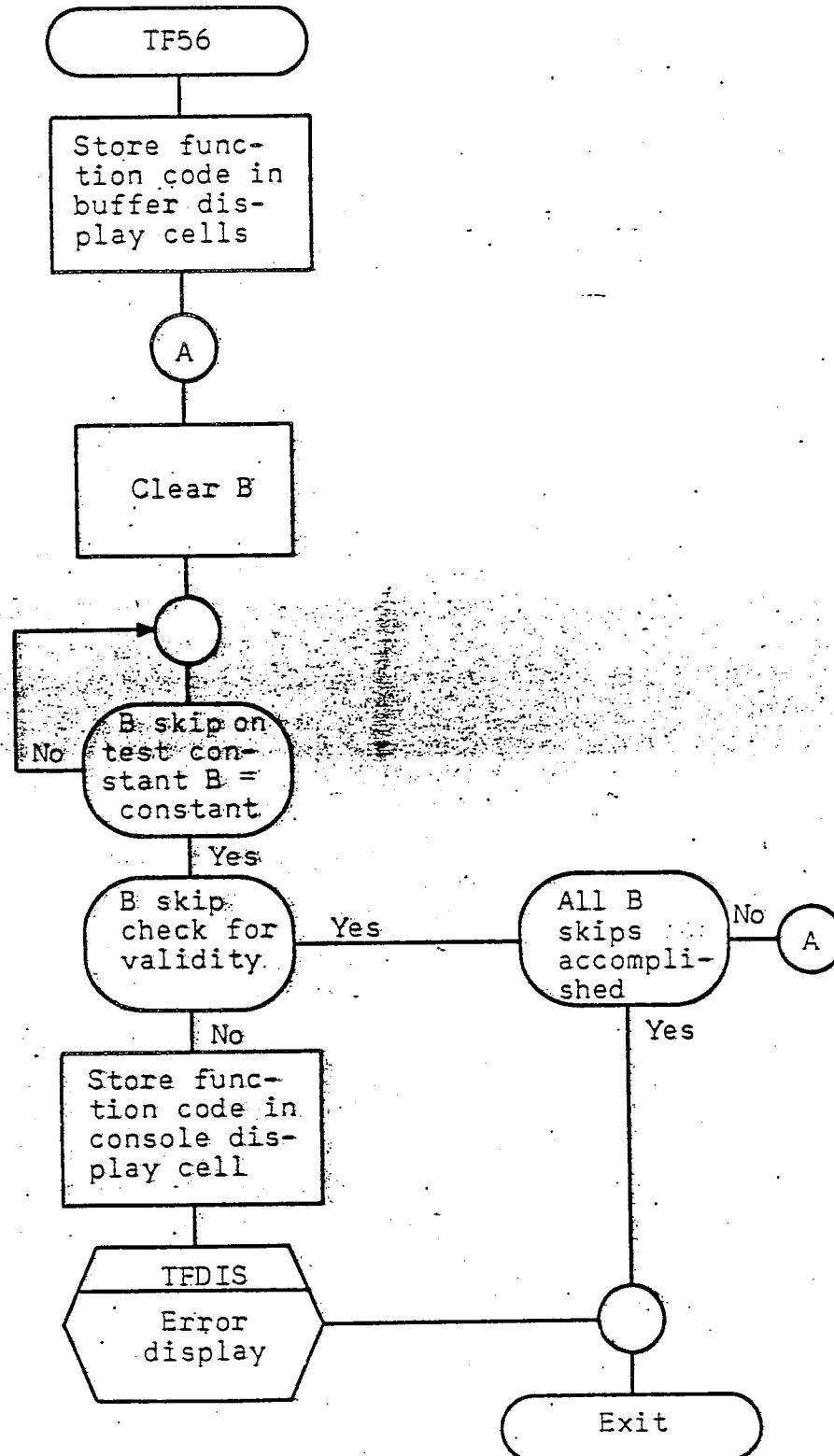
ALARMS AND/OR REMARKS:
ERROR DISPLAY -   PROGRAM STOP 0 set
                  correct information in AU
                  incorrect information in AL
                  function code (56xxxx) in CO
                  PROGRAM SKIP 4 - set for console error display only
                                   not set for error typeout (Function
                                   Code)
                  PROGRAM SKIP 0 not set to continue test; set to
                  recycle subroutine (TF56)

```
                  ( TF56 )
                     │
          ┌──────────────────────┐
          │  Store func-         │
          │  tion code in        │
          │  buffer dis-         │
          │  play cells          │
          └──────────────────────┘
                     │
                    (A)
                     │
          ┌──────────────────────┐
          │                      │
          │      Clear B         │
          │                      │
          └──────────────────────┘
                     │
          ┌─────────(○)
          │          │
          │     ( B skip on )
      No  │     ( test con-  )
          └─────( stant B =   )
                ( constant    )
                     │ Yes
              ( B skip )              ( All B )       No
              ( check for )  Yes      ( skips  )────(A)
              ( validity )───────────( accompli- )
                     │                ( shed    )
                     │ No                 │ Yes
          ┌──────────────────────┐
          │  Store func-         │
          │  tion code in        │
          │  console dis-        │
          │  play cell           │
          └──────────────────────┘
                     │
            ╱─────────────╲
           │    TFDIS      │
           │   Error       │────────(○)
           │   display     │         │
            ╲─────────────╱          │
                                ( Exit )
```

TF56: B SKIP

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PROGRAM DATA PAGE

SPECIFICATION SYMBOL
SB-10163

TITLE: TF57 - INDEX SKIP (57xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF57   KEY: _____   IS LABEL DUPLICATE? No

PROGRAMMER: PMC modified by TLR   DATE: 8 December 1967

NUMBER OF L₄ OUTPUT INSTRUCTIONS: 38

DESCRIPTION:

This subroutine checks the Index Skip command. AL is entered with a test-pattern constant and stored in the Index Cell. An ISK command is executed, (Y-1), and repeated until Y (Index Call) is equal to 0. Validity is checked by entering AL with the Index Call contents, if AL is equal to zero the execution is proper and the next, Sequential, test pattern is entered in AL and stored in the Index Cell. The above sequence is repeated until all Index Skip patterns have been completed, and then an exit is made to the executive routine (COMA). If an error is detected by any of the validity checks, AU will contain the correct pattern, AL the incorrect pattern, and an exit made to the display subroutine. With PROGRAM STOP 0 set, CO will contain the function code and the error may be evaluated. Upon return to this subroutine (TF57) an exit is made to the executive routine (COMA) to check for continuing the test or recycling this subroutine.

TITLE: TF57

INPUT PARAMETERS (Listed Sequentially):
COMA

	TEST PATTERNS	
	TPAT	777777
	TPAT1	000000
	TPAT5	007777
	TPAS1	000017
	TPAK6	002525
	TPAR	INDEX CELL

OUTPUT PARAMETERS (Listed Sequentially):
BUFF1
BUFF2
TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):
COMA - (EXEC)
TFDIS - Error Display
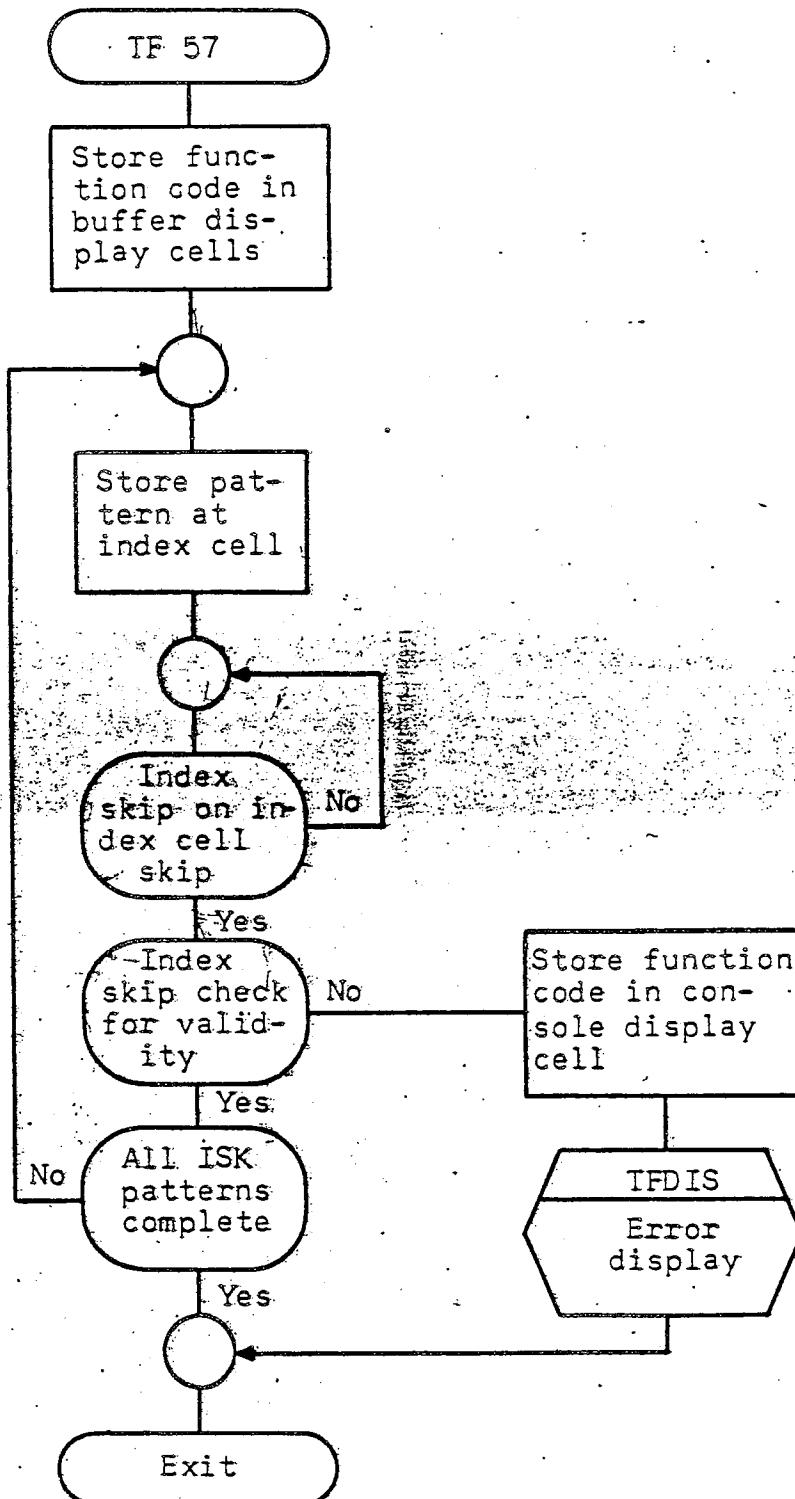
SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:

ERROR DISPLAY

PROGRAM STOP 0 - correct information in AU
incorrect information in AL
function code (57xxxx) in CO

PROGRAM SKIP 4 - set for console error display only
not set for error typeout (Function
Code 57)

PROGRAM SKIP 0 - not set to coninue test
set - recycle subroutine (TF57)

```
                    ( TF 57 )
                        │
            ┌───────────────────────┐
            │ Store func-           │
            │ tion code in          │
            │ buffer dis-           │
            │ play cells            │
            └───────────────────────┘
                        │
                       ( ○ )◄───────────┐
                        │               │
            ┌───────────────────────┐   │
            │ Store pat-            │   │
            │ tern at               │   │
            │ index cell            │   │
            └───────────────────────┘   │
                        │               │
                       ( ○ )◄────────┐  │
                        │            │  │
               ┌──────────────┐  No  │  │
              (  Index         )─────┘  │
              ( skip on in-    )        │
              ( dex cell       )        │
              (  skip          )        │
               └──────────────┘         │
                        │ Yes           │
               ┌──────────────┐     ┌───────────────────┐
              (  Index         ) No  │ Store function    │
              ( skip check     )─────│ code in con-      │
              ( for valid-     )     │ sole display      │
              (  ity           )     │ cell              │
               └──────────────┘     └───────────────────┘
                        │ Yes                 │
               ┌──────────────┐     ┌───────────────────┐
              (  All ISK       )     │     TFDIS         │
          No  ( patterns       )     │                   │
          ────( complete       )     │     Error         │
               └──────────────┘     │     display       │
                        │ Yes        └───────────────────┘
                       ( ○ )◄────────────────┘
                        │
                   ( Exit )
```

TF57:   INDEX SKIP

SPECIFICATION SYMBOL
SB-10163

TITLE: TF60 - JUMP A UPPER EQUAL ZERO TO Y (60xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF60   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: FWS modified by TLR   DATE: 8 December 1967

NUMBER OF L₄ OUTPUT INSTRUCTIONS: 18

DESCRIPTION:

This subroutine checks the performance of the Jump A Upper Equal Zero to Y command. A shift count is set up and AU is cleared. A JPAUZ command is initiated and executed. Validity is checked by entering AU with a test-pattern constant and attempting another 60 command. At this time AU is not equal to zero, therefore, no jump should take place. If no jump takes place, AU is left shifted one place and an Index Skip back to the JPAUZ command takes place. The subroutine repeats this process until the Index Skip indicates the completion of the 22nd AU left shift without an error. At this time the subroutine exits to the executive routine (COMA). If any of the validity checks detect an error, AU will contain the shifted pattern, and the routine exits to the display routine. If PROGRAM STOP 0 is set, CO will contain the function code, and the error may be evaluated. AL will not contain an error display. Upon return to this subroutine (TF60), an exit is made to the executive routine (COMA) to check for continuing the program or the recycling of this subroutine.

TITLE: TF60

INPUT PARAMETERS (Listed Sequentially):

COMA

TEST PATTERNS
TPAT1	000000
TPAB1	000001
TSH	000022

OUTPUT PARAMETERS (Listed Sequentially):
BUFF1

BUFF2

TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA (EXEC)

TSDIS - Error Display
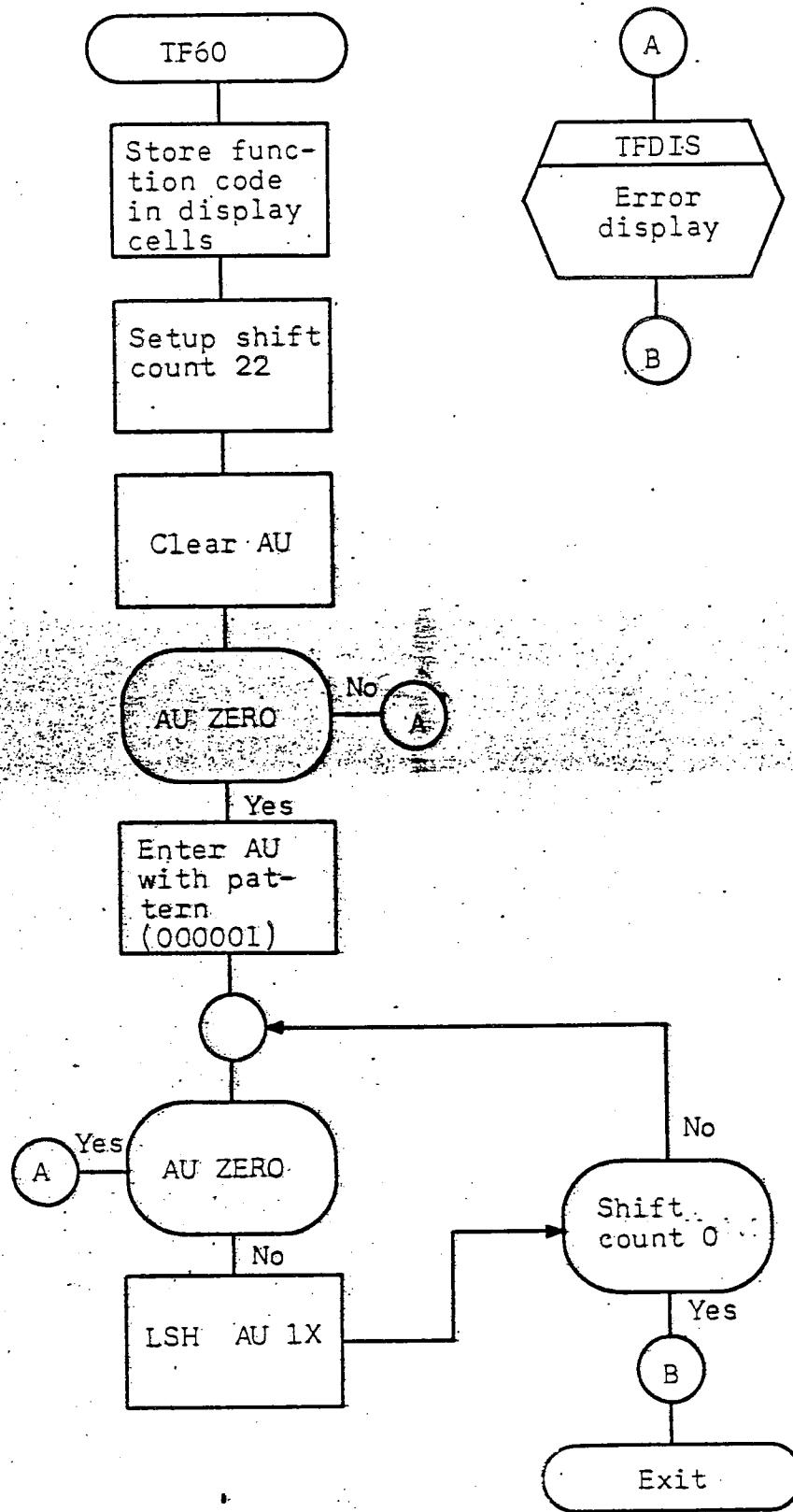
SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:
ERROR DISPLAY

        PROGRAM STOP 0 - shifted pattern in AU
                         no display in AL
                         function code (60xxxx) in CO
   PROGRAM SKIP 4 - set for console error display only
                         not set for error typeout (Function
                         Code 60)
        PROGRAM SKIP 0 - not set to continue test
                         set to recycle subroutine (TF60)

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SPECIFICATION SHEET

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SPECIFICATION SYMBOL
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```
        ( TF60 )                          ( A )
           |                               |
  +-----------------+            +---------------------+
  | Store func-     |            |      TFDIS          |
  | tion code       |            |  Error              |
  | in display      |            |  display            |
  | cells           |            +---------------------+
  +-----------------+                      |
           |                              ( B )
  +-----------------+
  | Setup shift     |
  | count 22        |
  +-----------------+
           |
  +-----------------+
  |                 |
  | Clear AU        |
  |                 |
  +-----------------+
           |
      ( AU ZERO )---- No ----( A )
           |
          Yes
  +-----------------+
  | Enter AU        |
  | with pat-       |
  | tern            |
  | (000001)        |
  +-----------------+
           |
          ( O )<--------------------------+
           |                              |
  ( A )-- Yes --( AU ZERO )              No
                    |              +------------------+
                   No              | Shift            |
  +-----------------+              | count 0          |
  | LSH  AU 1X      |------------->+------------------+
  |                 |                      |
  +-----------------+                     Yes
                                         ( B )
                                          |
                                    (  Exit  )
```

        TF60:   JUMP AU ZERO TO Y   60 XXXX
                                         ‾Y‾

SPECIFICATION SYMBOL
SB-10163

TITLE: TS60 - ROUND AU (506000)

DECK IDENTIFIER: FACT

CS-1 LABEL: TS60   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: FWS modified by TLR   DATE: 8 December 1967

NUMBER OF L_4 OUTPUT INSTRUCTIONS: 31

DESCRIPTION:

This subroutine checks the performance of the Round AU command.
AU and AL are entered with two, different, test-pattern constants.
A RND command is then executed. Validity is then checked by
comparing the result to the proper test pattern. If correct,
AU is entered with a different, test-pattern constant. Another
RND command is executed and validity is checked again. This
sequence is repeated again, and then an exit is made to the
executive routine (COMA). If an error is detected by the validity
checks, AU will contain the correct pattern, AL the incorrect
pattern, and an exit is made to the display subroutine. With
PROGRAM STOP 0 set, CO will contain the function code and the
error may be evaluated. Upon return to this subroutine (TS60)
an exit is made to the executive routine (COMA) in order to
determine whether to continue with the program or recycle this
subroutine.

| SPECIFICATION SYMBOL |
| SB-10163 |

TITLE: TS60

INPUT PARAMETERS (Listed Sequentially):
COMA

TEST PATTERNS	
TPAT	777777
TPAT1	000000
TPAB2	400000
TCO3	377777

OUTPUT PARAMETERS (Listed Sequentially):

BUFF1

BUFF2

BUFF3

BUFF4

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA (EXEC)

ISDIS - Error Display
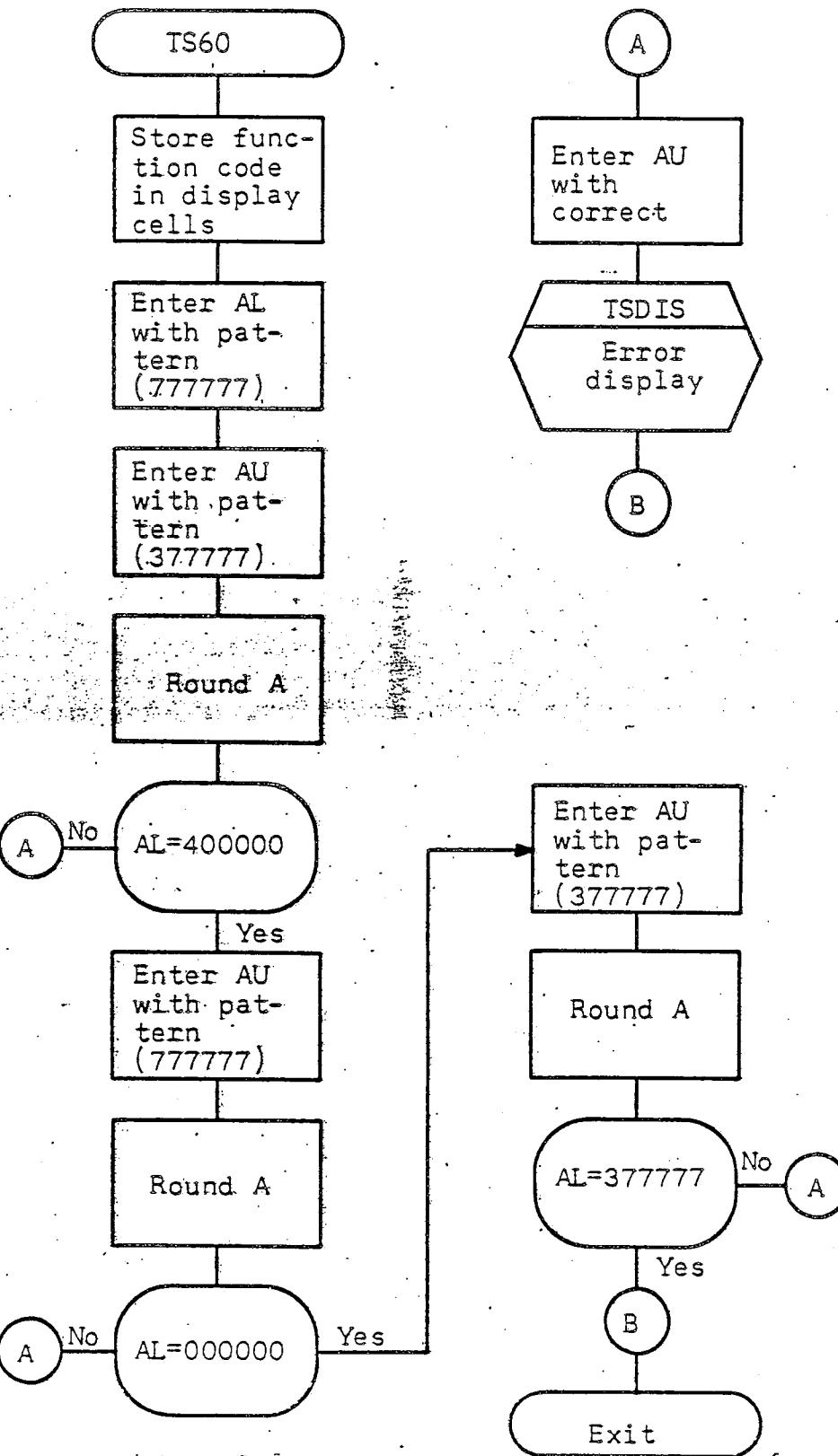
SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:
ERROR DISPLAY   PROGRAM STOP 0 set
                 correct pattern in AU
                 incorrect pattern in AL
                 function code (506000) in CO

                 PROGRAM SKIP 4 - set for console error display only
                                  not set for error typeout (Function
                                  Code 5060)

                 PROGRAM SKIP 0 not set - continue test; if set -
                                  recycle subroutine (TS60)

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TS60

Store function code in display cells

Enter AL with pattern (777777)

Enter AU with pattern (377777)

Round A

AL=400000 — No → A
Yes

Enter AU with pattern (777777)

Round A

AL=000000 — No → A
Yes →

A

Enter AU with correct

TSDIS
Error display

B

Enter AU with pattern (377777)

Round A

AL=377777 — No → A
Yes

B

Exit

TS60:   Round A   506000

SPECIFICATION SYMBOL
SB-10163

TITLE: TF61 - JUMP IF A LOWER IS EQUAL TO ZERO (61xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF61   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: FWS modified by TLR   DATE: 8 December 1967

NUMBER OF L_4 OUTPUT INSTRUCTIONS: 18

DESCRIPTION:

This subroutine checks the performance of the Jump If AL Is Equal to Zero command. A shift count is set up and AL is cleared. A JPALZ command is initiated and executed. Validity is checked by entering AL with a test-pattern constant and attempting another JPALZ command. At this time AL is not equal to zero, therefore, no jump should take place. If no jump takes place, AL is left shifted one place and an Index Skip back to the Jump if AL is zero command takes place. The subroutine repeats this process until the Index Skip indicates the completion of the 22nd AL left shift without an error. At this time the subroutine exits to the executive routine (COMA). If any of the validity checks detect an error, AL will contain the shifted pattern, and an exit is made to the display subroutine. If PROGRAM STOP 0 is set, CO will contain the function code, and the error may be evaluated. AL will not contain an error display. Upon return to this subroutine (TF61), an exit is made to the executive routine (COMA) to check for continuing the program or the recycling of this subroutine.

SPECIFICATION SYMBOL
SB-10163

TITLE: TF61

INPUT PARAMETERS (Listed Sequentially):

COMA

TEST PATTERN
TSH   000022

OUTPUT PARAMETERS (Listed Sequentially):

BUFF1
BUFF2
TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA (EXEC)

TFDIS — Error Display

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:

ERROR DISPLAY — PROGRAM STOP 0 set
                no display in AU
                shifted pattern in AL
                function code (61xxxx) in CO
                PROGRAM SKIP 4 — set for console error display only
                             not set for error typeout (Function
                             Code 61)
                PROGRAM SKIP 0 not set — continue test; if set —
                             recycle subroutine (TF61)

A-1975

```
        ┌──────────────┐                    ( A )
        │     TF61     │
        └──────┬───────┘              ┌──────────────┐
               │                      │    TFDIS      │
        ┌──────┴───────┐              ├──────────────┤
        │ Store func-  │              │    Error      │
        │ tion code    │              │   display     │
        │ in display   │              └──────┬────────┘
        │ cells        │                     │
        └──────┬───────┘                   ( B )
        ┌──────┴───────┐
        │ Setup shift  │
        │ count 22     │
        └──────┬───────┘
        ┌──────┴───────┐
        │              │
        │  Clear AL    │
        │              │
        └──────┬───────┘
         ┌─────┴─────┐  No
        │  AL ZERO   ├──────( A )
         └─────┬─────┘
               │ Yes
        ┌──────┴───────┐
        │ Enter AL     │
        │ with pat-    │
        │ tern         │
        │ (000001)     │
        └──────┬───────┘
             ( ○ )◄──────────────────┐
               │                      │ No
        ┌──────┴─────┐          ┌─────┴──────┐
( A )─Yes┤  AL ZERO  │          │   Shift    │
        └──────┬─────┘          │  count 0   │
               │ No             └─────┬──────┘
        ┌──────┴───────┐              │ Yes
        │              │            ( B )
        │ LSH  AL 1X   ├──────┘       │
        │              │        ┌─────┴──────┐
        └──────────────┘        │   Exit     │
                                └────────────┘
```
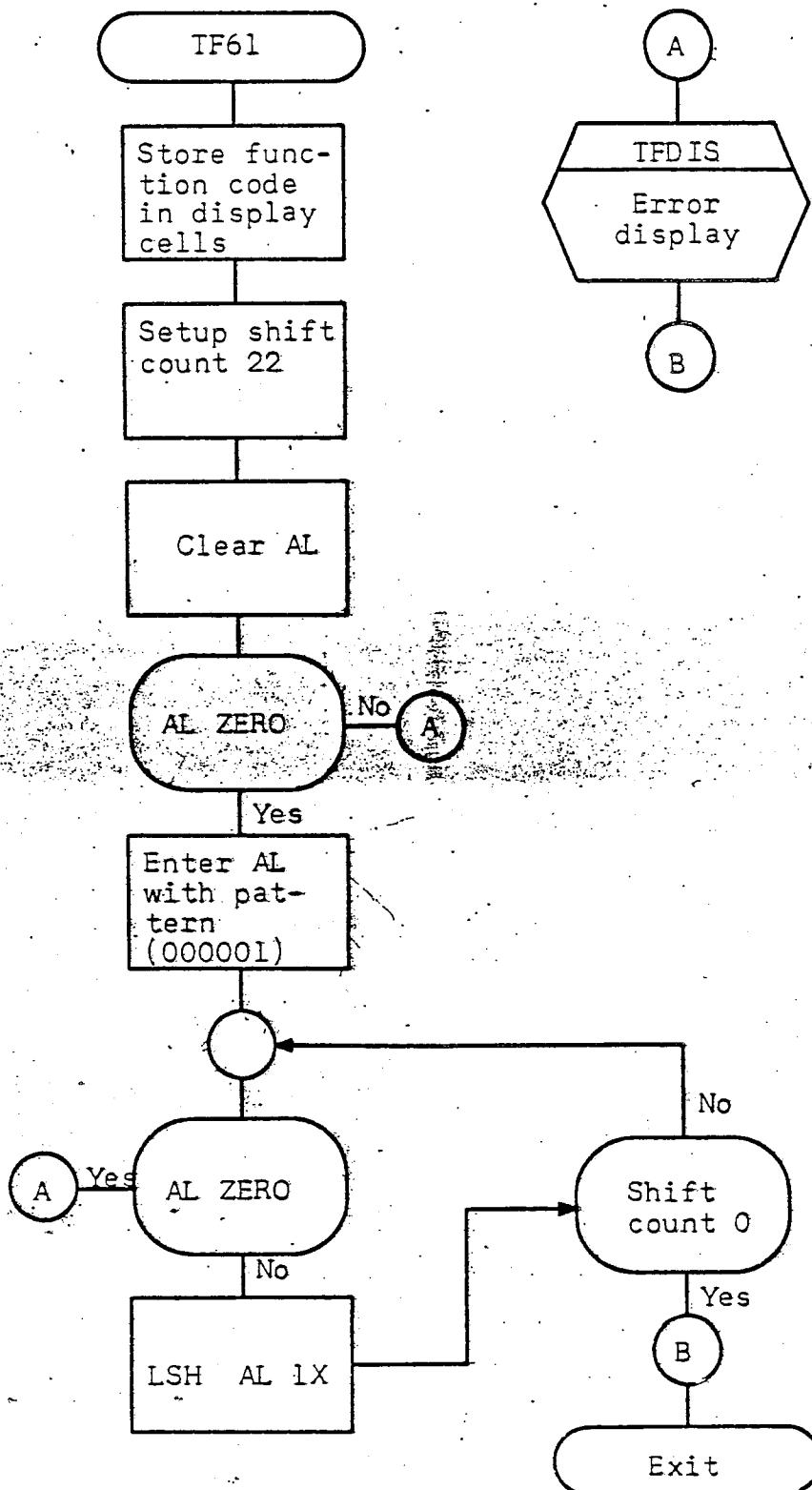
TF61: JUMP AL ZERO TO Y. 61$\underline{XXXX}$,
                              $\overline{Y}$

| SPECIFICATION SYMBOL |
| SB-10163 |

TITLE: TS61 - COMPLEMENT A LOWER (506100).

DECK IDENTIFIER: FACT

CS-1 LABEL: TS61   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: FWS modified by TLR   DATE: 8 December 1967

NUMBER OF L_4 OUTPUT INSTRUCTIONS: 23

DESCRIPTION:

This subroutine checks the Complement A Lower command. AL is entered with a constant. A CPAL command is executed and validity is checked by executing an ADD AL plus one. Another CPAL command is executed and validity is checked by comparing AL to a test-pattern constant. If equal, an exit is made to the executive routine (COMA). If an error is detected by the validity checks, the correct pattern is entered into AU, AL will contain the incorrect pattern, and an exit is made to the display subroutine, where with PROGRAM STOP 0 set, the function code is displayed in CO, and the error may be evaluated. Upon return to this sub-routine (TS61) an exit is made to the executive routine (COMA) to check for program continuance or the recycling of this subroutine.

SPECIFICATION SYMBOL
SB-10163

TITLE:___TS61_____

INPUT PARAMETERS (Listed Sequentially):

COMA

TEST PATTERNS
TPAT1   000000
TPAB1+1   777776

OUTPUT PARAMETERS (Listed Sequentially):

BUFF1

BUFF2

BUFF3

BUFF4

TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA (EXEC)

TSDIS — Error Display

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:
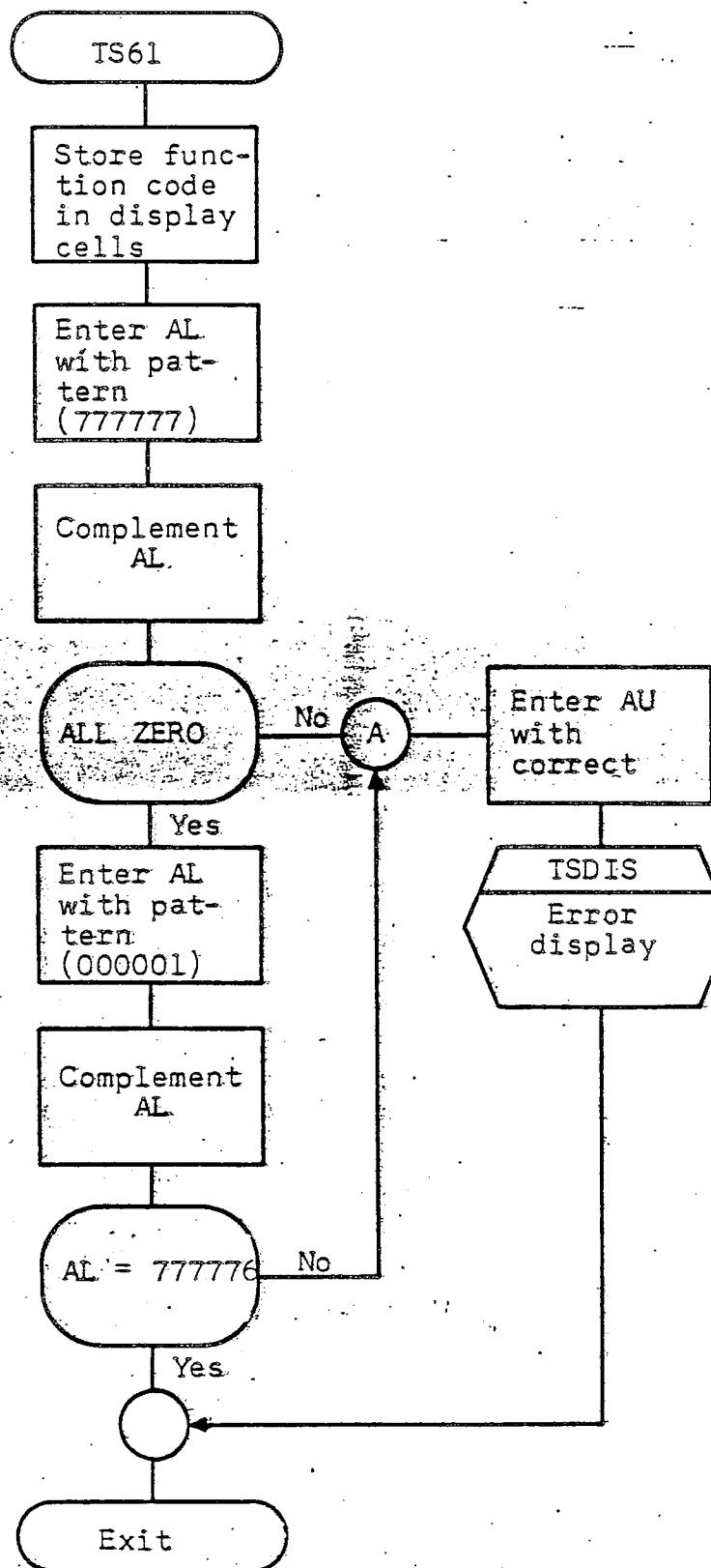
ERROR DISPLAY - PROGRAM STOP 0 set
               correct information in AU
               incorrect information in AL
               function code (506100) in CO
               PROGRAM SKIP 4 - set for console error display only
                                not set for error typeout (Function
                                Code 5061)
               PROGRAM SKIP 0 not set - continue test; if set -
                                recycle subroutine (TS61)

```
            ╭─────────────╮
            │    TS61      │
            ╰─────────────╯
                   │
            ┌─────────────┐
            │ Store func- │
            │ tion code   │
            │ in display  │
            │ cells       │
            └─────────────┘
                   │
            ┌─────────────┐
            │ Enter AL    │
            │ with pat-   │
            │ tern        │
            │ (777777)    │
            └─────────────┘
                   │
            ┌─────────────┐
            │ Complement  │
            │ AL          │
            └─────────────┘
                   │
            ╭─────────────╮   No    ╭───╮       ┌──────────┐
            │  ALL ZERO   │────────│ A │───────│ Enter AU │
            ╰─────────────╯         ╰───╯       │ with     │
                   │ Yes             ▲          │ correct  │
                   │                 │          └──────────┘
            ┌─────────────┐          │                │
            │ Enter AL    │          │          ┌──────────┐
            │ with pat-   │          │          │  TSDIS   │
            │ tern        │          │          ├──────────┤
            │ (000001)    │          │          │  Error   │
            └─────────────┘          │          │ display  │
                   │                 │          └──────────┘
            ┌─────────────┐          │                │
            │ Complement  │          │                │
            │ AL          │          │                │
            └─────────────┘          │                │
                   │                 │                │
            ╭─────────────╮   No     │                │
            │ AL = 777776 │──────────┘                │
            ╰─────────────╯                           │
                   │ Yes                              │
                   │                                   │
                  ╭─╮◄──────────────────────────────────┘
                  ╰─╯
                   │
            ╭─────────────╮
            │    Exit     │
            ╰─────────────╯
```

TS61: COMPLEMENT AL   506100

SPECIFICATION SYMBOL

SB-10163

TITLE: TC61 - JUMP COMPARE EQUAL TO Y (61xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TC61   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: FWS modified by TLR   DATE: 8 December 1967

NUMBER OF L$_4$ OUTPUT INSTRUCTIONS: 15

DESCRIPTION:

This subroutine checks the Jump Compare Equal to Y command. AL is entered with a test-pattern constant, and a compare of AL and an associated test-pattern is executed. A Jump if equal is executed and if proper the next pattern is entered into AL, compared to an associated test pattern, and another Jump if equal is executed. If correct an exit is made to the executive routine (COMA). If an error is detected due to an improper execution, AU will not contain a display, AL will contain the correct pattern, and an exit is made to the display subroutine, where with PROGRAM STOP 0 set, CO will contain the function code, and the error may be evaluated. Upon return to this subroutine (TC61) an exit is made to the executive routine (COMA) to check for program continuance or the recycling of this subroutine.

SPECIFICATION SYMBOL
SB-10163

TITLE: TC61

INPUT PARAMETERS (Listed Sequentially):

COMA

TEST PATTERNS
TPAT1	000000
TPAT1+1	000000
TPAT2	252525

OUTPUT PARAMETERS (Listed Sequentially):
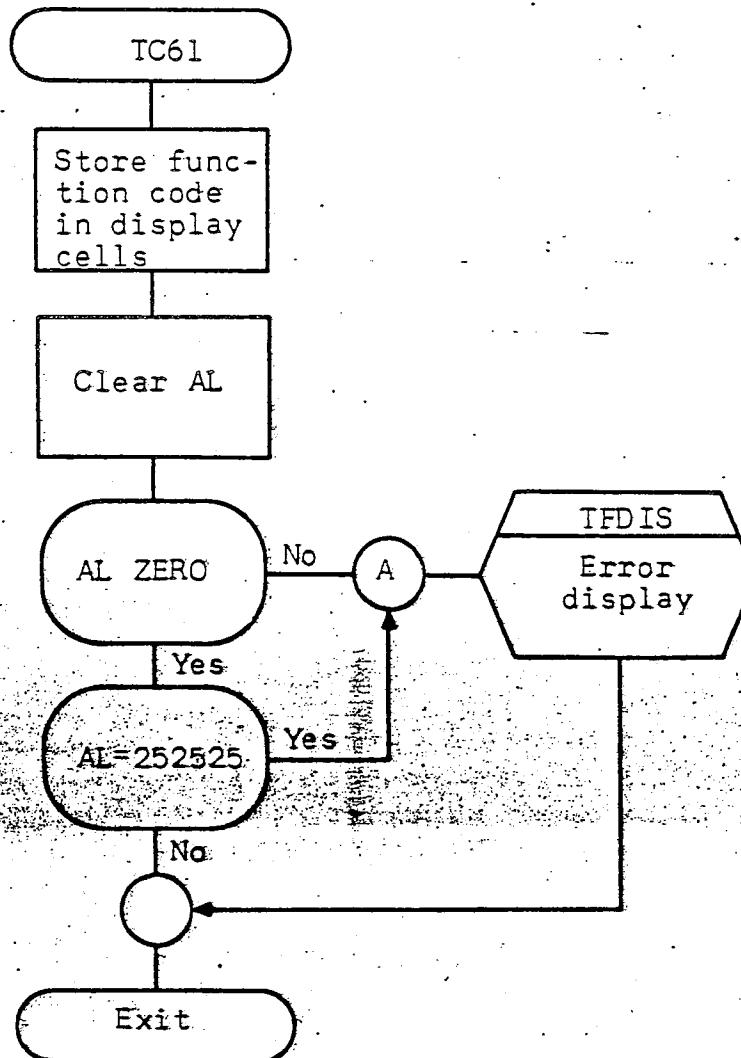
BUFF1

BUFF2

TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA (EXEC)

TFDIS - Error Display

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:

ERROR DISPLAY - PROGRAM STOP 0 set
no display in AU
correct pattern in AL
function code (61xxxx) in CO
PROGRAM SKIP 4 - set for console error display only
not set for error typeout (Function
Code 61)
PROGRAM SKIP 0 not set - continue test; if set -
recycle subroutine (TC61)

SPECIFICATION SYMBOL
SB-10163

```
            ╭─────────────╮
            │    TC61      │
            ╰─────────────╯
                   │
            ┌─────────────┐
            │ Store func- │
            │ tion code   │
            │ in display  │
            │ cells       │
            └─────────────┘
                   │
            ┌─────────────┐
            │             │
            │  Clear AL   │
            │             │
            └─────────────┘
                   │
            ╭─────────────╮       ┌───────────────┐
            │             │  No   │    TFDIS       │
            │  AL ZERO    │──────(A)──│ Error      │
            │             │       │    display     │
            ╰─────────────╯       └───────────────┘
                   │ Yes
            ╭─────────────╮
            │             │  Yes
            │ AL=252525   │──────────┘
            │             │
            ╰─────────────╯
                   │ No
                  (○)◄──────────────────┘
                   │
            ╭─────────────╮
            │    Exit      │
            ╰─────────────╯
```

TC61:   JUMP COMPARE EQ TO Y

61XXXX
     Y

SPECIFICATION SYMBOL
SB-10163

TITLE: TF62 - JUMP A UPPER NOT ZERO (62xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF62   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: FWS modified by TLR   DATE: 8 December 1967

NUMBER OF L$_4$ OUTPUT INSTRUCTIONS: 20

DESCRIPTION:

This subroutine checks the Jump A Upper Not Zero command. A shift count is set up and AU is entered with a test-pattern constant. A JPAUNZ command is executed and if proper AU is entered with the next test-pattern. Another JPAUNZ command is executed and if correct A Upper is left shifted one place followed by the JPAUNZ. The above is then repeated with an Index skip; the Index Skip is repeated until all patterns have been checked. If all executions are proper, an exit is made to the executive routine (COMA). If an error is detected AU will contain the shift pattern. AL will not contain a display, and an exit is made to the display subroutine. With PROGRAM STOP O set, CO will contain the function code and the error may be evaluated. Upon return to this subroutine (TF62) an exit is made to the executive routine to check for continuing the test or recycling this subroutine.

SPECIFICATION SYMBOL
SB-10163

TITLE: TF62

INPUT PARAMETERS (Listed Sequentially):

COMA

TEST PATTERNS
TPAT1   000000
TPAB1   000001
TSH   000022

OUTPUT PARAMETERS (Listed Sequentially):

BUFF1

BUFF2

TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA (EXEC)
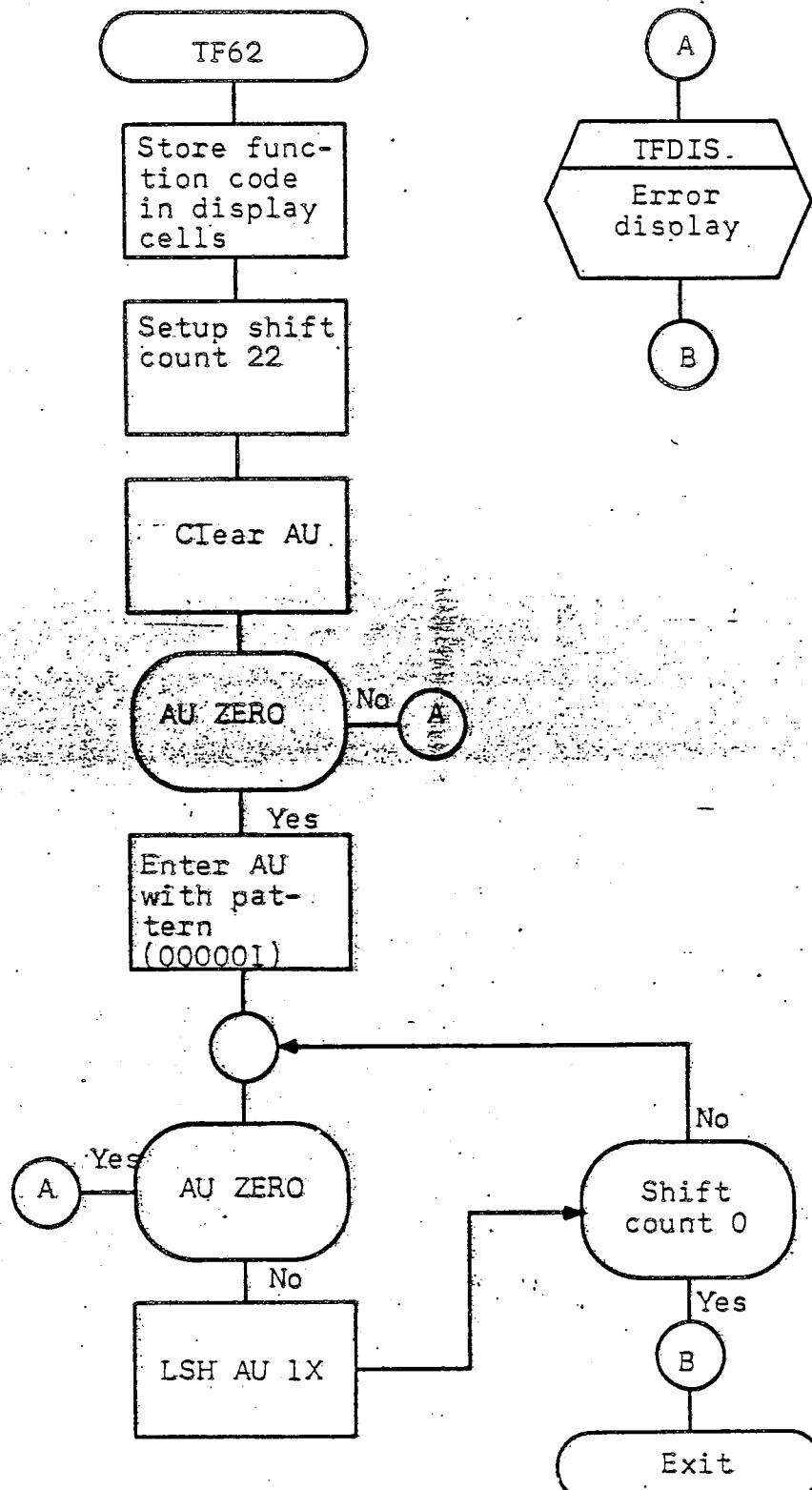
TFDIS — Error Display

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:

ERROR DISPLAY - PROGRAM STOP 0 set
                shifted pattern in AU
                no display in AL
   function code (62xxxx) in CO
                PROGRAM SKIP 4 - set for console error display only
                                 not set for error typeout (Function
                                 Code 62)
                PROGRAM SKIP 0 - not set to continue test
                                 set to recycle subroutine (TF62)

| SPECIFICATION SYMBOL |
| SB-10163 |

```
        ( TF62 )                          ( A )
           │                               │
  ┌─────────────────┐             ┌─────────────────┐
  │ Store func-     │             │     TFDIS.       │
  │ tion code       │             ├─────────────────┤
  │ in display      │             │     Error        │
  │ cells           │             │    display       │
  └─────────────────┘             └─────────────────┘
           │                               │
  ┌─────────────────┐                    ( B )
  │ Setup shift     │
  │ count 22        │
  │                 │
  └─────────────────┘
           │
  ┌─────────────────┐
  │                 │
  │   Clear AU      │
  │                 │
  └─────────────────┘
           │
       ( AU ZERO ) ──No── ( A )
           │
          Yes
  ┌─────────────────┐
  │ Enter AU        │
  │ with pat-       │
  │ tern            │
  │ (000001)        │
  └─────────────────┘
           │
          ( )◄─────────────────────────┐
           │                           │
 ( A )──Yes──( AU ZERO )      No──( Shift )
                 │                │ count 0 │
                No                │  ──Yes── ( B )
  ┌─────────────────┐                         │
  │                 │──────────────►        ( Exit )
  │  LSH AU 1X      │
  │                 │
  └─────────────────┘
```

TF62:   JUMP AU NOT ZERO TO Y   62XXXXX
                                      Y

SPECIFICATION SYMBOL
SB-10163

TITLE: TS62 - COMPLEMENT A UPPER (506200)

DECK IDENTIFIER: FACT

CS-1 LABEL: TS62 _____ KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: FWS modified by TLR _____ DATE: 8 December 1967

NUMBER OF L_4 OUTPUT INSTRUCTIONS: _____ 23 _____

DESCRIPTION:

This subroutine checks the Complement A Upper command. AU is
entered with a test-pattern and a CPAU command is executed. If
AU is equal to zero the execution was proper and AU is stored
with a different test pattern. Another CPAU command is executed
and validity is checked by entering AL with an associated test
pattern, and executing a compare mask. If the CPAU command
executions are proper, an exit is made to the executive routine
(COMA). If an error is detected AU will contain the incorrect
pattern, AL the correct pattern, and an exit is made to the
display subroutine. With PROGRAM STOP Q set, CO will contain
the function code, and the error may be evaluated. Upon return
to this subroutine (TS62) an exit is made to the executive
routine to check for program continuance or the recycling of this
subroutine.

SPECIFICATION SYMBOL
SB-10163

TITLE: TS62

INPUT PARAMETERS (Listed Sequentially):
COMA

TEST PATTERNS
TPAT   777777
TPAB1   000001

OUTPUT PARAMETERS (Listed Sequentially):

BUFF1

BUFF2

BUFF3

BUFF4

TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA (EXEC)

TSDIS - Error Display

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:
ERROR DISPLAY - PROGRAM STOP set
      incorrect information in AU
      correct information in AL
      function code (506200) in CO
      PROGRAM SKIP 4 - set for console error display only
           not set for error typeout (Function
           Code 5062)
      PROGRAM SKIP 0 not set - continue test; if set -
           recycle subroutine (TS62)
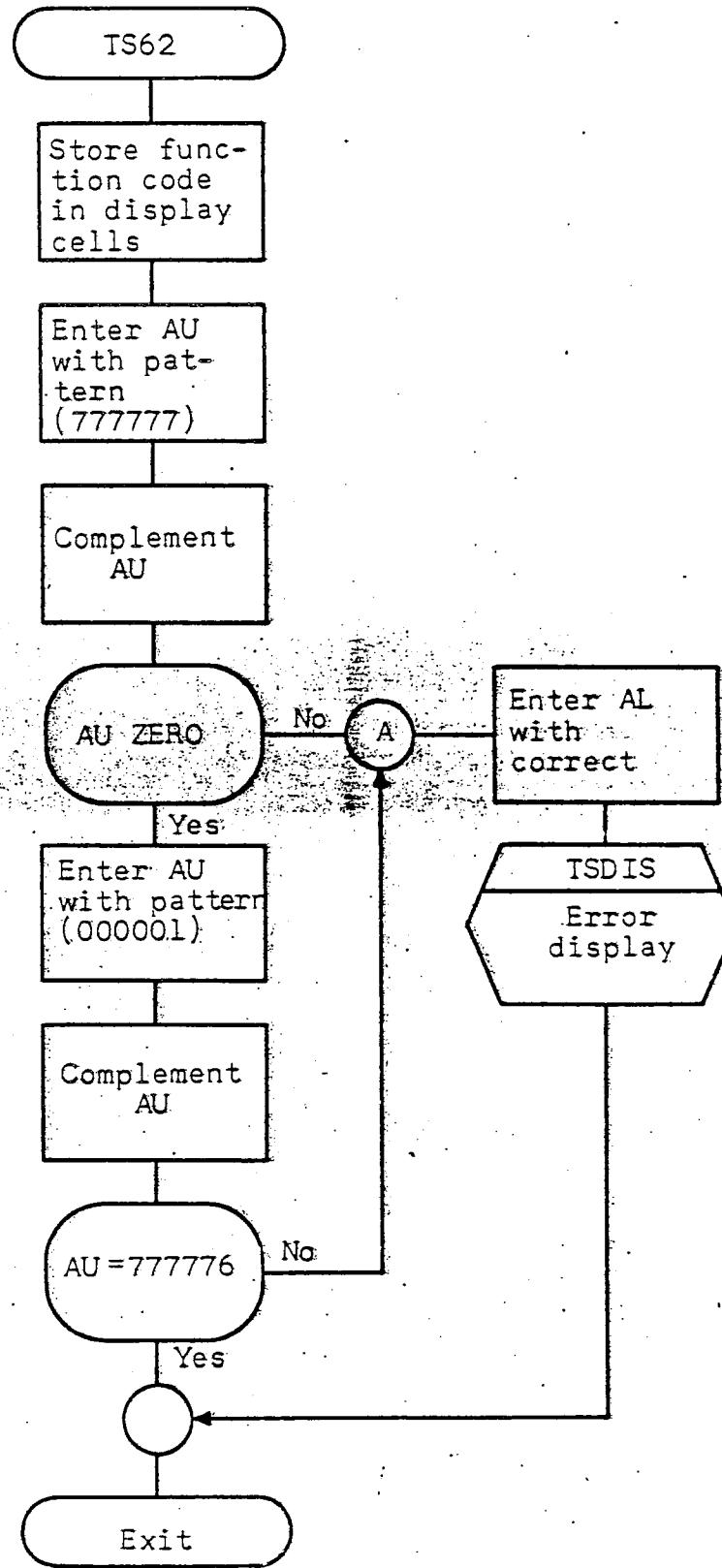
A-1975

```
                    ( TS62 )
                       │
          ┌────────────────────────┐
          │ Store func-            │
          │ tion code              │
          │ in display             │
          │ cells                  │
          └────────────────────────┘
                       │
          ┌────────────────────────┐
          │ Enter AU               │
          │ with pat-              │
          │ tern                   │
          │ (777777)               │
          └────────────────────────┘
                       │
          ┌────────────────────────┐
          │                        │
          │ Complement             │
          │ AU                     │
          │                        │
          └────────────────────────┘
                       │
            ╭──────────────╮          ┌──────────────┐
            │   AU ZERO    │── No ─(A)─│ Enter AL     │
            ╰──────────────╯          │ with         │
                       │              │ correct      │
                      Yes             └──────────────┘
          ┌────────────────────────┐          │
          │ Enter AU               │      ⬡ TSDIS
          │ with pattern           │      Error
          │ (000001)               │      display
          └────────────────────────┘
                       │
          ┌────────────────────────┐
          │                        │
          │ Complement             │
          │ AU                     │
          │                        │
          └────────────────────────┘
                       │
            ╭──────────────╮
            │ AU =777776   │── No ──┐
            ╰──────────────╯        │
                       │            │
                      Yes           │
                      ( ) ◄─────────┘
                       │
                  ( Exit )
```

TS62:   COMPLEMENT AU   506200

SPECIFICATION SYMBOL
SB-10163

TITLE: TF63 - JUMP A LOWER NOT ZERO (63xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF63   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: FWS modified by TLR   DATE: 8 December 1967

NUMBER OF L$_4$ OUTPUT INSTRUCTIONS: 20

DESCRIPTION:

This subroutine checks the Jump A Lower Not Zero command. A
shift count is set up and AL is entered with a constant. A
JPALNZ command is executed and if proper AL is entered with the
next constant. Another Jump if A Lower is not equal to zero
command is executed and if proper AL is left shifted one place.
An Index Skip command is executed, and the above sequence is
repeated until all patterns have been checked. If all executions
were correct an exit is then made to the executive routine (COMA).
If an error is detected on any of the validity checks, AU will
contain no display, AL the shifted pattern and an exit is made
to the display subroutine. With PROGRAM STOP 0 set, CO will
contain the function code, and the error may be evaluated. Upon
return to this subroutine (TF63) an exit is made to the executive
routine (COMA) to check for program continuance or the recycling
of this subroutine.

SPECIFICATION SYMBOL
SB-10163

TITLE: TF63

INPUT PARAMETERS (Listed Sequentially):

COMA

TEST PATTERN
TSH   000022

OUTPUT PARAMETERS (Listed Sequentially):
BUFF1

BUFF2

TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA (EXEC)

TFDIS - Error Display

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:

ERROR DISPLAY - PROGRAM STOP 0 set
                no display in AU
                shifted pattern in AL
                function code (63xxxx) in CO
                PROGRAM SKIP 4 - set for console error display only
                              not set for error typeout (Function
                              Code 63)
                PROGRAM SKIP 0 not set - continue test; if set -
                              recycle subroutine (TF63)

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SPECIFICATION SHEET

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SPECIFICATION SYMBOL
SB-10163

TF63

Store function code in display cells

Setup shift count 22

Clear AL

AL ZERO — No → (A)

Yes

Enter AL with pattern (000001)

(A) Yes — AL ZERO

No

LSH AL 1X

Shift count 0 — No

Yes

(B)

Exit

(A)

TFDIS
Error display

(B)
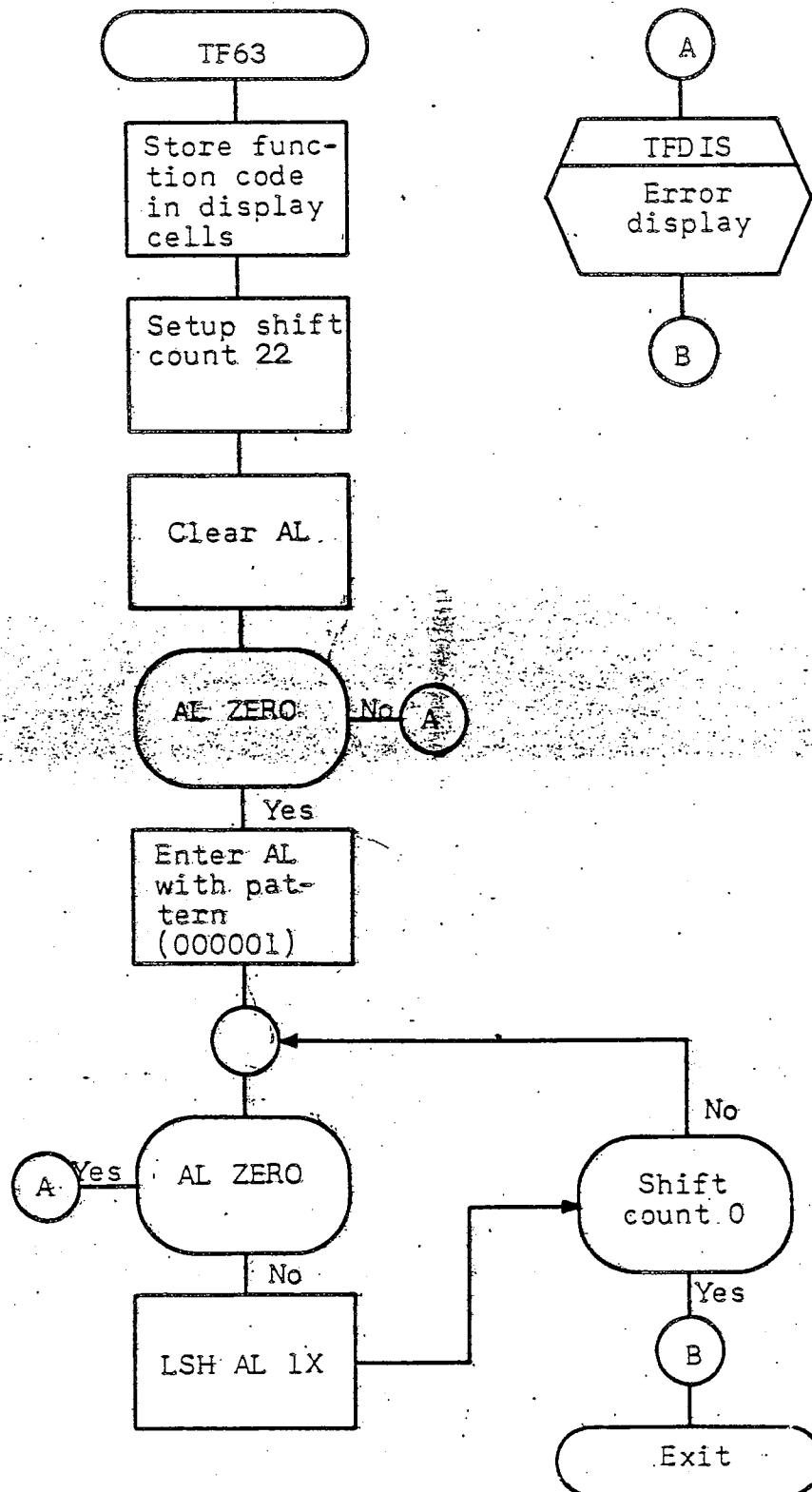
TF63:   JUMP AL NOT ZERO TO Y   63$\underline{XXXX}$
                                      $\overline{Y}$

SPECIFICATION SYMBOL
SB-10163

TITLE: TS63 - COMPLEMENT A (506300)

DECK IDENTIFIER: FACT

CS.1 LABEL: TS63 _____ KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: FWS modified by TLR   DATE: 8 December 1967

NUMBER OF L_4 OUTPUT INSTRUCTIONS: 26

DESCRIPTION:

This subroutine checks the Complement A command. AL and AU are
entered with the same, test-pattern constant. A CPA command is
executed and validity checked by comparing AL to an associated,
test-pattern constant. If correct, a Compare Mask using
another, test-pattern constant is used to check AU. Another
CPA command is executed and validity again checked. An exit
is made to the executive routine (COMA). If an error is detected
by any of the validity checks, AU and AL will contain patterns
that should be equal, and an exit is made to the display sub-
routine. With PROGRAM STOP O set, CO will contain the function
code, and the error may be evaluated. Upon return to this
subroutine (TS63) an exit is made to the executive routine (COMA)
to check for program continuance or the recycling of this sub-
routine.

SPECIFICATION SYMBOL
SB-10163

TITLE: TS63

INPUT PARAMETERS (Listed Sequentially):
COMA

TEST PATTERNS
TPAT   777777
TPAT2   252525
TPAT3   525252

OUTPUT PARAMETERS (Listed Sequentially):
BUFF1
BUFF2
BUFF3
BUFF4
TFX
ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):
COMA (EXEC)
TSDIS - Error Display
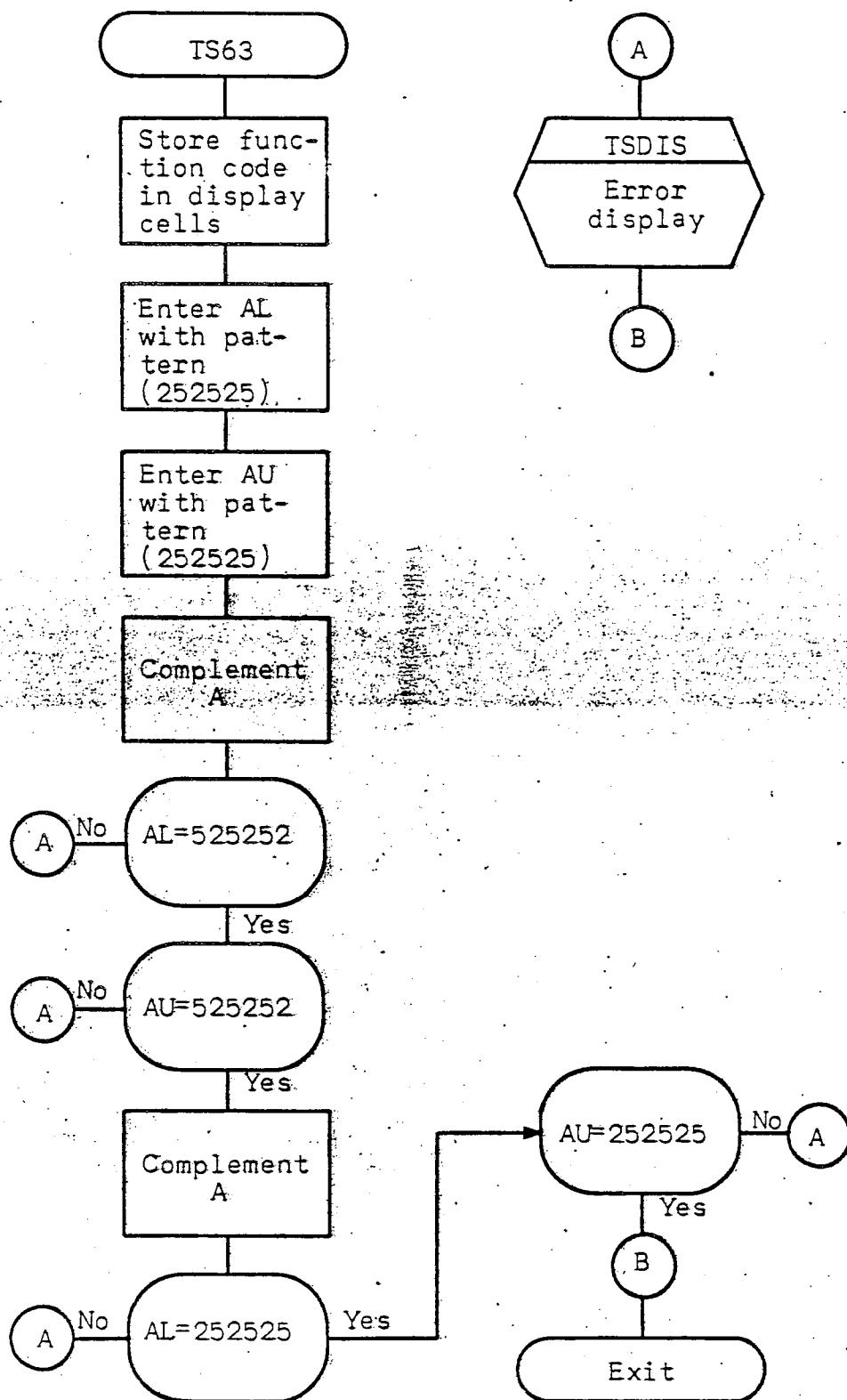
SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:
ERROR DISPLAY - PROGRAM STOP 0 set
                equal patterns in AU and AL
                function code (506300) in CO
                PROGRAM SKIP 4 - set for console error display only
                                 not set for error typeout (Function
                                 Code 5063)
                PROGRAM SKIP 0 not set - continue test; if set -
                                         recycle subroutine (TS63)

SPECIFICATION SYMBOL
SB-10163

TS63

Store func-
tion code
in display
cells

Enter AL
with pat-
tern
(252525)

Enter AU
with pat-
tern
(252525)

Complement
A

A — No — AL=525252

Yes

A — No — AU=525252

Yes

Complement
A

A — No — AL=252525 — Yes

A

TSDIS
Error
display

B

AU=252525 — No — A

Yes

B

Exit

TS63: COMPLEMENT A   506300

SPECIFICATION SYMBOL
SB-10163

TITLE: TC63 - JUMP NOT EQUAL (63xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TC63   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: FWS modified by TLR   DATE: 8 December 1967

NUMBER OF L₄ OUTPUT INSTRUCTIONS: ____15____

DESCRIPTION:

This subroutine checks the Jump Not Euqal command (Function Code
63). A pattern is entered into A Lower and a Compare AL to Y
is executed to set the Unequal Compare Designator. The JPNOT
command (Function Code 63) is executed and if proper a jump will
be made to the next portion of the subroutine. In this portion
a Compare AL Plus Y is executed with an equal-image pattern that
is contained in A Lower. The Unequal Compare Designator is cleared
and the Jump Not Equal command (Function Code 63) is again
executed. A proper execution will result in executing the
next command which is an exit to the executive routine (COMA)
for continuance of the test. If either execution of the Jump
Not Equal command is improper an exit is made to the display
subroutine (TFDIS) where the correct pattern is contained in A
Lower. Upon returning to this subroutine (TC63) an exit is
made to the executive routine (COMA) to check for continuance of
the test or recycling of this subroutine.

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SPECIFICATION SYMBOL
SB-10163

TITLE: TC63

INPUT PARAMETERS (Listed Sequentially):
COMA

TEST PATTERNS
TPAT1   000000
TPAB1   000001

OUTPUT PARAMETERS (Listed Sequentially):

BUFF 1

BUFF 2

TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):
COMA (EXEC)

TFDIS - Error Display

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:
ERROR DISPLAY - PROGRAM STOP 0 set
No Display in AU
Correct information in AL
Function Code (63xxxx) in CO
PROGRAM SKIP 4 - set for console error display only
not set for error typeout (Function
Code 63)
PROGRAM SKIP 0 not set - continue test; if set -
recycle subroutine (TC63)

A-1975

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SPECIFICATION SHEET

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SPECIFICATION SYMBOL
SB-10163

TC63

Store function code in display cells

Enter AL with pattern (000001)

AL ZERO ──Yes──▶ A ──── TFD IS / Error display

No

AL=000001 ──No──▶ (to A)

Yes

Exit
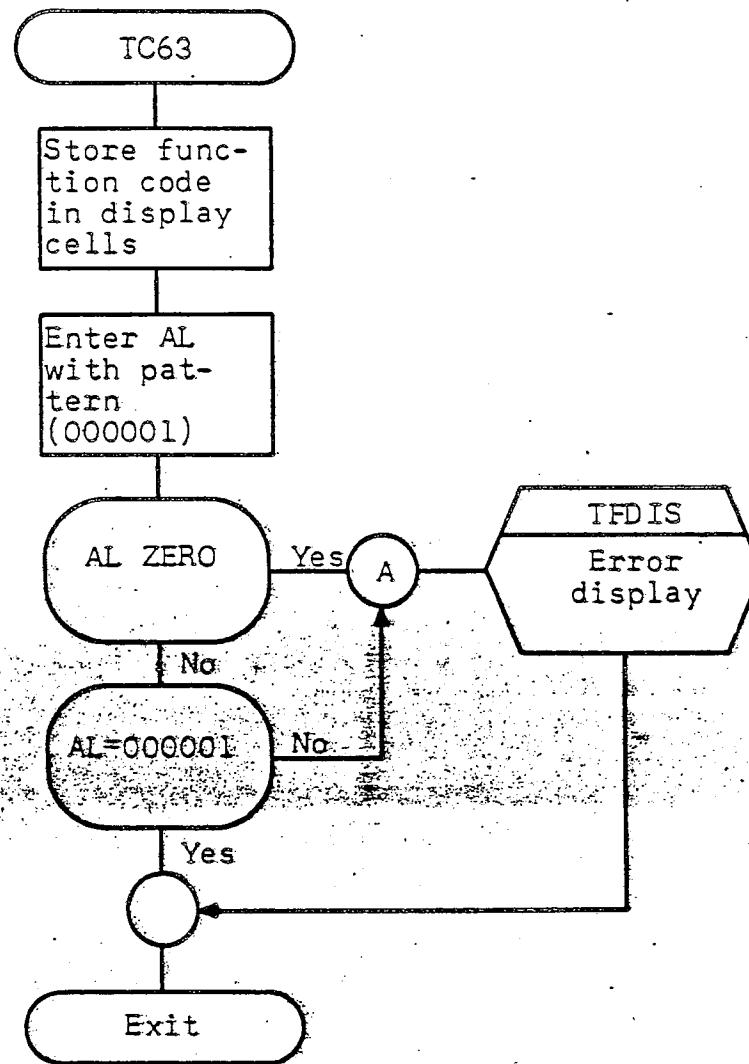
TC63: JUMP NOT EQUAL TO Y

$63\underline{XXXX}$
Y

SPECIFICATION SYMBOL
SB-10163

TITLE: TF64 - JUMP A UPPER POSITIVE (64xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF64   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: FWS modified by TLR   DATE: 8 December 1967

NUMBER OF L$_4$ OUTPUT INSTRUCTIONS: 14

DESCRIPTION:

This subroutine checks the Jump A Upper Positive command. AU
is entered with a test-pattern constant, and a JPAUP command is
executed if the execution is valid AU is entered with the next
test pattern, and another executing JPAUP command. A proper
execution will result in an exit to the executive routine (COMA).
If an error is detected by the validity checks, AU will contain
the correct pattern, AL will not contain a display, and an exit
is made to the display subroutine. With PROGRAM STOP 0 set, CO
will contain the function code, and the error may be evaluated.
Upon return to this subroutine (TF64) an exit is made to the
executive routine (COMA) to check for program continuance or the
recyling of this subroutine.

SPECIFICATION SYMBOL
SB-10163

TITLE: TF64

INPUT PARAMETERS (Listed Sequentially):
COMA

TEST PATTERNS
TPAT6   707070
TPAB3   312132

OUTPUT PARAMETERS (Listed Sequentially):
BUFF 1
BUFF 2
TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA (EXEC)
TFDIS - Error Display

SYSTEM DATA REFERENCES:
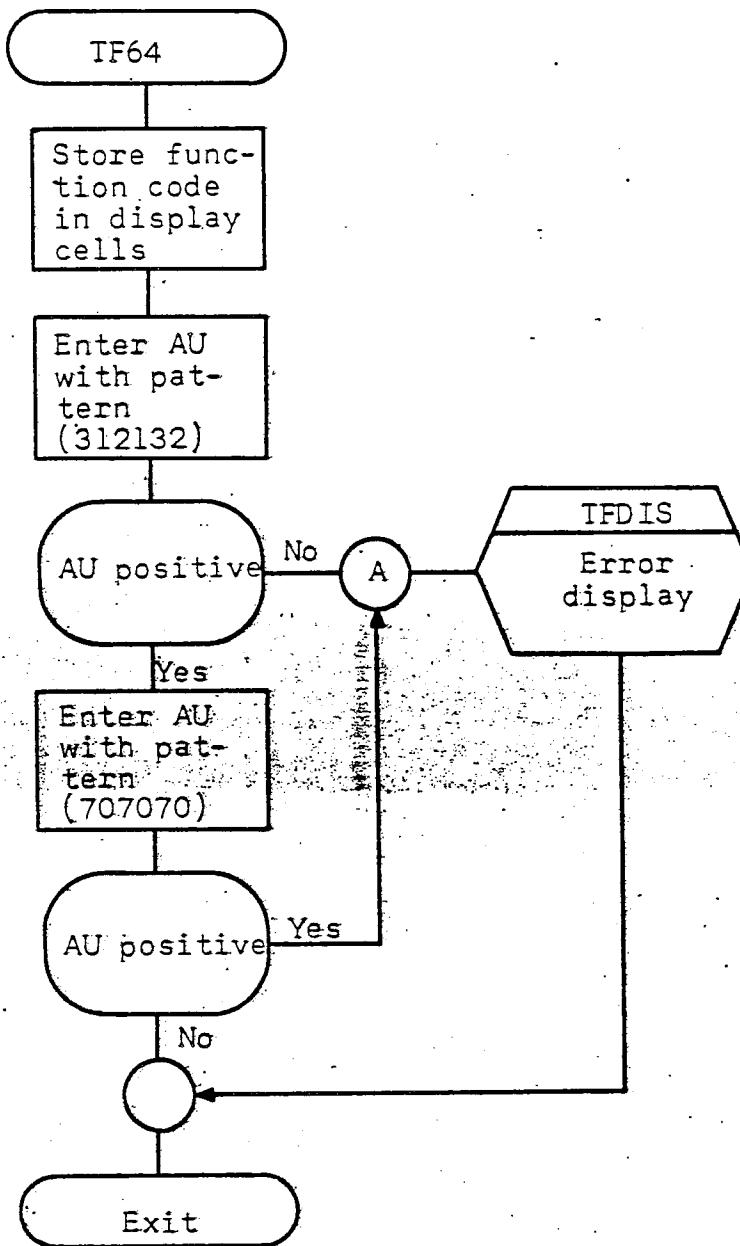
ALARMS AND/OR REMARKS:
ERROR DISPLAY - PROGRAM STOP 0 set
                Correct information in AU
                No Display in AL
                Function Code (64xxxx) in CO
                PROGRAM SKIP 4 - set for console error display only
                                 not set for error typeout (Function
                          Code 64)
                PROGRAM SKIP 0 not set - continue test
                                  set - recycle subroutine
                                  (TF64)

A-1975

TF64

Store func-
tion code
in display
cells

Enter AU
with pat-
tern
(312132)

AU positive — No → (A) →

TFDIS
Error
display

Yes

Enter AU
with pat-
tern
(707070)

AU positive — Yes →

No

(○)

Exit

TF64:   JUMP AU POSITIVE TO Y.   64XXXX
                                      Y

SPECIFICATION SYMBOL
SB-10163

TITLE: TF65 - JUMP A LOWER POSITIVE (65xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF65   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: FWS modified by TLR   DATE: 8 December 1967

NUMBER OF L$_4$ OUTPUT INSTRUCTIONS: 14

DESCRIPTION:

This routine checks the Jump A Lower Positive command. AL is
entered with a test pattern. A JPALP command is executed and if
proper AL is entered with the next test pattern. Another JPALF
is executed and if proper an exit to the executive routine (COMA)
is made. If an error is detected on the validity checks, AU will
not contain a display, AL will contain the correct pattern, and
an exit is made to the display subroutine, where with PROGRAM STOP
O set, CO will contain the function code, and the error may be
evaluated. Upon return to this subroutine (TF65) an exit is made
to the exectuive routine (COMA) to check for program continuance
or the recycling of this subroutine.

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SPECIFICATION SHEET

PROGRAM DATA PAGE (Cont)

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SPECIFICATION SYMBOL
SB-10163

TITLE: TF65

INPUT PARAMETERS (Listed Sequentially):

COMA

TEST PATTERNS
TPAT6   707070
TPAB3   312132

OUTPUT PARAMETERS (Listed Sequentially):
BUFF1
BUFF2
TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):
COMA (EXEC)
TFDIS - Error Display

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:
ERROR DISPLAY - PROGRAM STOP 0 set
              No Display in AU
              Correct pattern in AL
              Function Code (65xxxx) in CO
              PROGRAM SKIP 4 - set for console error display only
                               not set for error typeout (Function
                               Code 65)
              PROGRAM SKIP 0 not set - continue test; if set -
                               recycle subroutine (TF65)

SPECIFICATION SYMBOL
SB-10163

```
        ╭─────────────╮
        │    TF65      │
        ╰──────┬──────╯
        ┌──────┴───────┐
        │ Store func-  │
        │ tion code    │
        │ in display   │
        │ cells        │
        └──────┬───────┘
        ┌──────┴───────┐
        │ Enter AL     │
        │ with pat-    │
        │ tern         │
        │ (312132)     │
        └──────┬───────┘
        ╭──────┴───────╮      No    ╭───╮        ╱‾‾TFDIS‾‾╲
        │ AL positive  ├──────────→ │ A ├────────│  Error   │
        ╰──────┬───────╯            ╰─▲─╯        │ display  │
               │ Yes                   │          ╲_____╱
        ┌──────┴───────┐               │
        │ Enter AL     │               │
        │ with pat-    │               │
        │ tern         │               │
        │ (707070)     │               │
        └──────┬───────┘               │
        ╭──────┴───────╮   Yes         │
        │ AL positive  ├───────────────┘
        ╰──────┬───────╯
               │ No
             ( ○ )◄──────────────────────────────┘
               │
        ╭──────┴───────╮
        │    Exit      │
        ╰──────────────╯
```

TF65:   JUMP AL POSITIVE TO Y   65$\underline{XXXX}{Y}$

SPECIFICATION SYMBOL
SB-10163

TITLE: TC65 - JUMP Y LESS THAN OR EQUAL A LOWER (65xxxx)

DECK IDENTIFIER: _____

CS-1 LABEL: ___TC65___ . KEY: _____ IS LABEL DUPLICATE? ___No___

PROGRAMMER: _FWS modified by TLR_ DATE: _8 December 1967_

NUMBER OF L$_4$ OUTPUT INSTRUCTIONS: ___17___

DESCRIPTION:

This subroutine checks the Jump Y Less Than or Equal A Lower
command. AU and AL are entered with two, different test patterns.
A Compare Mask is executed using a third test pattern. A
JPMLEQ command is executed and if proper AL is entered with a
different test pattern. Again a Compare Mask, and 65 command are
executed. If the execution is proper an exit is made to the
executive routine (COMA). If an error is detected, AU will
contain the Compare Mask, AL will contain the correct pattern
and an exit is made to the display subroutine. With PROGRAM STOP
0 set, CO will contain the function code, and the error may be
evaluated. Upon return to this subroutine (TC65) an exit is
made to the executive routine (COMA) to check for program
continuance or the recycling of this subroutine.

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PROGRAM DATA PAGE (Cont)

SPECIFICATION SYMBOL
SB-10163

TITLE: TC65

INPUT PARAMETERS (Listed Sequentially):

COMA

TEST PATTERNS
TPAT	777777
TPAT1	000000
TPAT2	252525
TPAT3	525252
TPAB1	000001

OUTPUT PARAMETERS (Listed Sequentially):

BUFF1

BUFF2

TEX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA (EXEC)

TEDIS - Error Display

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:

ERROR DISPLAY - PROGRAM STOP 0 set
                Compare Mask in AU
                Correct pattern in AL
                Function Code (65xxxx) in CO
                PROGRAM SKIP 4 - set for console error display only
                            not set for error typeout
                            (Function Code 65)
                PROGRAM SKIP 0 not set - continue test
                            set - recycle subroutine (TC65)
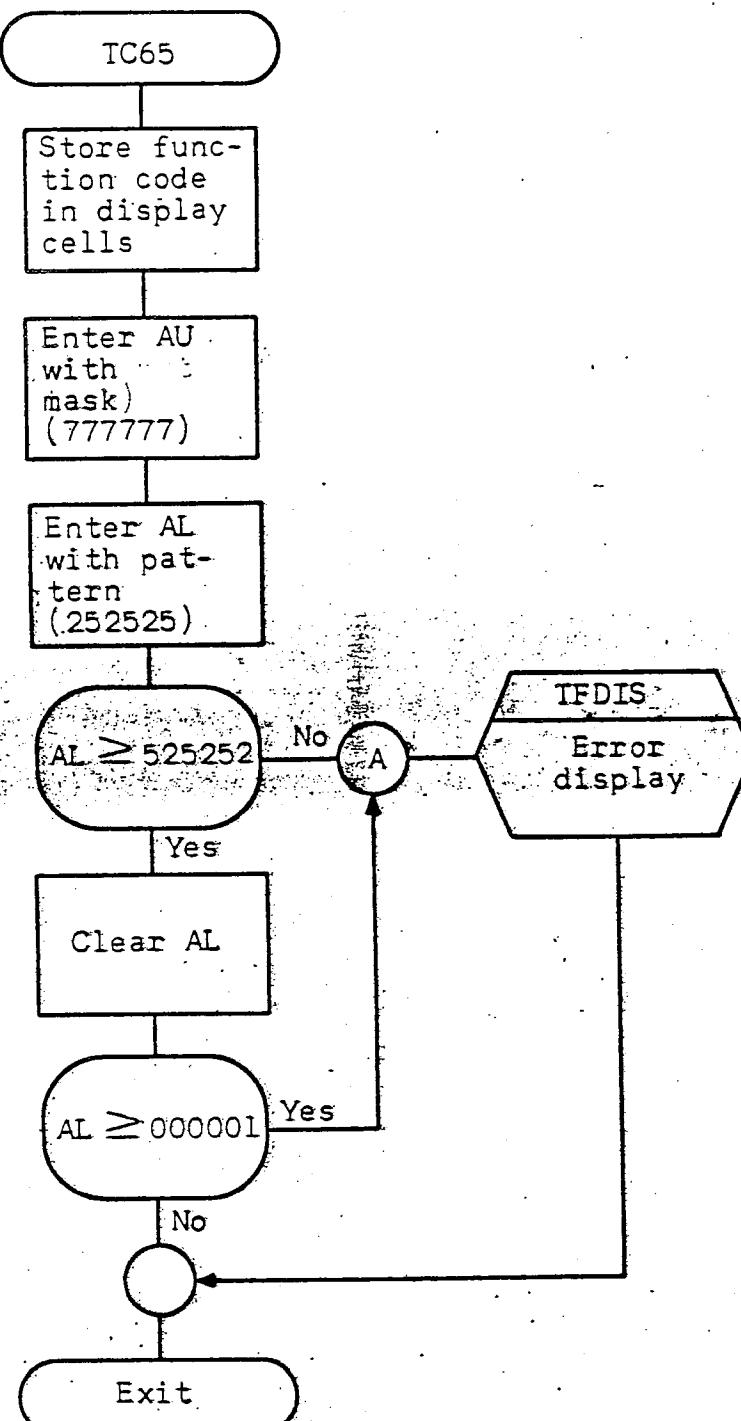
| SPECIFICATION SYMBOL |
| SB-10163 |

```
        ┌──────────────┐
        (    TC65      )
        └──────┬───────┘
        ┌──────┴───────┐
        │ Store func-  │
        │ tion code    │
        │ in display   │
        │ cells        │
        └──────┬───────┘
        ┌──────┴───────┐
        │ Enter AU     │
        │ with         │
        │ mask)        │
        │ (777777)     │
        └──────┬───────┘
        ┌──────┴───────┐
        │ Enter AL     │
        │ with pat-    │
        │ tern         │
        │ (.252525)    │
        └──────┬───────┘
```

AL ≥ 525252 ── No ──▶ (A) ──▶ IFDIS Error display

Yes │

```
        ┌──────────────┐
        │              │
        │  Clear AL    │
        │              │
        └──────┬───────┘
```

AL ≥ 000001 ── Yes ──▶ (A)

No │

( ) ◀── (Error display)

```
        ┌──────────────┐
        (    Exit      )
        └──────────────┘
```

TC65:   JUMP TO Y IF MEMORY EQUAL TO OR LESS THAN AL

$$65\underline{XXXX}_{Y}$$

SPECIFICATION SYMBOL
SB-10163

TITLE: TF66 - JUMP A UPPER NEGATIVE (66xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF66   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: FWS modified by TLR   DATE: 8 December 1967

NUMBER OF L₄ OUTPUT INSTRUCTIONS: 14

DESCRIPTION:

This subroutine checks the Jump A Upper Negative command. AU is
entered with a test pattern. A JPAUNG command is executed and if
proper AU is entered with a different test pattern. Another
JPAUNG command is executed and if proper an exit is made to the
executive routine (COMA). If an error is detected by the
validity checks, AU will contain the correct pattern, AL will not
contain a display and an exit is made to the display subroutine.
With PROGRAM STOP 0 set, CO will contain the function code, and
the error may be evaluated. Upon return to this subroutine (TF66)
an exit is made to the executive routine (COMA) to check for
program continuance or the recycling of this subroutine.

SPECIFICATION SYMBOL
SB-10163

TITLE: TF66

INPUT PARAMETERS (Listed Sequentially):

TEST PATTERNS
TPAT6   707070
TPAB3   312132

OUTPUT PARAMETERS (Listed Sequentially):
BUFF1

BUFF2

TFX

ABNORMAL EXITS (Listed Sequentially):
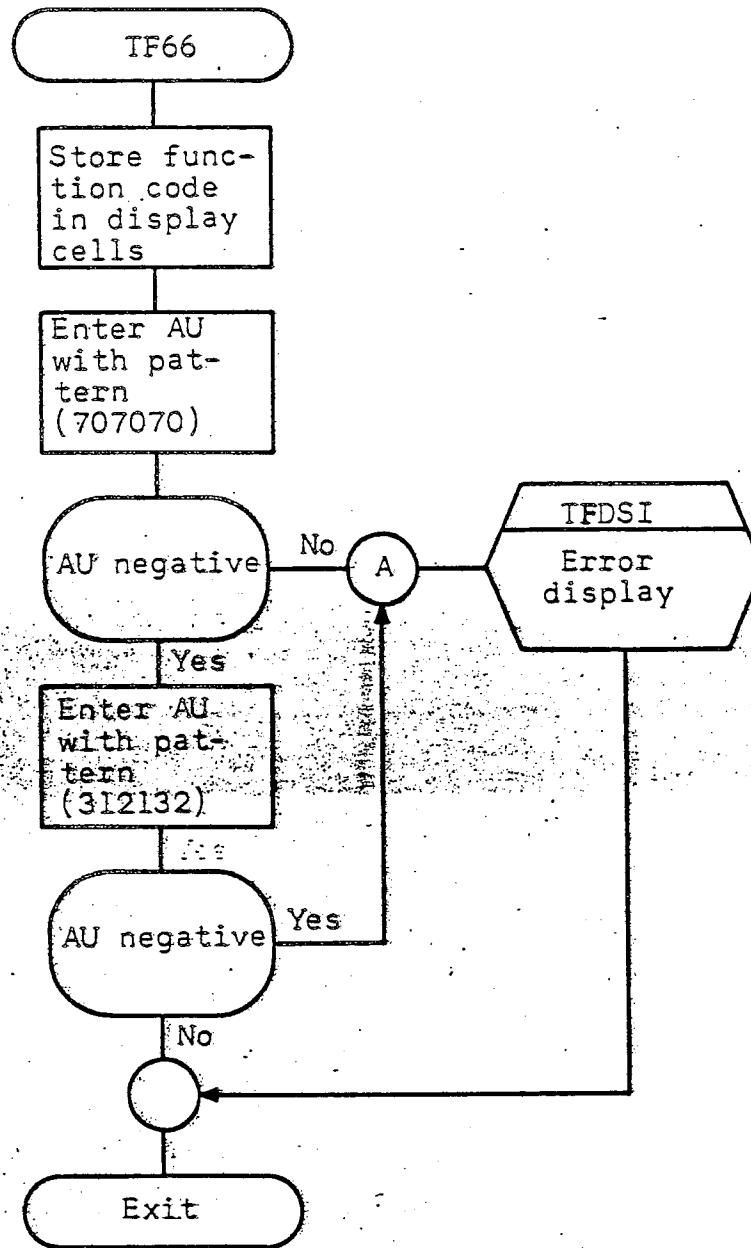
NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):
COMA (EXEC)

TFDIS - Error Display

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:
ERROR DISPLAY - PROGRAM STOP 0 set
                  Correct pattern in AU
                  No Display in AL
                  Function Code (65xxxx) in CO
                  PROGRAM SKIP 4 - set for console error display only
                              not set for error typeout (Function
                              Code 66)
                  PROGRAM SKIP 0 not set - continue test; if set -
                              recycle subroutine (TF66)

```
                    ( TF66 )
                       |
           +-----------------------+
           | Store func-           |
           | tion code             |
           | in display            |
           | cells                 |
           +-----------------------+
                       |
           +-----------------------+
           | Enter AU              |
           | with pat-             |
           | tern                  |
           | (707070)              |
           +-----------------------+
                       |
         (  AU negative  )--No--( A )      /  TFDSI    \
                       |                   \  Error     /
                      Yes                   \ display  /
           +-----------------------+
           | Enter AU              |
           | with pat-             |
           | tern                  |
           | (312132)              |
           +-----------------------+
                       |
         (  AU negative  )--Yes----+
                       |
                      No
                      |
                    (  O  )
                      |
                  ( Exit )
```

TF66: JUMP AU NEGATIVE TO Y $66\underset{Y}{\underline{XXXX}}$

SPECIFICATION SYMBOL
SB-10163

TITLE: TF67 - JUMP A LOWER NEGATIVE (67xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF67   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: FWS modified by TLR   DATE: 8 December 1967

NUMBER OF L$_4$ OUTPUT INSTRUCTIONS: 14

DESCRIPTION:

This subroutine checks the Jump A Lower Negative command. AL is
entered with a test pattern. A JPALNG command is then executed
and if proper the next test pattern is entered into AL checked
by entering AL with a different test pattern. Another JPALNG
command is executed and if correct an exit is made to the
executive routine (COMA). If an error is detected by the
validity checks, AU will not contain a display, AL will contain
the correct pattern, and an exit is made to the display sub-
routine. With PROGRAM STOP 0 set, CO will contain the function
code, and the error may be evaluated. Upon return to this sub-
routine (TF67) an exit is made to the executive routine (COMA)
to check for program continuance or the recycling of this sub-
routine.

TITLE: TF67

INPUT PARAMETERS (Listed Sequentially):

TEST PATTERNS
TPAT6   707070
TPAB3   312132

OUTPUT PARAMETERS (Listed Sequentially):

BUFF1

BUFF2

TEX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA (EXEC)

TFDIS - Error Display

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:
ERROR DISPLAY - PROGRAM STOP 0 set
   No Display in AU
                Correct information in AL
                Function Code (67xxxx) in CO
                PROGRAM SKIP 4 - set for console error display only
                                 not set for error typeout (Function
                                 Code 67)
                PROGRAM SKIP 0 not set - continue test; if set -
                                 recycle subroutine (TF67)

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SPECIFICATION SYMBOL
SB-10163

```
        ┌──────────────┐
        │     TF67     │
        └──────┬───────┘
        ┌──────┴───────┐
        │ Store func-  │
        │ tion code    │
        │ in display   │
        │ cells        │
        └──────┬───────┘
        ┌──────┴───────┐
        │ Enter AL     │
        │ with pat-    │
        │ tern         │
        │ (707070)     │
        └──────┬───────┘
        ╭──────┴───────╮  No          ┌─────────────┐
        │ AL negative  ├──────( A )────│    TFDIS    │
        ╰──────┬───────╯              │   Error     │
           Yes │                      │   display   │
        ┌──────┴───────┐              └──────┬──────┘
        │ Enter AL     │                     │
        │ with pat-    │                     │
        │ tern         │                     │
        │ (312132)     │                     │
        └──────┬───────┘                     │
        ╭──────┴───────╮  Yes                │
        │ AL negative  ├────────┘            │
        ╰──────┬───────╯                     │
            No │                             │
             ( ○ )◄──────────────────────────┘
               │
        ┌──────┴───────┐
        │    Exit      │
        └──────────────┘
```

TF67:   JUMP AL NEGATIVE TO Y   67 $\underbrace{XXXX}_{Y}$

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PROGRAM DATA PAGE

SPECIFICATION SHEET

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SPECIFICATION SYMBOL
SB-10163

TITLE: TC67 - JUMP Y GREATER THAN A LOWER (67xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TC67   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: FWS modified by TLR   DATE: 8 December 1967

NUMBER OF L₄ OUTPUT INSTRUCTIONS: 17

DESCRIPTION:

This subroutine checks the Jump Y Greater Than A Lower command.
AU and AL are entered with different test patterns. A Compare
Mask is executed using a third test pattern. A JPMGR command
is then executed and if proper AL is entered with the next test
pattern. Again a Compare Mask, and JPMGR command are executed
and if proper an exit is made to the executive routine (COMA).
If an error is detected by the validity checks, AU will contain
the Compare Mask, AL will contain the correct pattern, and an
exit is made to the display subroutine. With PROGRAM STOP 0 set,
CO will contain the function code, and the error may be evaluated.
Upon return to this subroutine (TC67) an exit is made to the
executive routine (COMA) to check for program continuance or the
recycling of this subroutine.

SPECIFICATION SYMBOL
SB-10163

TITLE: TC67

INPUT PARAMETERS (Listed Sequentially):

COMA

TEST PATTERNS

TPAT	777777
TPAT1	000000
TPAT6	707070
TPAT7	070707
TPAB1	000001

OUTPUT PARAMETERS (Listed Sequentially):

BUFF 1

BUFF 2

TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA (EXEC)

TFDIS - Error Display

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:

ERROR DISPLAY — PROGRAM STOP 0 set
                Compare Mask in AU
                Correct Information in AL
                Function Code (67xxxx) in CO
                PROGRAM SKIP 4 - set for console error display only
                                 not set for error typeout (Function
                                 Code 67)
                PROGRAM SKIP 0 not set - continue test; if set -
                                 recycle subroutine (TC67)

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SPECIFICATION SHEET

| SHEET 418 | REVISION — |

SPECIFICATION SYMBOL
SB-10163

TC67

Store function code in display cells

Enter AU with mask (777777)

Enter AL with pattern (707070)

AL < 070707 — Yes → A → TFD IS / Error display

No

Enter AL with pattern (000001)

AL < ZERO — No

Yes

Exit
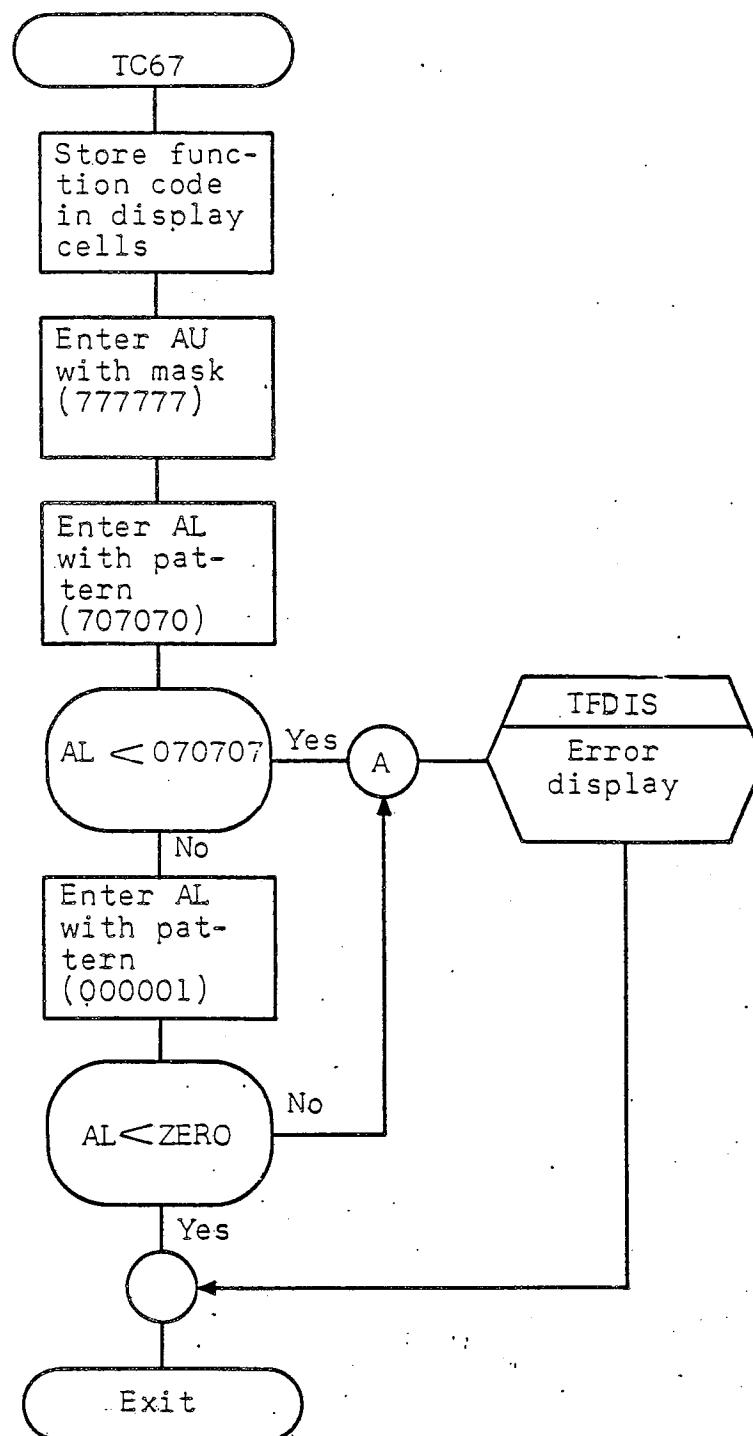
TC67:   JUMP TO Y IF MEMORY GREATER THAN AL

67 XXXX
Y

SPECIFICATION SYMBOL
SB-10163

TITLE: TF70 - ENTER A LOWER WITH CONSTANT (SIGN EXT.) (70xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF70   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: PMC modified by TLR   DATE: 8 December 1967

NUMBER OF L_4 OUTPUT INSTRUCTIONS: 40

DESCRIPTION:

This subroutine checks the Enter A Lower With Constant (Sign Ex-
tended) command. AU is entered with the correct, test-pattern
constant, and an ENTALK command is executed. Validity is checked
by comparing AL to the associated test pattern, and if correct,
the above sequence is repeated until all patterns have been
checked. An exit is then made to the executive routine (COMA).
If an error is detected, AU will contain the correct pattern,
AL the incorrect pattern, and an exit is made to the display sub-
routine. With PROGRAM STOP 0 set, CO will contain the function
code, and the error may be evaluated. Upon return to this
subroutine (TF70) an exit is made to the executive routine (COMA)
to check for program continuance or the recycling of this sub-
routine.

SPECIFICATION SYMBOL
SB-10163

TITLE: TF70

INPUT PARAMETERS (Listed Sequentially):
COMA

TEST PATTERNS

TPAT	777777
TPAT1	000000
TPAB1	000001
TPAB1+1	777776
TPAK5	775252
TPAK6	002525
TPAK7	777070
TPAK7+1	000707

OUTPUT PARAMETERS (Listed Sequentially):
BUFF1

BUFF2

TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):
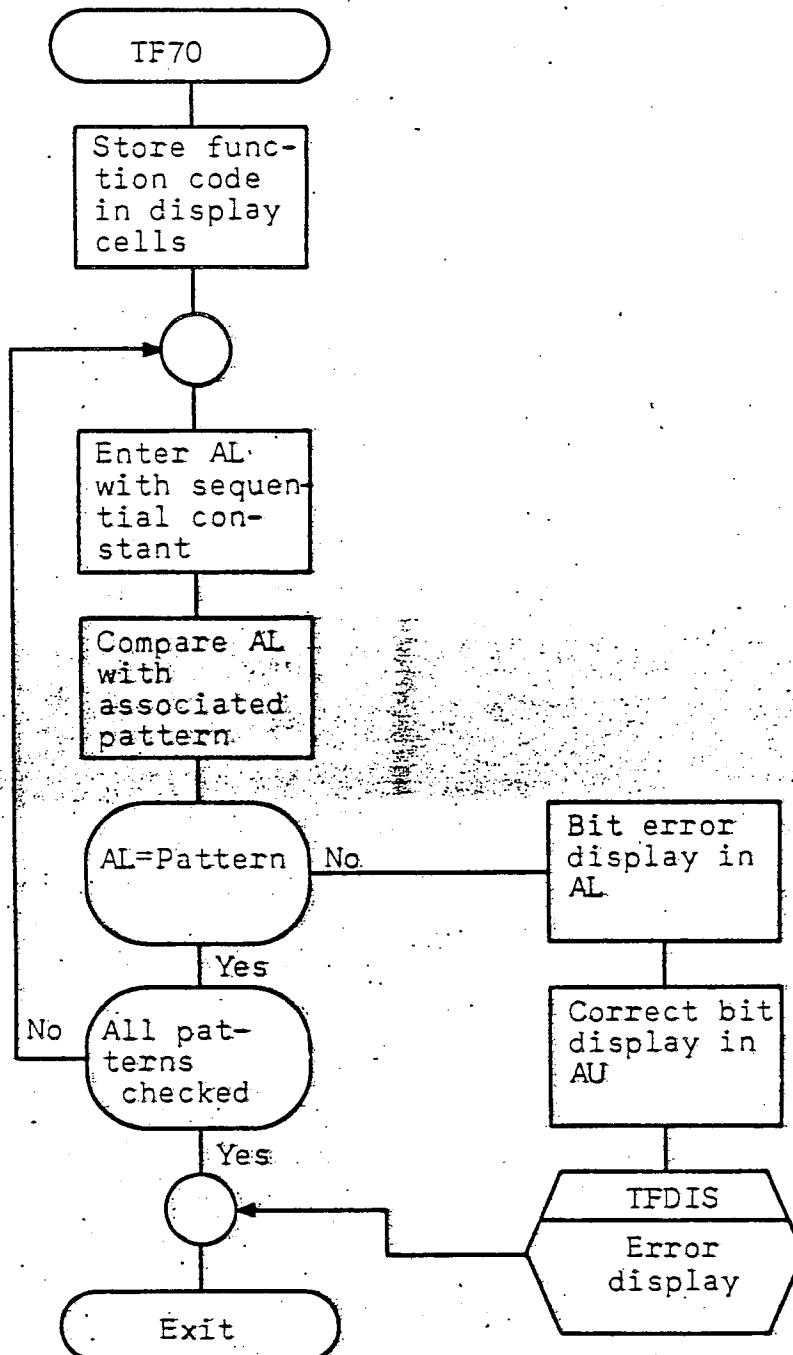
COMA (EXEC)

TFDIS - Error Display

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:
ERROR DISPLAY - PROGRAM STOP 0 set
                  Correct information in AU
                  Incorrect information in AL
                  Function Code (70xxxx) in CO
                  PROGRAM SKIP 4 - set for console error display only
                                  not set for error typeout (Function
                                  Code 70)
                  PROGRAM SKIP 0 not set - continue test; if set -
                                  recycle subroutine (TF70)

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SPECIFICATION SHEET

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SPECIFICATION SYMBOL
SB-10163

```
          ( TF70 )
             |
      +---------------+
      | Store func-   |
      | tion code     |
      | in display    |
      | cells         |
      +---------------+
             |
           ( O )<------------+
             |               |
      +---------------+      |
      | Enter AL      |      |
      | with sequen-  |      |
      | tial con-     |      |
      | stant         |      |
      +---------------+      |
             |               |
      +---------------+      |
      | Compare AL    |      |
      | with          |      |
      | associated    |      |
      | pattern       |      |
      +---------------+      |
             |               |
       (AL=Pattern) --No--> +---------------+
             |              | Bit error     |
            Yes             | display in    |
             |              | AL            |
      (All pat-) --No--+    +---------------+
      ( terns   )      |           |
      ( checked )      |    +---------------+
             |         |    | Correct bit   |
            Yes        |    | display in    |
             |         |    | AU            |
           ( O )<--+   |    +---------------+
             |     |   |           |
         ( Exit )  |   |      <TFDIS>
                   |   |      Error display
                   +---+
```

TF70: ENTER AL WITH CONSTANT (SIGN EXT.)

SPECIFICATION SYMBOL
SB-10163

TITLE: TF71 - ADD A LOWER PLUS CONSTANT (SIGN EXT.) (71xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF71   KEY: _____   IS LABEL DUPLICATE? No

PROGRAMMER: FWS modified by TLR   DATE: 8 December 1967

NUMBER OF L₄ OUTPUT INSTRUCTIONS: 26

DESCRIPTION:

This subroutine checks the Add A Lower Plus Constant (Sign
Extended) command. AL is entered with a constant. An ADDALK
command is executed. Validity is checked by entering AU with
the correct, associated test pattern and comparing AL with that
same pattern. If correct, the next ADDALK command is executed.
This sequence is repeated until all patterns have been checked.
An exit is made to the executive routine (COMA). If an error
is detected AU will contain the correct pattern, AL the incorrect
pattern, and an exit is made to the display subroutine. With
PROGRAM STOP 0 set, CO will contain the function code and the
error may be evaluated. Upon return to this subroutine (TF71) an
exit is made to the executive routine (COMA) to check for program
continuance or the recycling of this subroutine.

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PROGRAM DATA PAGE (Cont)

SPECIFICATION SYMBOL
SB-10163

TITLE: TF71

INPUT PARAMETERS (Listed Sequentially):
COMA

TEST PATTERNS
TPAT1   000000
TPAK2   002222
TPAK4   003333
TPAS4   000002

OUTPUT PARAMETERS (Listed Sequentially):

BUFF1

BUFF2

TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):
COMA (EXEC.)

TFDIS - Error Display

SYSTEM DATA REFERENCES:
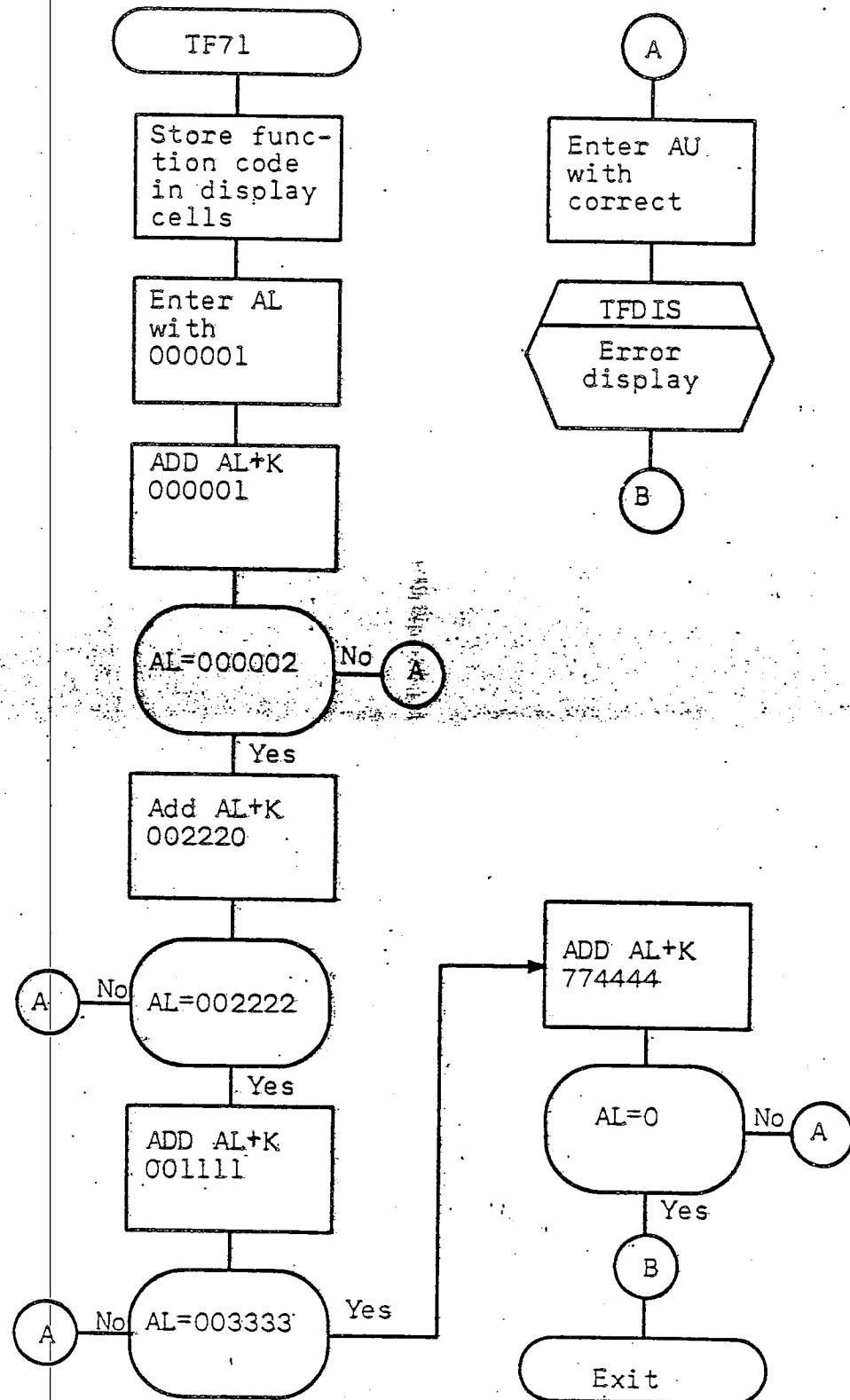
ALARMS AND/OR REMARKS:
ERROR DISPLAY - PROGRAM STOP 0 set
Correct information in AU
Incorrect information in AL
Function Code (71xxxx) in CO
PROGRAM SKIP 4 - set for console error display only
not set for error typeout (Function
Code 71)
PROGRAM SKIP 0 not set - continue test; if set -
recycle subroutine (TF71)

SPECIFICATION SYMBOL
SB-10163

(TF71)

Store function code in display cells

Enter AL with 000001

ADD AL+K 000001

AL=000002 —No→ (A)

Yes

Add AL+K 002220

(A) ←No— AL=002222

Yes

ADD AL+K 001111

(A) ←No— AL=003333 —Yes→

(A)

Enter AU with correct

TFDIS
Error display

(B)

ADD AL+K 774444

AL=0 —No→ (A)

Yes

(B)

(Exit)

TF71: ADD AL+K (SIGN EXTENDED)   71XXXX
Y

SPECIFICATION SYMBOL
SB-10163

TITLE: TS73 - ENTER SPECIAL REGISTER (5073xx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TS73   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: PMC/HWM modified by TLR   DATE: 8 December 1967

NUMBER OF L₄ OUTPUT INSTRUCTIONS: 34

DESCRIPTION:

This subroutine checks the Enter Special Register Command. A
constant is entered into the Special Register with an ENTSR
command. Validity is then checked by storing the contents of
the SR in a test cell, entering the content of the test cell
into AL, and the associated, test pattern into AU. A Compare
is then made of AL and the associated test pattern, and if
correct, the next pattern is entered into the SR. This is
repeated until all patterns have been checked. An exit is then
made to the executive routine (COMA). If an error is detected,
AU will contain the correct pattern, AL the incorrect pattern,
and an exit is made to the display subroutine. With PROGRAM
STOP 0 set, CO will contain the function code and the error
may be evaluated. Upon return to this subroutine (TS73) an
exit is made to the executive routine (COMA) to check for
program continuance or the recycling of this subroutine.

SPECIFICATION SYMBOL
SB-10163

TITLE: TS73

INPUT PARAMETERS (Listed Sequentially):

COMA

TEST PATTERNS

TPAT1	000000
TPAB1	000001
TPAS4	000002
TPAS5	000004
TPAS6	000007
TPAR	TEST CELL

OUTPUT PARAMETERS (Listed Sequentially):

BUFF1

BUFF2

BUFF3

BUFF4

TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA (EXEC)

TSDIS — Error Display

### SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:
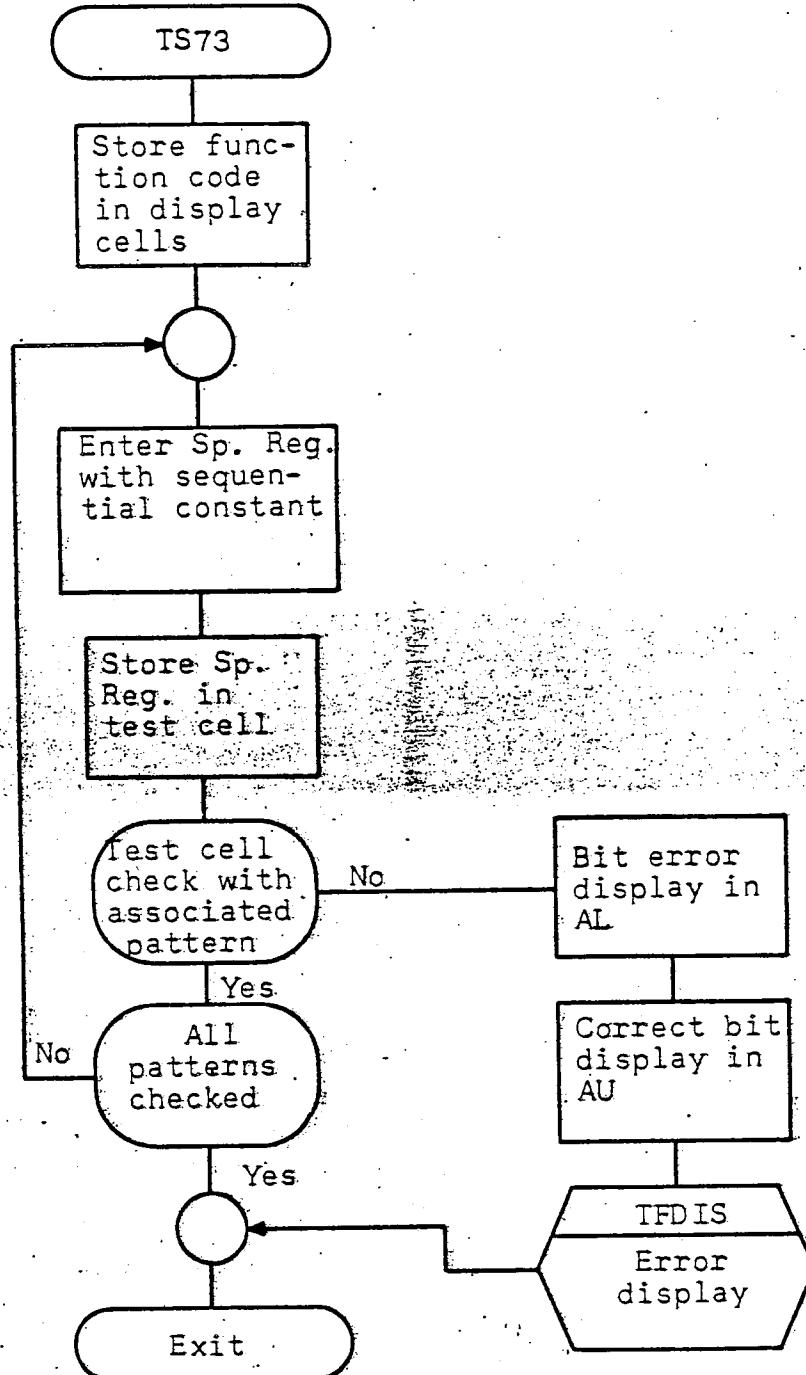
ERROR DISPLAY — PROGRAM STOP 0 set
Correct information in AU
Incorrect information in AL
Function Code (5073xx) in CO
PROGRAM SKIP 4 - set for console error display only
not set for error typeout (Function
Code 5073)
PROGRAM SKIP 0 not set - continue test; if set -
recycle subroutine (TS73)

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SPECIFICATION SHEET

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SPECIFICATION SYMBOL
SB-10163

```
                    ╭─────────────╮
                    │    TS73     │
                    ╰──────┬──────╯
                           │
                    ┌──────┴──────┐
                    │ Store func- │
                    │ tion code   │
                    │ in display  │
                    │ cells       │
                    └──────┬──────┘
                           │
                          (○)
                           │
                    ┌──────┴──────┐
                    │Enter Sp. Reg│
                    │with sequen- │
                    │tial constant│
                    └──────┬──────┘
                           │
                    ┌──────┴──────┐
                    │ Store Sp.   │
                    │ Reg. in     │
                    │ test cell   │
                    └──────┬──────┘
                           │
                  ╭────────┴────────╮   No    ┌────────────┐
                  │ Test cell       │────────▶│ Bit error  │
                  │ check with      │         │ display in │
                  │ associated      │         │ AL         │
                  │ pattern         │         └─────┬──────┘
                  ╰────────┬────────╯               │
                          Yes                 ┌─────┴──────┐
          No    ╭──────────┴──────╮           │Correct bit │
         ◀──────│ All             │           │display in   │
                │ patterns        │           │ AU          │
                │ checked         │           └─────┬──────┘
                ╰────────┬────────╯                 │
                        Yes                    ╱─────┴──────╲
                         │                    │   TFD IS     │
                        (○)◀──────────────────│   Error      │
                         │                     ╲  display   ╱
                  ╭──────┴──────╮               ╲──────────╱
                  │    Exit     │
                  ╰─────────────╯
```

TS73:   ENTER SPECIAL REGISTER

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P R O G R A M   D A T A   P A G E

SPECIFICATION SYMBOL

SB-10163

TITLE: TF73 - B JUMP (73xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF73   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: PMC modified by TLR   DATE: 8 December 1967

NUMBER OF L$_4$ OUTPUT INSTRUCTIONS: 27

DESCRIPTION:

This subroutine checks the B Jump command. First AU and the
test area (TF73 - 10$_8$ addresses) are cleared to 0's. B is
entered with a constant, in the test area (TB73 plus B) and a
return is made to the address containing the B Jump. The Jump
and Store is repeated until the decrementation of B is complete.
Validity is then checked by entering AL with TB73 (test area) and
checking for the proper contents. If correct, the next
sequential test pattern is entered into B and the above operation
is repeated until all test patterns have been used. If all
executions are correct, an exit is made to the executive routine
(COMA).

A-1974

SPECIFICATION SYMBOL
SB-10163

TITLE: TF73

INPUT PARAMETERS (Listed Sequentially):
COMA

TEST PATTERNS
TPAT1   000000
TB73   TEST AREA

OUTPUT PARAMETERS (Listed Sequentially):

BUFF1

BUFF2

TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):
COMA (EXEC)

TFDIS — Error Display

SYSTEM DATA REFERENCES:
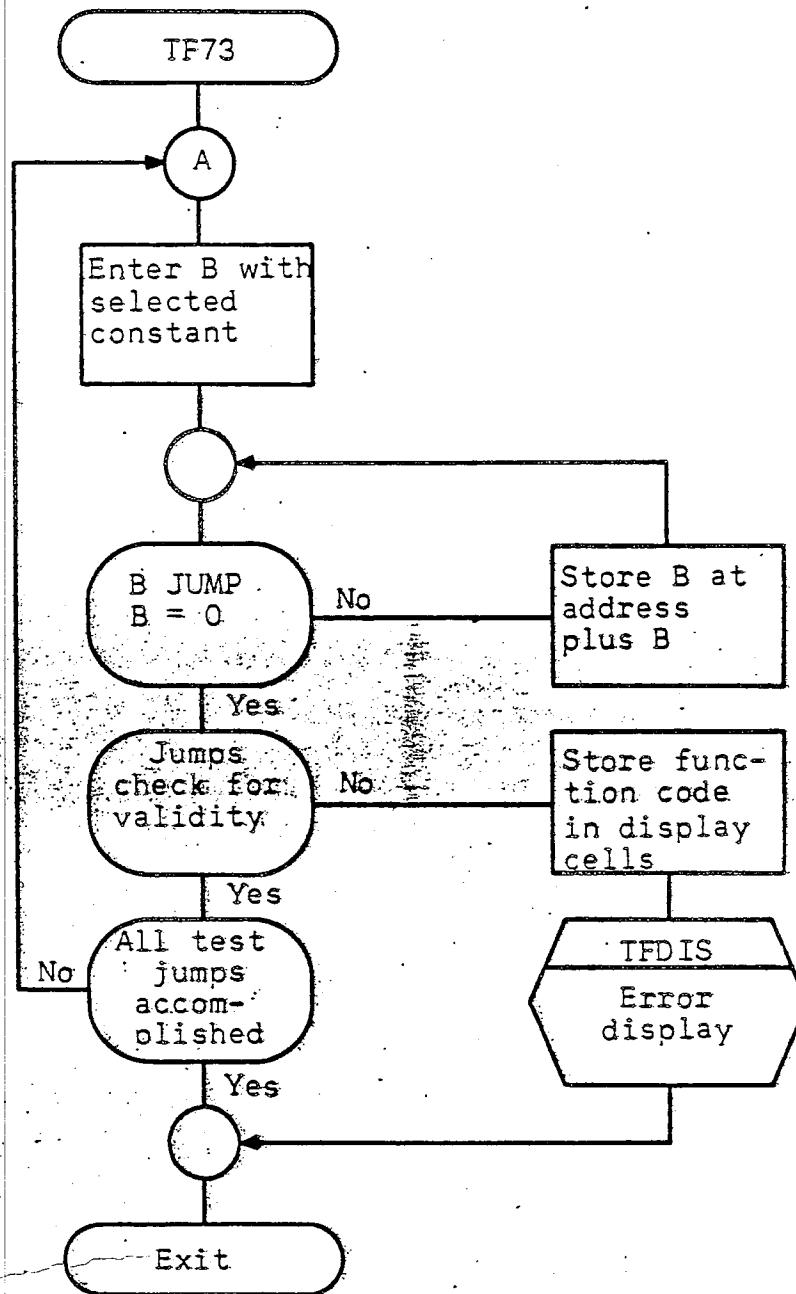
ALARMS AND/OR REMARKS:
ERROR DISPLAY — PROGRAM STOP 0 set
        Correct information in AU
        Incorrect information in AL
        Function Code (73xxxx) in CO
      PROGRAM SKIP 4 — set for console error display only
              not set for error typeout (Function
              Code 73)
      PROGRAM SKIP 0 not set — continue test; if set —
               recycle subroutine (TF73)

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SPECIFICATION SHEET

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SPECIFICATION SYMBOL
SB-10163

```
        ┌──────────────┐
        │     TF73     │
        └──────┬───────┘
               │
             ( A )
               │
        ┌──────┴───────┐
        │ Enter B with │
        │ selected     │
        │ constant     │
        └──────┬───────┘
               │
             (   )◄──────────────────────┐
               │                          │
        ┌──────┴───────┐                  │
        │  B  JUMP     │  No   ┌──────────┴───┐
        │  B = 0       │──────►│ Store B at   │
        └──────┬───────┘       │ address      │
               │ Yes           │ plus B       │
               │               └──────────────┘
        ┌──────┴───────┐
        │   Jumps      │  No   ┌──────────────┐
        │ check for    │──────►│ Store func-  │
        │ validity     │       │ tion code    │
        └──────┬───────┘       │ in display   │
               │ Yes           │ cells        │
        ┌──────┴───────┐       └──────┬───────┘
  No    │  All test    │              │
◄───────│  jumps       │       ╱──────┴───────╲
        │  accom-      │      │    TFDIS       │
        │  plished     │      │   Error        │
        └──────┬───────┘      │   display      │
               │ Yes          ╲──────┬─────────╱
             (   )◄───────────────────┘
               │
        ┌──────┴───────┐
        │    Exit      │
        └──────────────┘
```

TF73:   B JUMP

SPECIFICATION SYMBOL
SB-10163

TITLE: TF74 - TEST STORE ADDRESS (74xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF74   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: PMC modified by TLR   DATE: 8 December 1967

NUMBER OF L_4 OUTPUT INSTRUCTIONS: 52

DESCRIPTION:

This subroutine tests the Store Address command (Function Code 74).
A series of test patterns are entered into A Lower and a STRADR
command is executed using a test cell. The contents of the test
cell are entered into A Upper, and through the use of a Compare
Mask the execution of the Store Address is verified. If the
execution was proper, the next pattern is checked, and on
completion of all patterns an exit is made to the executive
routine (COMA). If during the verification of any of the series
of executions an error is detected, A Upper is entered with the
correct information and A Lower contains the incorrect information
and an exit is made to the display subroutine (TFDIS). Upon
returning to this subroutine (TF74) an exit is made to the
executive routine (COMA) for continuance of the test or re-
cycling of this subroutine (TF74).

| SPECIFICATION SYMBOL |
| SB-10163 |

TITLE: TF74

INPUT PARAMETERS (Listed Sequentially):

COMA

TEST PATTERNS	
TPAT	777777
TPAT5	007777
TCO1	777777
TPAT1	000000
TPAK	002020
TPAK1	005050
TPAK3	007070
TPAT6	707070
TPAB5	010001
TPAR	TEST CELL

OUTPUT PARAMETERS (Listed Sequentially):

BUFF 1

BUFF 2

TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):

COMA (EXEC)

TFDIS – Error Display

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:
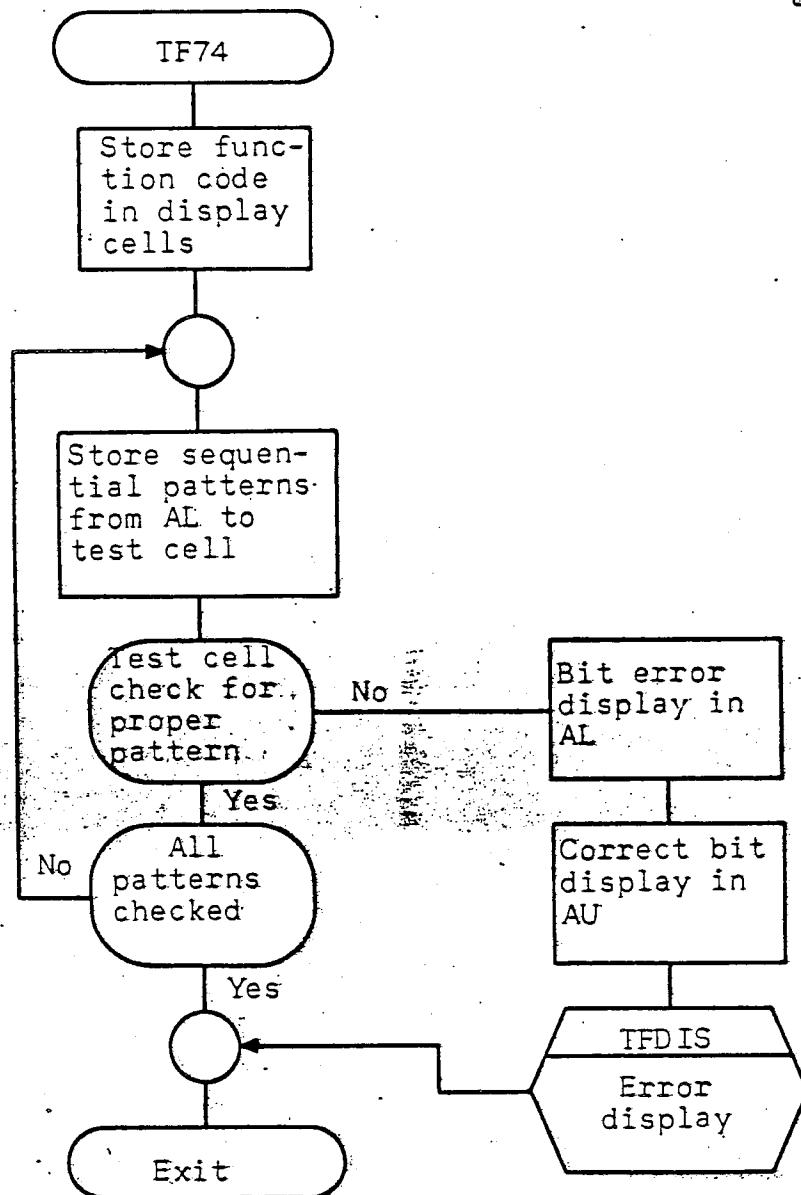
ERROR DISPLAY – PROGRAM STOP 0
        Correct bit configuration in AU
        Incorrect bit configuration in AL
        Function Code (74xxxx) in CO
        PROGRAM SKIP 4 - set for console error display only
                not set for error typeout (Function
                Code 74)
        PROGRAM SKIP 0 not set - continue test; if set -
                recycle subroutine (TF74)

A-1975

```
            ┌──────────────┐
            │     TF74     │
            └──────┬───────┘
            ┌──────┴───────┐
            │ Store func-  │
            │ tion code    │
            │ in display   │
            │ cells        │
            └──────┬───────┘
                  ( )
            ┌──────┴───────┐
            │ Store sequen-│
            │ tial patterns│
            │ from AL to   │
            │ test cell    │
            └──────┬───────┘
         ( Test cell )        ┌──────────────┐
         ( check for )  No    │ Bit error    │
         ( proper    )───────▶│ display in   │
         ( pattern   )        │ AL           │
              │ Yes           └──────┬───────┘
         ( All       )        ┌──────┴───────┐
     No  ( patterns  )        │ Correct bit  │
         ( checked   )        │ display in   │
              │ Yes           │ AU           │
             ( )◀──────       └──────┬───────┘
         ┌────┴─────┐       ╱  TFD IS  ╲
         │   Exit   │      ╱   Error    ╲
         └──────────┘      ╲   display  ╱
                            ╲_____╱
```

TF74:   STORE ADDRESS

SPECIFICATION SYMBOL
SB-10163

TITLE: TF75 - TEST STORE SPECIAL REGISTER (75xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF75   KEY: _____ IS LABEL DUPLICATE? No

PROGRAMMER: PMC modified by TLR   DATE: 8 December 1967

NUMBER OF L₄ OUTPUT INSTRUCTIONS: 75

DESCRIPTION:

This subroutine tests the Store Special Register instruction
(Function Code 75). A number of sequential constants are entered
into the Special Register and the STRSR instruction is executed
and checked for validity. If the execution is proper the next
constant is stored and checked until all have been checked. If
all are correct an exit is made to the executive routine (COMA).
If in checking the store special register instruction an
execution is found to be improper, the correct information is
entered into A Upper, the incorrect information is contained in
A lower, and an exit is made to the display subroutine (TFDIS).
Upon returning to this subroutine (TF75) an exit is made to the
executive routine (COMA) to check for continuing the test or re-
cycling this subroutine (TF75).

SPECIFICATION SYMBOL
SB-10163

TITLE: TF75

INPUT PARAMETERS (Listed Sequentially):
COMA

TEST PATTERNS	
TPAS6	000017
TPAS5	000014
TPAT1	000000
TPAS4	000002

OUTPUT PARAMETERS (Listed Sequentially):

BUFF1

BUFF2

TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):
COMA.

TFDIS - Error Display

SYSTEM DATA REFERENCES:
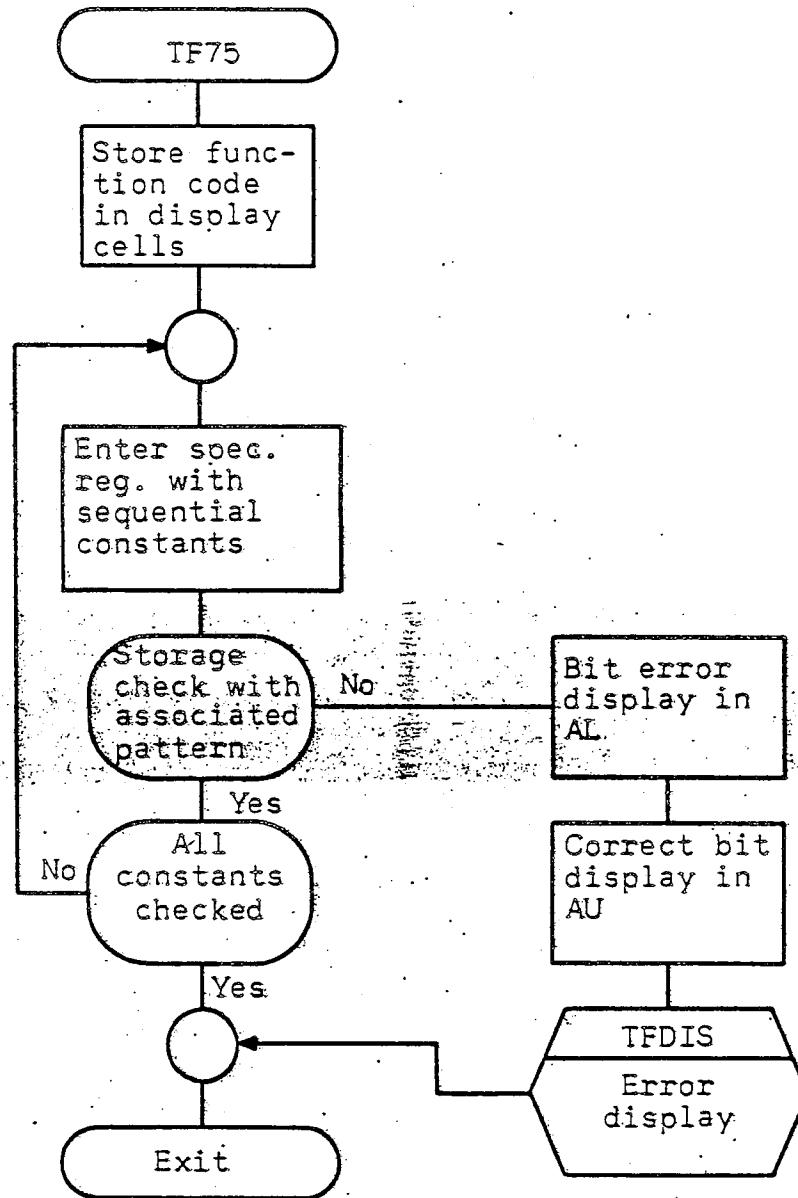
ALARMS AND/OR REMARKS:

ERROR DISPLAY

STOP 0 - correct information in A upper
incorrect information in A lower
function code (75xxxx) in CO

PROGRAM SKIP 4 - set for console error display only
not set for error typeout (Function Code 75)

PROGRAM SKIP 0 - not set to continue test
set to recycle subroutine (TF75)

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SPECIFICATION SHEET

| SHEET | 436 | REVISION | — |

SPECIFICATION SYMBOL
SB-10163

```
            ╭─────────────╮
            │    TF75      │
            ╰──────┬──────╯
            ┌──────┴──────┐
            │ Store func- │
            │ tion code   │
            │ in display  │
            │ cells       │
            └──────┬──────┘
                 ( ● )◄──────────┐
            ┌──────┴──────┐      │
            │ Enter spec. │      │
            │ reg. with   │      │
            │ sequential  │      │
            │ constants   │      │
            └──────┬──────┘      │
          ╭────────┴────────╮  No  ┌──────────────┐
          │ Storage         │─────►│ Bit error    │
          │ check with      │      │ display in   │
          │ associated      │      │ AL           │
          │ pattern         │      └──────┬───────┘
          ╰────────┬────────╯             │
                  Yes                      │
          ╭────────┴────────╮      ┌──────┴───────┐
      No  │     All         │      │ Correct bit  │
     ◄────│  constants      │      │ display in   │
          │   checked       │      │ AU           │
          ╰────────┬────────╯      └──────┬───────┘
                  Yes                      │
                 ( ● )◄──────────┐    ╭────┴────╮
            ╭─────┴─────╮        └────┤ TFDIS   │
            │   Exit    │             │ Error   │
            ╰───────────╯             │ display │
                                      ╰─────────╯
```

TF75:   STORE SPECIAL REGISTER

SPECIFICATION SYMBOL
SB-10163

TITLE: TF76 - TEST RETURN JUMP (76xxxx)

DECK IDENTIFIER: FACT

CS-1 LABEL: TF76   KEY: _____   IS LABEL DUPLICATE? No

PROGRAMMER: PMC modified by TLR   DATE: 8 December 1967

NUMBER OF L_4 OUTPUT INSTRUCTIONS: 21

DESCRIPTION:

This subroutine tests the Return Jump instruction (Function Code 76). A series of RJP commands are executed and checked for validity. If all executions are correct an exit is made to the executive routine (COMA). If the validity check should detect an improper execution an indirect return jump is made to the display subroutine (TF.DIS) and the Function Code (76xxxx) is displayed in CO. Upon returning to this subroutine (TF76) an exit is made to the executive routine (COMA) to check for continuing the test or recycling this subroutine (TF76).

SPECIFICATION SYMBOL
SB-10163

TITLE: TF76

INPUT PARAMETERS (Listed Sequentially):
COMA

OUTPUT PARAMETERS (Listed Sequentially):
BUFF1

BUFF2

TFX

ABNORMAL EXITS (Listed Sequentially):

NEXT LEVEL PROCEDURES OR SUBROUTINES (Keys of Duplicate Labels Specified):
COMA (EXEC)

TFDIS - Error Display

SYSTEM DATA REFERENCES:

ALARMS AND/OR REMARKS:

ERROR DISPLAY

STOP 0 - Function Code (76xxxx) in CO
PROGRAM SKIP 4 - set for console error display only
                 not set for error typeout (Function Code 76)
PROGRAM SKIP 0 - not set to continue test
                 set to recycle subroutine (TF76)