DEVELOPMENT OF A TEST AND FLIGHT ENGINEERING ORIENTED LANGUAGE

PHASE III PRESENTATION

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Prepared for
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John F. Kennedy Space Center

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This booklet contains the material used during the oral presentation to describe the work done in Phase III of the development of a Test and Flight Engineer Oriented Computer language.

Based on an analysis of previously developed test oriented languages (Phase I) and a study of test language requirements (Phase II) a high order language has been designed to enable test and flight engineers to checkout and operate the proposed Space Shuttle and other NASA vehicles and experiments.

The language is called ALOFT:

A Language Oriented to Flight Engineering and Testing

The report describes the language, compares its terminology to similar terms in other test languages, and discusses its features and utilization.

The Phase III report is published as Martin Marietta document MCR-70-424.
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FLIGHT ENGINEER ORIENTED LANGUAGE
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CONTRACT NAS10-7308
PHASE III ORAL PRESENTATION
17 DECEMBER 1970
MEMBERS OF THE STUDY TEAM

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C. WILLIAM CASE
J. GYURE
EDMUND L. KINNEY
STUDY PHASES

PHASE I

REVIEW THE PAST AND CURRENT DEVELOPMENT EFFORT RELATED TO SPACE VEHICLE AUTOMATIC CHECKOUT LANGUAGE

PHASE II

DEVELOP THE NEEDED CHARACTERISTICS FOR A SPACE SHUTTLE AND FLIGHT ENGINEER ORIENTED LANGUAGE

PHASE III

PRODUCE A LIST OF LANGUAGE REQUIREMENTS (A SPECIFICATION) FOR THE BASIC DESIGN OF THE LANGUAGE
A LANGUAGE ORIENTED TO FLIGHT ENGINEERING AND TESTING

A L O F T
FEATURES

TEST ORIENTED CAPABILITIES FOR:

TEST INITIATION
APPLICATION OF STIMULUS
MEASUREMENT OF OUTPUT
COMPARISON OF RESULTS
MAN/MACHINE INTERFACES
RECORDS AND LOGS WITH TIME TAGS
MONITORING
CLOCK AND TIME CONTROLLED ACTIONS
SYSTEM, SUBSYSTEM, AND UNIT TESTING
INDEPENDENCE WITH RESPECT TO TESTING EQUIPMENT VIA:

- DICTIONARY DATA BANKS
- COMMON CHARACTER SET
- FREE FORM WITH RESPECT TO INPUT MEDIA
- NO INTERACTION WITH OPERATING SYSTEM
- TEST WRITER-CREATED SAFING FEATURES
FLEXIBILITY PROVIDED BY:

FULL ARITHMETIC AND RELATIONAL OPERATOR SET
THIRTY-TWO CHARACTER DATA NAMES
ARRAY AND STRUCTURE CAPABILITY
SIMPLE LOOP CAPABILITY
SUBROUTINES
INTEGER, FIXED POINT, BOOLEAN, TEST, BINARY, AND TIME DATA
SIMPLE NUMERIC AND BOOLEAN ASSIGNMENT STATEMENTS
UNCONDITIONAL AND SIMPLE CONDITIONAL TRANSFERS
INTERRUPT INITIATED ROUTINES
ENGINEERING READER ORIENTATION WITH

ENGLISH WORDS FOR PRIMITIVES

NATURAL ENGLISH FORMS AS DELIMITERS

NATURAL STATEMENT STRUCTURE

COMMENTS EASILY ACCOMMODATED
CONCURRENT TEST EXECUTION PROVISIONS:

INITIATED VIA LANGUAGE PRIMITIVES
SYNCHRONIZATION CAPABILITY
MEANING DEPENDENT ON LANGUAGE PROCESSOR IMPLEMENTATION
SELF-EXTENSION THROUGH:

- MACRO DEFINITION CAPABILITY
- OTHER LANGUAGE CAPABILITY
- PROGRAMMER ABILITY TO CREATE NEW PRIMITIVES FROM EXISTING CORE SET AND CREATE SPECIALIZED SUBROUTINES IN OTHER LANGUAGES.
SPECIAL COMMUNICATIONS REQUIREMENTS:

COMPUTER TO COMPUTER

COMPUTER TO DATA BUS
## Comparison of Typical Test Oriented Language Operators

<table>
<thead>
<tr>
<th>ACTION</th>
<th>ATOLL</th>
<th>ATLAS</th>
<th>OTHER</th>
<th>RECOMMENDED</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Apply or turn on:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. an analog stimulus</td>
<td>N/E*</td>
<td>APPLY</td>
<td>STIMULATE (7, 8)**</td>
<td></td>
</tr>
<tr>
<td>b. a discrete stimulus</td>
<td>SSEL, DISO, MD50</td>
<td>APPLY</td>
<td>TURN-ON (4, 5)</td>
<td></td>
</tr>
<tr>
<td>c. a digital stimulus</td>
<td>N/E</td>
<td>APPLY</td>
<td>APPLY (7, 8)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>LINK (8)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>TURN, or SET</td>
<td></td>
</tr>
<tr>
<td>2. Acquire the value of:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. an analog parameter</td>
<td>DELY, TEST, READ</td>
<td>MEASURE</td>
<td>CHECK/ANALOG (7, 8)</td>
<td>MEASURE, READ</td>
</tr>
<tr>
<td>b. a discrete parameter</td>
<td>DELY, TEST, SCAN</td>
<td>MEASURE</td>
<td>CHECK/DISCRETE (7, 8)</td>
<td></td>
</tr>
<tr>
<td>c. a digital parameter</td>
<td>DELY, TEST</td>
<td>MEASURE</td>
<td>LINK (8)</td>
<td></td>
</tr>
<tr>
<td>3. Open the circuit connecting the Unit-Under-Test (UUT) and the test system</td>
<td>N/E</td>
<td>OPEN</td>
<td>TURN-ON (5)</td>
<td>SET----OPEN</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SET (7, 8)</td>
<td></td>
</tr>
<tr>
<td>4. Close the circuit connecting the UUT and the test system</td>
<td>N/E</td>
<td>CLOSE</td>
<td>TURN-OFF (5)</td>
<td>SET----CLOSED</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>RESET (7, 8)</td>
<td></td>
</tr>
<tr>
<td>5. Select connection for routing signals between test system equipment UUT test points</td>
<td>N/E</td>
<td>CONNECT</td>
<td>CONNECT (6, 7, 8)</td>
<td>Connection included in APPLY and MEASURE statements</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Remove connection for routing signals between test system and UUT test points</td>
<td>N/E</td>
<td>DISCONNECT</td>
<td>DISCONNECT (6)</td>
<td>Removal of connection included in APPLY and MEASURE statement</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Vary signal input until measurement satisfies required condition</td>
<td>N/E</td>
<td>ADJUST</td>
<td>N/E</td>
<td>Macro capability will satisfy requirement when needed</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Determine acceptability of acquired values</td>
<td>N/E</td>
<td>COMPARE</td>
<td>IF (4, 5)</td>
<td>IF</td>
</tr>
<tr>
<td>9. Acquire and compare</td>
<td>SCAN</td>
<td>VERIFY</td>
<td>CHECK/ANALOG (7, 8)</td>
<td>VERIFY</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CHECK/DISCRETE (7, 8)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CHECK/PWM (7, 8)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>IF (4, 5)</td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
- *N/E - No equivalent
- **- ATOLL - ATOLL-II
- 1. ATOLL
- 2. ATLAS
- 3. CLASP
- 4. ATOLL-II
- 5. MOLTOL
- 6. TOOL
- 7. CTL
- 8. VTL
- 9. ADAP
- 10. ASEP
- 11. STOL
## COMPARISON OF TYPICAL TEST ORIENTED LANGUAGE OPERATORS

**OUTPUT OPERATORS**

<table>
<thead>
<tr>
<th>ACTION</th>
<th>ATOLL</th>
<th>ATLAS</th>
<th>OTHER</th>
<th>RECOMMENDED</th>
</tr>
</thead>
<tbody>
<tr>
<td>10. Repetitively acquire and evaluate (single values or multiparameters)</td>
<td>MNTR DELY</td>
<td>MONITOR and DISPLAY (only) VERIFY</td>
<td>DD and DI MNTR (4)</td>
<td>VERIFY MONITOR (4, 5)</td>
</tr>
<tr>
<td>11. Acquire the value of several samples of a parameter and store</td>
<td>N/E</td>
<td>N/E</td>
<td>SAMPLE (4, 5)</td>
<td>N/E</td>
</tr>
<tr>
<td>12. Perform arithmetic operations</td>
<td>N/E</td>
<td>CALCULATE</td>
<td>Arithmetic Assignment Statements (3, 4, 5)</td>
<td>LET (variable reference)</td>
</tr>
<tr>
<td>13. Display tutorial, informational, or error messages</td>
<td>DPLY DPM M DFLG</td>
<td>DISPLAY</td>
<td>DISPLAY (4, 5)</td>
<td>DISPLAY (variable)</td>
</tr>
<tr>
<td></td>
<td>RECD DMON</td>
<td>INDICATE</td>
<td>DISPLAY (7, 8)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RMS</td>
<td>PRESENT (5)</td>
<td>PRESENT (5)</td>
<td></td>
</tr>
<tr>
<td>14. Display descriptions and associated slides to operator</td>
<td>DMON</td>
<td>N/E</td>
<td>DISPLAY MA (6)</td>
<td>DISPLAY (Canned Message)</td>
</tr>
<tr>
<td>15. Record output on line printer or typewriter</td>
<td>RECD RED</td>
<td>PRINT</td>
<td>DEVICE - PRINT (5)</td>
<td>PRINT (4)</td>
</tr>
<tr>
<td>16. Record output on magnetic tape, drum, or disc</td>
<td>RECD RED</td>
<td>RECORD</td>
<td>DEVICE - TAPE (5)</td>
<td>RECORD (4)</td>
</tr>
<tr>
<td>17. Save data for later high speed retrieval</td>
<td>READ RGT RCDC</td>
<td>SAVE</td>
<td>READ (5)</td>
<td>READ (7)</td>
</tr>
<tr>
<td>18. Invoke or call a test program</td>
<td>EXEC CALL</td>
<td>N/E</td>
<td>START (3)</td>
<td>PERFORM PROGRAM</td>
</tr>
<tr>
<td>19. Conditional transfer</td>
<td>IMC TFLG</td>
<td>GO TO ---- IF</td>
<td>MEASURE (7, 8)</td>
<td>IF ---- THEN (4, 5)</td>
</tr>
<tr>
<td></td>
<td>TGTC TEST</td>
<td></td>
<td>CK/ANALOG (7, 8)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DELY</td>
<td></td>
<td>CK/DISC (7, 8)</td>
<td></td>
</tr>
</tbody>
</table>

**PROGRAM INITIATION**

**TRANSFER OF CONTROL**
## Comparison of Typical Test Oriented Language Operators

### Unconditional transfer

<table>
<thead>
<tr>
<th>ACTION</th>
<th>ATOLL</th>
<th>ATLAS</th>
<th>OTHER</th>
<th>RECOMMENDED</th>
</tr>
</thead>
<tbody>
<tr>
<td>20. Unconditional transfer</td>
<td>GO TO</td>
<td>GO TO</td>
<td>GO TO (3, 4, 5) RETURN (4, 5)</td>
<td>GO TO</td>
</tr>
</tbody>
</table>

### Transfer control to the operator

<table>
<thead>
<tr>
<th>ACTION</th>
<th>ATOLL</th>
<th>ATLAS</th>
<th>OTHER</th>
<th>RECOMMENDED</th>
</tr>
</thead>
<tbody>
<tr>
<td>21. Transfer control to the operator</td>
<td>SEMI</td>
<td>WAIT FOR (operator intervention)</td>
<td>HOLD, STOP, HALT (4, 5) INTERRUPT (4) REQUEST (5) (part of operating system) (7)</td>
<td>REQUEST</td>
</tr>
</tbody>
</table>

### Repeat step or group of steps embedded in program

<table>
<thead>
<tr>
<th>ACTION</th>
<th>ATOLL</th>
<th>ATLAS</th>
<th>OTHER</th>
<th>RECOMMENDED</th>
</tr>
</thead>
<tbody>
<tr>
<td>22. Repeat step or group of steps embedded in program</td>
<td>EXEC (operator choice)</td>
<td>REPEAT</td>
<td>REPEAT (7, 8)</td>
<td>REPEAT</td>
</tr>
</tbody>
</table>

### Provisions for concurrent testing

<table>
<thead>
<tr>
<th>ACTION</th>
<th>ATOLL</th>
<th>ATLAS</th>
<th>OTHER</th>
<th>RECOMMENDED</th>
</tr>
</thead>
<tbody>
<tr>
<td>23. Provisions for concurrent testing</td>
<td>N/E</td>
<td>N/E</td>
<td>START (4, 5, 6)</td>
<td>CONCURRENTLY PERFORM</td>
</tr>
</tbody>
</table>

### Provisions for synchronizing two separately conducted test programs

<table>
<thead>
<tr>
<th>ACTION</th>
<th>ATOLL</th>
<th>ATLAS</th>
<th>OTHER</th>
<th>RECOMMENDED</th>
</tr>
</thead>
<tbody>
<tr>
<td>24. Provisions for synchronizing two separately conducted test programs</td>
<td>N/E</td>
<td>N/E</td>
<td>SYNC (4, 5)</td>
<td>SYNCHRONIZE</td>
</tr>
</tbody>
</table>

### Exit from present or a program temporarily to provide for other languages

<table>
<thead>
<tr>
<th>ACTION</th>
<th>ATOLL</th>
<th>ATLAS</th>
<th>OTHER</th>
<th>RECOMMENDED</th>
</tr>
</thead>
<tbody>
<tr>
<td>25. Exit from present or a program temporarily to provide for other languages</td>
<td>EXEM Call</td>
<td>LEAVE and RESUME</td>
<td>ENTER ASSEMBLY CODE (4, 5) DIRECT and END (3)</td>
<td>LEAVE and RESUME</td>
</tr>
</tbody>
</table>

### Identify a routine to be executed as a result of an interrupt

<table>
<thead>
<tr>
<th>ACTION</th>
<th>ATOLL</th>
<th>ATLAS</th>
<th>OTHER</th>
<th>RECOMMENDED</th>
</tr>
</thead>
<tbody>
<tr>
<td>26. Identify a routine to be executed as a result of an interrupt</td>
<td>TERM</td>
<td>N/E</td>
<td>POST (4, 5) ON (3) INTERRUPT (10) POST SIM (11)</td>
<td>WHEN INTERRUPT (interrupt name) OCCURS PERFORM (program name)</td>
</tr>
</tbody>
</table>

### Enable/disable interrupts

<table>
<thead>
<tr>
<th>ACTION</th>
<th>ATOLL</th>
<th>ATLAS</th>
<th>OTHER</th>
<th>RECOMMENDED</th>
</tr>
</thead>
<tbody>
<tr>
<td>27. Enable/disable interrupts</td>
<td>N/E</td>
<td>N/E</td>
<td>POST SIM (11)</td>
<td>ENABLE DISABLE</td>
</tr>
</tbody>
</table>

### Postpone execution until time event or value occurs

<table>
<thead>
<tr>
<th>ACTION</th>
<th>ATOLL</th>
<th>ATLAS</th>
<th>OTHER</th>
<th>RECOMMENDED</th>
</tr>
</thead>
<tbody>
<tr>
<td>28. Postpone execution until time event or value occurs</td>
<td>DELAY 1. time 2. event 3. value</td>
<td>DECY WAIT FOR</td>
<td>DETER/KEY (7) DETER/TIME (7) DELAY (4, 5, 8, 10) WAIT (4, 5)</td>
<td>WHEN (time) AFTER (time) VERIFY (event or value) ----WITHIN (time)</td>
</tr>
</tbody>
</table>

### Return system to quiescent state prior to additional testing

<table>
<thead>
<tr>
<th>ACTION</th>
<th>ATOLL</th>
<th>ATLAS</th>
<th>OTHER</th>
<th>RECOMMENDED</th>
</tr>
</thead>
</table>
| 29. Return system to quiescent state prior to additional testing | N/E             | FINISH | N/E | "Black box approach of airlines makes this operator attractive for their application"

### Change program statement

<table>
<thead>
<tr>
<th>ACTION</th>
<th>ATOLL</th>
<th>ATLAS</th>
<th>OTHER</th>
<th>RECOMMENDED</th>
</tr>
</thead>
<tbody>
<tr>
<td>30. Change program statement</td>
<td>N/E</td>
<td>ALTER</td>
<td>N/E</td>
<td>&quot;Undesirable from an operational viewpoint&quot;</td>
</tr>
</tbody>
</table>
### Comparison of Typical Test Oriented Language Operators

<table>
<thead>
<tr>
<th>ACTION</th>
<th>ATOLL</th>
<th>ATLAS</th>
<th>OTHER</th>
<th>RECOMMENDED</th>
</tr>
</thead>
<tbody>
<tr>
<td>31. Establish a series of statements to be accomplished within a specific time period</td>
<td>N/E</td>
<td>PREPARE &amp; EXECUTE</td>
<td>PROC and EXECUTE (4, 5) IMMEO UNTIL (4)</td>
<td>WHEN (time critical subroutine) (See para 3.18)</td>
</tr>
<tr>
<td>32. Communication between two or more digital machines</td>
<td>N/E</td>
<td>N/E</td>
<td>REQUEST and TRANSMIT (4) DISPATCH (5) LINK (8) DIRECT (3)</td>
<td>SEND and READ</td>
</tr>
<tr>
<td>33. Subroutine delimiters</td>
<td>BEGIN and RETN</td>
<td>DEFINE and END</td>
<td>PROC and EXIT (3) BEGIN and END (4) PROC and END (5)</td>
<td>BEGIN and END</td>
</tr>
<tr>
<td>34. Program delimiters</td>
<td>NAME and END</td>
<td>BEGIN and TERMINATE</td>
<td>START and TERMINATE (3)</td>
<td>BEGIN PROGRAM and PROGRAM COMPLETE</td>
</tr>
<tr>
<td>35. Provide standard values for one or more characteristics of a signal type</td>
<td>N/E</td>
<td>SPECIFY</td>
<td>N/E</td>
<td>N/E</td>
</tr>
<tr>
<td>36. Assign a name to a specific function or signal</td>
<td>DECL</td>
<td>DEFINE</td>
<td>DECLARE (4, 5)</td>
<td>SPECIFY REPLACE (substitute an abbreviation)</td>
</tr>
<tr>
<td>37. Declare lists, tables, or names, for stored parameters</td>
<td>RGIT RCDC PROB PROC</td>
<td>N/E</td>
<td>DECLARE ARRAYS, LISTS, &amp; STRINGS (4, 5)</td>
<td>DECLARE</td>
</tr>
<tr>
<td>38. Include a block of common statements or routines into the program as desired</td>
<td>MLSR</td>
<td>N/E</td>
<td>INCORP (4, 5)</td>
<td><a href="#">Macro capability</a> [provides this capability]</td>
</tr>
<tr>
<td>39. Predetermined lists of discretes which will be legal during program run</td>
<td>DISA</td>
<td>N/E</td>
<td>DOMASK (4)</td>
<td><a href="#">Identify in dictionary</a> [data bank]</td>
</tr>
<tr>
<td>40. Specify which display consoles will be enabled to effect program operation</td>
<td>CODE</td>
<td>N/E</td>
<td>CONSOLE (4) LEGAL (10)</td>
<td>Test operation and program can be structured to ignore inadvertent console action</td>
</tr>
<tr>
<td>41. Remove or add specific or all discretes from a monitor profile</td>
<td>PREM PROC</td>
<td>N/E</td>
<td>DOMASK (4) DEMASK (4) RELEASE MONITOR (4, 5)</td>
<td>ACTIVATE DEACTIVATE RELEASE</td>
</tr>
</tbody>
</table>
Language Syntax Diagrams

SIMPLE DATA ORGANIZATION

DECLARE NAME

NUMERIC

BOOLEAN

MESSAGE

TIME

(Positive integer required)

NAME NUMBER STATE

(TIME VALUE, DENVER, DO/VS/ON)
dim :: = any of the dimensions listed in the matrix below.

<table>
<thead>
<tr>
<th>FUNCTION TYPE</th>
<th>BASIC UNIT</th>
<th>(10^1)</th>
<th>(10^2)</th>
<th>(10^3)</th>
<th>(10^4)</th>
<th>(10^5)</th>
<th>(10^6)</th>
<th>(10^7)</th>
<th>(10^8)</th>
<th>(10^9)</th>
<th>(10^{10})</th>
<th>(10^{11})</th>
</tr>
</thead>
<tbody>
<tr>
<td>volts ac/dc</td>
<td>volt</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>current ac/dc</td>
<td>ampere</td>
<td>A</td>
<td></td>
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<tr>
<td>frequency</td>
<td>hertz</td>
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<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>pulses per second</td>
<td>PPS</td>
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</tr>
<tr>
<td>time</td>
<td>day</td>
<td></td>
<td></td>
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</table>
BINARY NUMBER

STATE

TEXT CONSTANT

TEXT

CHAR STRING

TIME VALUE

(Positive integers required for all)
DECLARE_T2_TIME.
DECLARE_FLAG_1_BOOLEAN = OFF.
DECLARE "INPUT"_VALUE OF X_NUMERIC.
DECLARE_OUTPUT DATA "FOR CRT 1"
  MESSAGE = TEXT (END OF TEST.).
AFTER CLOCK 1 IS 5MSEC,
MEASURE_FUNCTION OF X AND SAVE AS Y.
<table>
<thead>
<tr>
<th>FUNCTION NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAME</td>
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</table>

**FUNCTION SPECIFICATION**
- SPECIFY

**ON**
- BUS
- BINARY NUMBER

**WITH**
- ADDRESS
- BINARY NUMBER

**CHANNEL**
- USING
- FUNCTION

**STATE**
- VALUE
- CONVERTED
- BY

**SUBROUTINE NAME**
000100 NAME        ILAFF
000200 CODE        A4
001000 DISA        MDO,123
                  
001400 DISO1       MDO,123
001500 DELY1       10 MDII11, BOO3100 
                  ↑
001600 SEMI1       *BATTERY TRANSFER CONTROL NO GO REF 0015*
                  
003100 TFLG1       F14, B999999
                  :
999999 END
BEGIN BATT.TEST

DECLARE EXTERNAL DOV(BATT.TRANS.CONT=D213)

DECLARE EXTERNAL VDI(BATT.TRANS.IND=D512)

CONSOLE=A4

TURN ON BATT.TRANS.CONT, ELSE GO TO BTNG

DELAY 10 MS

IF BATT.TRANS.IND IS ON, THEN GO TO NEXTTEST,
ELSE CONTINUE

HALT $ BATTERY TRANSFER IS NO GO C102 $

END BATT.TEST
BEGIN DICTIONARY DATA BANK_BATTERY FUNCTIONS_.

SPECIFY_BATTERY TRANSFER CONTROL ON BUS 1 AND IU 1

USING FUNCTION CODE B0101000000

AND CONVERTED BY_BATTOUT_.

SPECIFY_BATTERY TRANSFER INDICATOR ON BUS 2 AND IU 2

USING FUNCTION CODE B1101000000

AND CONVERTED BY_BATTIN_.

SPECIFY_CRT1, LINE 1 ON BUS 3 AND IU 3

USING FUNCTION CODE B0000010001

AND CONVERTED BY_CHARCONV_.

SPECIFY_CRT1, LINE 2 ON BUS 3 AND IU 3

USING FUNCTION CODE B0000010010

AND CONVERTED BY_CHARCONV_.

DICTIONARY DATA BANK_BATTERY FUNCTIONS_COMPLETE.
BEGIN PROGRAM_BATTERY_TEST_.

USE_DICTIONARY_DATA_BANK_BATTERY_FUNCTIONS_.

DECLARE RESPONSE_MESSAGE WITH 1 CHARACTER.

TURN_BATTERY_TRANSFER_CONTROL_ON.

VERIFY_BATTERY_TRANSFER_INDICATOR_WITHIN_10MSEC_THEN

GOTO STATEMENT 10.

DISPLAY TEXT (BATTERY_TRANSFER IS NOGO.) ON_CRT1, LINE 1_.

STATEMENT 20 REQUEST TEXT (TYPE Y TO CONTINUE, N TO END TEST.) ON

_CRT1, LINE 2_ AND SAVE INPUT AS RESPONSE_.

IF RESPONSE IS EQUAL TO TEXT (Y) THEN GOTO STATEMENT 10.

IF RESPONSE IS EQUAL TO TEXT (N) THEN GOTO STATEMENT 100.

DISPLAY TEXT (INPUT_ERROR.) ON_CRT1, LINE 1_.

GOTO STATEMENT 20.

STATEMENT 10 "PROGRAM CONTINUES" 

.

STATEMENT 100 PROGRAM_BATTERY_TEST_COMPLETE.
A LANGUAGE ORIENTED TO FLIGHT ENGINEERING AND TESTING (ALOFT)

- INCORPORATES KNOWLEDGE OF PREVIOUSLY DESIGNED TEST LANGUAGES
- INCORPORATES KNOWLEDGE OF SPACE SHUTTLE CONFIGURATION
- INCORPORATES KNOWLEDGE OF THE GENERAL TEST AND CHECKOUT PROBLEM
ALOFT PROVIDES:

- EASE OF READING, LEARNING, AND USE
- POWERFUL CAPABILITIES FOR MATCHING ANY TEST ENVIRONMENT
- INTERNAL GROWTH WITHOUT REDESIGN OF THE LANGUAGE
- POTENTIAL LONG TERM USE
SPECIFICATION OF ALOFT

A LANGUAGE ORIENTED TO FLIGHT ENGINEERING AND TESTING

(The specification for ALOFT appears as Appendix A of the Phase III Report, MCR-70-424; and has been separately prepared as MCR-70-450.)
### Abstract

This booklet contains the specification for **ALCFT**, a Language Oriented to Flight Engineering and Testing.

ALCFT provides the language characteristics needed to test and operate the Space Shuttle and other NASA space vehicles and experiments. Using the good features of previously developed test-oriented languages and correcting for their faults; ALCFT has been designed to operate in a multidisciplined environment, independent of the test system. These important features should ensure wide acceptance by its users and permit structuring tests long before the test system is finalized.

The ALCFT language is readily learned, easy to write, and its English-like nonambiguous statements ensure that the readers will understand the test procedures.

ALCFT was conceived during work on contract NAS10-7303 for the Development of a Test and Flight Engineer Oriented Computer Language.

Criteria for the design of ALCFT is documented in Martin Marietta reports MCR-70-327, MCR-70-365, and MCR-70-424.

### Key Words

<table>
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<tr>
<th>Key Words</th>
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### Security Classification

- Report: UNCLASSIFIED
- Page: UNCLASSIFIED
MCR-70-425

APPENDIX B

KAF2 FLIGHT CONTROL PREPS PROGRAM

WRITTEN IN A T O L L

(Phase III Presentation Material NAS10-7308)
### ST-PROGRAM COMPILATE OF IVAR KAF2

**NAME**

*F7C* DAT PREPS AS509 6/10/70 REV 0

**CODE**

IKAF2

**DISA**

A4,A12,B12,A13

**PAYOFF**

MD0,378,379,408,409,410,480,

694,695,1790,1799,1801,1803,

1807,1819,1823,1903,1904,1905,

1906,1907,1909,1910,2006,2007,

2008,2009,1769,1800,1802,1804,

1805,1806

**DECL.**

S-1C/BURN, DPAO-12J01-04-

S-2BURN, DPAO-12J07-08-

S-48/BURN, DPAO-12J02-01-

P/SERV0/COMP, DPAO-12J03-01-

Y/SERV0/COMP, DPAO-12J04-01-

R-YL/SP/COMP, DPAO-12J05-01-

R-Y2/SP/COMP, DPAO-12J07-01-

FCC/0NY/6011, DPAO-12J01-03-

FCC/0NY/6031, DPAO-12J01-04-

R-ROLL/COMP, DPAO-12J08-02-

YAW/COMP, DPAO-12J08-03-

PITCH/COMP, DPAO-12J08-04-

REF/ROLL, DPAO-03-05-

REF/YAW, DPAO-03-04-

REF/PITCH, DPAO-03-06-

CMD/ROLL, CP1A0-03-03-

CMD/YAW, CP1A0-03-02-

CMD/PITCH, CP1A0-03-01-

CSP/P0WER/YN, DPAO-12J01-06-

WH/SP/GR-1, DPAO-12J08-05-

WH/SP/GR-2, DPAO-12J08-06-

WH/SP/GR-3, DPAO-12J08-07-

MD0-489, MD0-694, MD0-695-

MD0-1790, MD0-1799, MD0-1801-

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MD0-378, MD0-410, MD0-1909-

CLEAR ALL STORAGE TABLES USED IN THIS PROGRAM

SC0V

SC0W

SC0X

SC0Y

SC0Z

LDIA,LDI,ALL

LD0A,LD0,ALL

F-1,-2,-3,-4,-5,-6,-7,-8,-9,-

-10,-11,-12,-13,-14

SET ALL FLAGS USED IN THIS PROGRAM TO ZERO

014100

014200

014300

014400

014500

014600

014700

014800

014900

015000

015100

015200

015300

015400

015500

015600

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016000

016100

016200

016300

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016500

016600

016700

016800

016900

017000

017100

017200

017300

017400

017500

017600

017700

017800

017900

018000

018100

018200

018300

018400

018500

018600

018700

018800

018900

019000

019100

019200
**PREPS AS509 6/15/70 REV.**

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**IF NOT CALLED BY LINKER BRANCH TO MANUAL OPTION SELECT**

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**SET FLAG 6, INDICATES FCC POWERED ON BY PROGRAM**

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*PROGRAM COMPILATION OF IVAR KAF2 SERIES 000000 DATE 000000*
IF EDS/CRG OPTION NOT SELECTED BRANCH TO FCC PANEL SET UP

IF CSP PWR IS ON BRANCH TO TEST OF WHEEL SPEED INDICATIONS.

SET TIME CELL B USED FOR UP TO SPEED INDICATIONS

STORE GMT INTO SCOW

ISSUE CSP POWER ON

SET FLAG 5 INDICATES CSP POWERED ON BY PROGRAM

IF FCC OPTION NOT SELECTED BRANCH TO EDS/CRG PANEL SET UP

TEST CSP POWER

FCC MODE CHECKS IN PROGRESS

ISSUE S-1C BURN MODE ON

TEST FCC POWER BUSS +6D11

TEST FCC POWER BUSS +6D31

TEST FCC POWER BUSS +6D31A

TEST S-1C BURN MODE

ISSUE S-11, S-1VB BURN AND COAST MODES OFF

ISSUE S-IC BURN MODE

TEST S-1C/BURN, B105300

DISO1 MDO, 2009

IF EDS/CRG OPTION IS NOT SELECTED BRANCH TO FCC MODE CHECK

TEST CSP POWER

ZERO EDS/CRG RAMPS

ISSUE YAW AND ROLL AXIS, SPARE OFF, REF. CMD, AND PITCH AXIS ON

IF FCC OPTION NOT SELECTED BRANCH TO WHEEL SPEED TEST

TEST S-11 BURN MODE
67 TESTO ISSUE S-11 BURN MODE OFF, S-IVB BURN MODE ON
68 MEMO SET INDEX REGISTER 3 TO 7
69 SFLG1 TEST FOR TCB +8 SECONDS
70 TEST IF TCB +8 SECONDS EXPIRED BRANCH TO WHEEL SPEED TEST
71 G0T0 ISSUE CCIS RAMP POSITIVE FOR 1 SEC.
72 DIS01 DECREMENT INDEX REGISTER 3
73 INX -1 2
74 TFLG0 IF EDS/CRG OPTON NOT SELECTED BRANCH TO FCC COMPARATOR CK
75 TFLG1 IF CSP NOT TURNED ON BY PROGRAM BYPASS WHEEL SPEED TEST
76 TFLG1 HAS GR-1 UP-T0-SPEED DATA ALREADY BEEN TAKEN
77 TESTO STORE GMT IN SCOX
78 HGMT SET FLAG 7, INDICATES GR-1 UP-T0-SPEED DATA TAKEN
79 SFLG0 HAS GR-2 UP-T0-SPEED DATA ALREADY BEEN TAKEN
80 TFLG1 TEST GR-2 UP-T0-SPEED INDICATION
81 TESTO STORE GMT IN SC0Y
82 HGMT SET FLAG 8, INDICATES GR-2 UP-T0-SPEED DATA TAKEN
83 SFLG1 HAS GR-3 UP-T0-SPEED DATA ALREADY BEEN TAKEN
84 TFLG1 TEST GR-3 UP-T0-SPEED INDICATION
85 TESTO STORE GMT IN SC0Z
86 HGMT SET FLAG 9, INDICATES GR-3 UP-T0-SPEED DATA TAKEN
87 SFLG0 ARE ALL GROUPS UP-T0-SPEED
88 MTG TEST TCB +20 SECONDS
89 TEST IF TCB +20 SECONDS EXPIRED BRANCH TO ERROR MESSAGE
90 G0T0 ISSUE EDS/CRG RAMP POSITIVE FOR 3 SECONDS
91 DIS01 TEST REF. PITCH FOR +2 TO +6 DEG/SEC
92 TESTN 3.25 0.25 0.75 VDC PREP/PITCH, B106200
   READ REF. PITCH INTO TAB 1
<table>
<thead>
<tr>
<th>Instruction</th>
<th>Description</th>
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<tbody>
<tr>
<td>93 HEAD</td>
<td>TEST CMD PITCH FBR +/- 0.4 DEG/SEC: OF REF.</td>
</tr>
<tr>
<td>94 TESTN</td>
<td>TAB1 0.10 0.10 VDC PCMD/PITCH, B106400</td>
</tr>
<tr>
<td>95 DIS01</td>
<td>DELAY UNTIL RAMP AT ZERO OR 10 SEC.EXPIRES</td>
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<tr>
<td>96 DELY0</td>
<td>ISSUE EDS/CRG RAMP NEGATIVE FOR 3 SECONDS</td>
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<tr>
<td>98 DIS01</td>
<td>TEST REF. PITCH FBR -2 TO -6 DEG/SEC</td>
</tr>
<tr>
<td>99 TESTN</td>
<td>1.75 0.75 0.25 VDC READ REF. PITCH INTO TAB 1</td>
</tr>
<tr>
<td>100 HEAD</td>
<td>TEST CMD PITCH FBR +/- 0.4 DEG/SEC: OF REF.</td>
</tr>
<tr>
<td>101 TESTN</td>
<td>TAB1 0.10 0.10 VDC PCMD/PITCH, B106800</td>
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<tr>
<td>102 DIS00</td>
<td>DESELECT REF. GYRO</td>
</tr>
<tr>
<td>103 DIS01</td>
<td>ISSUE EDS/CRG RAMP POSITIVE ON</td>
</tr>
<tr>
<td>104 DELY1</td>
<td>DELAY UNTIL EDS/CRG PITCH COMP. SETS OR 3 SECONDS EXPIRES</td>
</tr>
<tr>
<td>105 DIS00</td>
<td>ISSUE EDS/CRG RAMP POSITIVE OFF</td>
</tr>
<tr>
<td>106 TESTO</td>
<td>IF EDS/CRG PITCH COMP. NOT SET BRANCH TO ERROR MESSAGE</td>
</tr>
<tr>
<td>107 DIS01</td>
<td>ISSUE CMD: GYRO OFF, SPARE GYRO ON</td>
</tr>
<tr>
<td>108 TESTN</td>
<td>3.25 0.25 0.75 VDC ZERO EDS/CRG RAMPS</td>
</tr>
<tr>
<td>109 DIS01</td>
<td>DELAY UNTIL EDS/CRG RAMP AT ZERO OR 10 SECONDS EXPIRES</td>
</tr>
<tr>
<td>110 DELY0</td>
<td>ISSUE EDS/CRG RAMP NEGATIVE FOR 3 SECONDS</td>
</tr>
<tr>
<td>112 DIS01</td>
<td>TEST SPARE PITCH FBR +2 TO +6 DEG/SEC</td>
</tr>
<tr>
<td>113 TESTN</td>
<td>1.75 0.75 0.25 VDC ZERO EDS/CRG RAMPS</td>
</tr>
<tr>
<td>114 DIS01</td>
<td>TEST SPARE PITCH FBR -2 TO -6 DEG/SEC</td>
</tr>
<tr>
<td>115 TFLG0</td>
<td>IF FCC OPTION NOT SELECTED BRANCH TO EDS/CRG YAW RAMP CHECK</td>
</tr>
<tr>
<td>116 DIS01</td>
<td>ISSUE FCC COAST TEST MODE ON</td>
</tr>
<tr>
<td>117 TESTO</td>
<td>DECIMENT INDEX REGISTER 3</td>
</tr>
<tr>
<td>118 INCX</td>
<td>-1 2 DECIMALS</td>
</tr>
<tr>
<td>119 DELY1</td>
<td>DELAY UNTIL FCC PITCH SERVO COMP. SETS OR 3 SECONDS EXPIRES</td>
</tr>
</tbody>
</table>

**Notes:**
- ST-PROGRAM COMPILE OF IVAR KA92 SERIES AS509
- DATE: 04/10/70 REV 0
- HEAD: VDC PREF/PITCH, TAB1
- DIS01: 100MD0,410
- DIS02: 100MD0,410
- DIS03: 300MD0,694
- DIS04: MD0,1907
- DIS05: 300MD0,694
- DIS06: 300MD0,694
- DIS07: 300MD0,694
- DIS08: 300MD0,694
- DIS09: 300MD0,694
- DIS10: 300MD0,694
- DIS11: 300MD0,694
- DIS12: MD0,1807
- DIS13: 300PP/SERVO/COMP, B012100
- DIS14: 300PP/SERVO/COMP, B012100
- DIS15: PS-4B/RUN, B017600
IF DELAY EXPIRES BRANCH TO ERROR MESSAGE

120 G010

ISSUE CCIS YAW AXIS ON

MD0,1799

121 DIS01

ISSUE CCIS PITCH AXIS OFF

MD0,1801

122 DIS00

DELAY UNTIL FCC YAW SERVO COMP.SETS OR 3 SECONDS EXPIRES

123 DELYS

IF DELAY EXPIRES BRANCH TO ERROR MESSAGE

124 G010

ISSUE S-IVB BURN MODE AND COAST TEST MODE OFF

MD0,1807,2007

125 DIS05

IF EDS/CRG OPTION NOT SELECTED BRANCH TO FCC SPAT.CMP.CHECK

126 TFLG0

ISSUE PITCH AXIS AND SPARE OFF.YAW AXIS,REF.AND CMD ON

MD0,1905,-1906.1907,1909,-1910

127 MDS0

DELAY UNTIL EDS/CRG RAMP AT ZERO OR 10 SECONDS EXPIRES

10000MD1635

128 DELY0

ISSUE EDS/CRG RAMP POSITIVE FOR 3 SECONDS

3000MD0,694

130 DIS01

TEST REF.YAW FOR +2 TO +6 DEG/SEC.

131 TESTN 3.25 0.25 0.75 VDC

READ REF.YAW INTO TAB 1

PREF/YAW,B108500

132 READ

VDC

PREF/YAW,TAB1

133 TESTN TAB1 0.10 0.10 VDC

ZERO EDS/CRG RAMP

134 DIS01

DELAY UNTIL EDS/CRG RAMP AT ZERO OR 10 SECONDS EXPIRES

100MD0,410

135 DELY0

ISSUE EDS/CRG RAMP NEGATIVE FOR 3 SECONDS

10000MD0,695

136 DIS01

TEST REF.YAW FOR -2 TO -6 DEG/SEC.

138 TESTN 1.75 0.75 0.25 VDC

READ CMD YAW INTO TAB 1

PREF/YAW,B108900

139 READ

VDC

PREF/YAW,TAB1

140 TESTN TAB1 0.10 0.10 VDC

DESELECT REF.GYR

141 DIS00

MD0,1907

142 DIS01

ISSUE EDS/CRG RAMP POSITIVE ON

MD0,694

143 DELY1

DELAY UNTIL EDS/CRG YAW COMPARET SETS OR 3 SECONDS EXPIRES

3000PYAW/COMP

144 DIS00

ISSUE EDS/CRG RAMP POSITIVE OFF

MD0,694

145 TEST0

IF EDS/CRG YAW COMP. NOT SET BRANCH TO ERROR MESSAGE

PYAW/COMP,B109300

146 MDS0

ISSUE CMD.GYR OFF,SPARE GYR ON

MD0,-1909,1910

147 DIS01

ISSUE EDS/CRG RAMP POSITIVE ON FOR 3 SECONDS

3000MD0,694

148 DIS00

ISSUE CMD.GYR OFF,SPARE GYR ON
**PROGRAM COMPILATION OF IVAR KAF2 SERIES - AS509**

**Revision 0000**

**Date at Preps AS509: 6/10/70**

---

148 **TESTN**

3.25 0.25 0.75 VDC

PCMD/YAW, B109500

**DIS01**

100MD0, 410

**DLY0**

1000MD1635

**DIS01**

300MD0, 695

**TESTN**

1.75 0.75 0.25 VDC

PCMD/YAW, B109700

**DIS01**

100MD0, 410

**TFLGO**

F1, B016900

**DIS01**

MD0, 1807

**DLY1**

3000PR-Y1/SP/CMP, B015900

**GOT0**

B109000

**DIS00**

MD0, 1799

**DLY1**

3000PP/SPAT/CMP, B016900

**GOT0**

B110100

**DIS01**

MD0, 1801

**DIS00**

MD0, 1799

**DLY1**

3000PP/SPAT/CMP, B016900

**GOT0**

B110300

**DIS01**

100MD0, 378

**DIS00**

MD0, 1790

**DIS00**

MD0, 1801, 1803, 1807, 1819

**TFLGO**

F2, B021100

**MDS0**

MD0, 1904, 1905, 1907, 1909, 1910

**DIS00**

MD0, 1800MD1635

**DLY0**

10000MD1635

**DIS01**

3000MD0, 695

**TESTN**

3.25 0.25 0.75 VDC

PCMD/ROLL, B110500

**TFLGO**

READ REF. ROLL INTO TAB 1

**MDS0**

MD0, 1904, 1905, 1907, 1909, 1910

**DLY0**

10000MD1635

**DIS01**

3000MD0, 695

**TESTN**

TAB1 0.10 0.10 VDC

PCMD/ROLL, B110700

---
176 DIS01: ZERO EDS/CRG RAMPS
177 DELY0: DELAY UNTIL EDS/CRG RAMPS AT ZERO OR 10 SECONDS EXPIRES
179 DIS01: ISSUE EDS/CRG RAMP NEGATIVE FOR 3 SECONDS
180 TESTN: TEST REF.ROLL FOR -2 TO -6 Deg/SEC
181 READ: READ REF.ROLL INTO TAB 1
182 TESTN: TEST CMD.ROLL FOR +/- 0.4 Deg/SEC OF REF.
183 DIS00: ISSUE EDS/CRG RAMP POSITIVE ON
184 DIS01: DELAY UNTIL EDS/CRG ROLL COMP. SETS OR 3 SECONDS EXPIRES
185 DELY1: ISSUE EDS/CRG RAMP POSITIVE OFF
186 DIS00: IF EDS/CRG ROLL COMP. NOT SET BRANCH TO ERROR MESSAGE
187 TEST0: ISSUE CMD. GYRO OFF, SPARE GYRO ON
188 MDS0: ISSUE EDS/CRG RAMP POSITIVE ON FOR 3 SECONDS
189 DIS01: TEST SPARE ROLL FOR +2 TO +6 Deg/SEC.
190 TESTN: 3.25 0.25 0.25 VDC
191 DIS01: DELAY UNTIL EDS/CRG RAMPS AT ZERO OR 10 SECONDS EXPIRES
192 DELY0: ISSUE EDS/CRG RAMP NEGATIVE FOR 3 SECONDS
194 DIS01: TEST SPARE ROLL FOR -2 TO -6 Deg/SEC.
195 TESTN: 1.75 0.75 0.25 VDC
196 DIS01: IF PROGRAM DID NOT TURN ON CSP BYPASS WH. SP. DATA OUTPUT
197 TFLGO: WHEEL SPEED DATA OUTPUT ROUTINE
198 UPLY: *EDS/CRG SYSTEM POWER APPLICATION
199 NECDC
200 TFLGO: *GROUP 1, UP TO SPEED
201 UPLY: SC0X, RDY
202 NECDC: F7, 08020300
203 TFLGO: SC0Y, RDY
204 DPLY: F8, 08020600
205 NECDC: SC0Y, RDY
206 TFLGO: F9, 08020900
207 DPLY: SC0Z, RDY
ISSUE REF. CMD, SP, PITCH, YAW, AND ROLL AXIS OFF.

209 MDSO

If FCC OPTION NOT SELECTED BRANCH TO EDS/CRG COMP. RESET

210 TFLG0

If program did NOT turn ON FCC BYPASS POWER ON DATA OUTPUT

211 TFLG0

FCC POWER ON DATA OUTPUT

212 UPLY

*FCC SYSTEM POWER APPLICATION

213 RECDC

SCOV, RDY

214 UPLY

*FCC PREPS PERFORMED

215 TFLG1

If FCC COMP. SET OPTION SELECTED, BYPASS COMP. RESET

216 DISO1

100MDO, 379

217 GOTO

8021900

218 UPLY

*FCC COMP. SETS REMAINED SET

219 TFLG0

100MDO, 409

220 UPLY

*EDS/CRG PREPS PERFORMED

221 TFLG1

If EDS/CRG COMP. SET OPTION SELECTED, BYPASS COMP. RESET

222 DISO1

100MDO, 409

223 GOTO

8022500

224 UPLY

*EDS/CRG COMP. SETS REMAINED SET

225 MSFG

CLEAR ALL FLAGS USED

226 RECDC

SCOV

227 RECDC

SCOW

228 RECDC

SCOX

229 RECDC

SCOX

230 RECDC

SCOX

231 PREM

LDIA, LDI, ALL

232 UPLY

KAF2 COMPLETE

233 NGMT1

8999998

234 GOTO

KAF2: MANUAL OPTION SELECT ROUTINE

1000 UPLY

KAF2-PRIMARY OPTIONS. ENTER SPR AND OPTION DESIRED

1. FCC AND EDS/CRG PREPS

2. FCC PREPS ONLY

3. EDS/CRG PREPS ONLY

1001 SEMIR

4B100200, B100500, B100800, B101100

1002 UPLY

OPTION ENTERED 1

F, 1, 2

1003 MSFG

8101300

1004 GOTO

8101300

1005 UPLY

OPTION ENTERED 2

F1

1006 SFLG1

8101300

1007 GOTO

8101300

1008 UPLY

OPTION ENTERED 3

F2

1009 SFLG1
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<td>GTO</td>
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<td>1053</td>
<td>UPLY</td>
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Secondary Options, Enter Spr and Option Desired

1. FCC and EDS/CRG Comparators Reset
2. FCC Comparators Set
3. EDS/CRG Comparators Set
4. FCC and EDS/CRG Comparators Set

Kaf2 Error Routines

Error Routine For Ldi Scan Failure

Configuration Scan Unsuccessful:

***ERROR***

Configuration Scan On: IVXF0, B185000

---

Program Compile Of Ivar Kaf2 Series • As509 Revision • 0000 Date

Preps As509 6/10/70 Rev 0
INCRIMENT ROUTINE FOR FCC TEST INPUTS

1054 G0T0 8006100
1055 DPLY **CSP-SYSTEM POWER INDICATION DID NOT COME ON
1056 G0T0 8006400
1057 DPLY 5000PS-2/BURN, 8006800
1058 DPLY **S-I1 BURN MODE INDICATION DID NOT COME ON
1059 G0T0 8006800
1060 DPLY **ALL UP TO SPEED IND. DID NOT COME ON WITHIN 20 SEC
1061 G0T0 8009400
1062 DPLY **REF.PITCH POS. NOT WITHIN 2 TO 6 DEG/SEC.
1063 G0T0 8009300
1064 DPLY **CMD.PITCH POS. NOT WITHIN 0.4 DEG/SEC. OF REF.
1065 G0T0 8009500
1066 DPLY **REF.PITCH NEG. NOT WITHIN -2 TO -6 DEG/SEC.
1067 G0T0 8010000
1068 DPLY **CMD.PITCH NEG. NOT WITHIN 0.4 DEG/SEC. OF REF.
1069 G0T0 8010200
1070 DPLY **EDS/CBG PITCH COMPARATOR DID NOT SET.
1071 G0T0 8010650
1072 DPLY **SPARE PITCH POS. NOT WITHIN 2 TO 6 DEG/SEC.
1073 G0T0 8010900
1074 DPLY **SPARE PITCH NEG. NOT WITHIN -2 TO -6 DEG/SEC.
1075 G0T0 8011400
1076 DPLY **S-IVB BURN MODE INDICATION DID NOT COME ON.
1077 G0T0 8011800
1078 DISI01 1000M00, 480
1079 INCX -1 1
1080 G0T0 8011900
1081 DPLY **FCC.PITCH SERVO COMPARATOR DID NOT SET.
1082 G0T0 8012100
1083 DPLY **FCC YAW SERVO COMPARATOR DID NOT SET.
1084 G0T0 8012500
1085 DPLY **REF.YAW POS. NOT WITHIN 2 TO 6 DEG/SEC.
1086 G0T0 8013200
1087 DPLY **CMD.YAW POS. NOT WITHIN 0.4 DEG/SEC. OF REF.
1088 G0T0 8013400
1089 DPLY **REF.YAW NEG. NOT WITHIN -2 TO -6 DEG/SEC.
1090 G0T0 8013900
1091 DPLY **CMD.YAW NEG. NOT WITHIN 0.4 DEG/SEC. OF REF.
1092 G0T0 8014100
1093 DPLY **EDS/CBG YAW COMPARATOR DID NOT SET.
1094 G0T0 8014600
1095 DPLY **SPARE YAW POS. NOT WITHIN 2 TO 6 DEG/SEC.
1096 G0T0 8014900
1097 DPLY **SPARE YAW NEG. NOT WITHIN -2 TO -6 DEG/SEC.
1098 G0T0 8015400
1099 DPLY **FCC R-Y 1 SPATIAL COMPARATOR DID NOT SET.
1100 G0T0 8015900
1101 DPLY **FCC R-Y 2 SPATIAL COMPARATOR DID NOT SET.
1102 G0T0 8016100
1103 DPLY **FCC PITCH SPATIAL COMPARATOR DID NOT SET.
1104 G0T0 8016500
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>1105</td>
<td><strong>REF. ROLL POS. NOT WITHIN +2 TO +6 DEG/SEC.</strong></td>
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<td>1106</td>
<td><strong>REF. ROLL POS. NOT WITHIN 0.4 DEG/SEC. OF REF.</strong></td>
</tr>
<tr>
<td>1107</td>
<td><strong>CMD. ROLL POS. NOT WITHIN -2 TO -6 DEG/SEC.</strong></td>
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<td>1108</td>
<td><strong>CMD. ROLL NEG. NOT WITHIN 0.4 DEG/SEC. OF REF.</strong></td>
</tr>
<tr>
<td>1109</td>
<td><strong>CMD. ROLL NEG. NOT WITHIN -2 TO -6 DEG/SEC.</strong></td>
</tr>
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<td>1110</td>
<td><strong>EDS/CRG ROLL COMPARATOR DID NOT SET.</strong></td>
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<tr>
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<td><strong>SPARE ROLL POS. NOT WITHIN +2 TO +6 DEG/SEC.</strong></td>
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<td>1112</td>
<td><strong>SPARE ROLL NEG. NOT WITHIN -2 TO -6 DEG/SEC.</strong></td>
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<td><strong>SPARE ROLL NEG. NOT WITHIN -2 TO -6 DEG/SEC.</strong></td>
</tr>
<tr>
<td>1114</td>
<td><strong>VXF3-SUBROUTINE WHICH OFFERS RETRY OR TERMINATE ONLY</strong></td>
</tr>
<tr>
<td>1115</td>
<td><strong>PROGRAM CANNOT CONTINUE WITH THIS ERROR</strong></td>
</tr>
<tr>
<td>1116</td>
<td><strong>SECOND DELAY UNLESS THE S-IC BURN MODE SWITCH IS PLACED ON</strong></td>
</tr>
<tr>
<td>1117</td>
<td><strong>PROGRAM WILL TERMINATE AFTER 10 SECONDS.</strong></td>
</tr>
<tr>
<td>1118</td>
<td><strong>PROGRAM WILL RETRY THE FAILED CONDITION WHEN THE S-IC BURN MODE SWITCH IS RETURNED TO AUTO.</strong></td>
</tr>
<tr>
<td>1119</td>
<td><strong>PROGRAM IS RETESTING FAILED CONDITION</strong></td>
</tr>
<tr>
<td>1120</td>
<td><strong>TEST STEP SUBSEQUENT TO THE RETURN OPERATOR</strong></td>
</tr>
<tr>
<td>1121</td>
<td><strong>PROGRAM IS NOW IN UNRESTRICTED SEMI.</strong></td>
</tr>
</tbody>
</table>

**VXF3-SUBROUTINE WHICH OFFERS RETRY OR TERMINATE ONLY**

<table>
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<tr>
<th>Line</th>
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<tbody>
<tr>
<td>1115</td>
<td><strong>PROGRAM BEING DELAYED BY CCIS PANEL OPERATOR.</strong></td>
</tr>
<tr>
<td>1116</td>
<td><strong>PROGRAM WILL RETRY THE FAILED CONDITION WHEN THE S-IC BURN MODE SWITCH IS RETURNED TO AUTO.</strong></td>
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<td><strong>PROGRAM IS RETESTING FAILED CONDITION</strong></td>
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</table>
APPENDIX C

KAF2 FLIGHT CONTROL PREPS PROGRAM

WRITTEN IN A L O F T

(Phase III Presentation Material NAS10-7308)
ST PROGRAM *KAF2* FLIGHT CONTROL PREPARATIONS FOR ASS09 IMPLEMENTED USING **ALOFT___'A LANGUAGE ORIENTED TO FLIGHT ENGINEERING AND TESTING'**

**DECEMBER 17, 1970**

BEGIN DICTIONARY DATA BANK - KAF2 DISC OUTPUTS TO VEH -

SPECIFY _ IU ZERO COMMAND ON _ WITH ADDRESS **MDOA** AND CHANNEL **MD0378**

AND CONVERTED BY _ MDO CONVERSION _

SPECIFY _ COMPARATOR RESET _ WITH ADDRESS **MDOA** AND CHANNEL **MD0379**

AND CONVERTED BY _ MDO CONVERSION _

SPECIFY _ COMMAND FCC MATRIX ENABLE _ WITH ADDRESS **MDOA** AND CHANNEL **MD0408** AND CONVERTED BY _ MDO CONVERSION _

SPECIFY _ EDS COMP MNTR RESET _ WITH ADDRESS **MDOA** AND CHANNEL **MD0409**

AND CONVERTED BY _ MDO CONVERSION _

SPECIFY _ EDSRG ZERO TORQUE CMD ON _ WITH ADDRESS **MDOA** AND CHANNEL **MD0410** AND CONVERTED BY _ MDO CONVERSION _

SPECIFY _ IU RAMP POSITIVE ON _ WITH ADDRESS **MDOA** AND CHANNEL **MD0480**

AND CONVERTED BY _ MDO CONVERSION _

SPECIFY _ IU RAMP POS _ WITH ADDRESS **MDOA** AND CHANNEL **MD0694**

AND CONVERTED BY _ MDO CONVERSION _

SPECIFY _ IU RAMP NEG _ WITH ADDRESS **MDOA** AND CHANNEL **MD0695**

AND CONVERTED BY _ MDO CONVERSION _

SPECIFY _ IU ST 124M _ WITH ADDRESS **MDOA** AND CHANNEL **MD01789**

AND CONVERTED BY _ MDO CONVERSION _

SPECIFY _ IU CONTROL RATE GYRO _ WITH ADDRESS **MDOA** AND CHANNEL **MD01790** AND CONVERTED BY _ MDO CONVERSION _

SPECIFY _ IU YAW SELECT _ WITH ADDRESS **MDOA** AND CHANNEL **MD01799**

AND CONVERTED BY _ MDO CONVERSION _
SPECIFY - IU ROLL SELECT - WITH ADDRESS '*MDOA*' AND CHANNEL '*MDO1800*' AND CONVERTED BY MDO CONVERSION .

SPECIFY - IU PITCH SELECT - WITH ADDRESS '*MDOA*' AND CHANNEL '*MDO1801*' AND CONVERTED BY MDO CONVERSION .

SPECIFY - IU TEST INPUT A - WITH ADDRESS '*MDOA*' AND CHANNEL '*MDO1802*' AND CONVERTED BY MDO CONVERSION .

SPECIFY - IU TEST INPUT B - WITH ADDRESS '*MDOA*' AND CHANNEL '*MDO1803*' AND CONVERTED BY MDO CONVERSION .

SPECIFY - IU SIC BURN TEST - WITH ADDRESS '*MDOA*' AND CHANNEL '*MDO1804*' AND CONVERTED BY MDO CONVERSION .

SPECIFY - IU SII BURN TEST - WITH ADDRESS '*MDOA*' AND CHANNEL '*MDO1805*' AND CONVERTED BY MDO CONVERSION .

SPECIFY - IU SIVB BURN TEST - WITH ADDRESS '*MDOA*' AND CHANNEL '*MDO1806*' AND CONVERTED BY MDO CONVERSION .

SPECIFY - IU SIVB COAST TEST - WITH ADDRESS '*MDOA*' AND CHANNEL '*MDO1807*' AND CONVERTED BY MDO CONVERSION .

SPECIFY - IU STEP ENABLE - WITH ADDRESS '*MDOA*' AND CHANNEL '*MDO1809*' AND CONVERTED BY MDO CONVERSION .

SPECIFY - IU FCC SYSTEM PWR - WITH ADDRESS '*MDOA*' AND CHANNEL '*MDO1823*' AND CONVERTED BY MDO CONVERSION .

SPECIFY - IU EDS RG SYS POWER - WITH ADDRESS '*MDOA*' AND CHANNEL '*MDO1903*' AND CONVERTED BY MDO CONVERSION .

SPECIFY - IU EDS RG ROLL AXIS SEL - WITH ADDRESS '*MDOA*' AND CHANNEL '*MDO1904*' AND CONVERTED BY MDO CONVERSION .

SPECIFY - IU EDS RG YAW AXIS SEL - WITH ADDRESS '*MDOA*' AND CHANNEL '*MDO1905*' AND CONVERTED BY MDO CONVERSION .
SPECIFY _ IU EOS RG PITCH AXIS SEL _ WITH ADDRESS **MDOA** AND CHANNEL **MD01906** AND CONVERTED BY _ MDO CONVERSION _ .

SPECIFY _ IU EOS RG PEF GYRO SEL _ WITH ADDRESS **MDOA** AND CHANNEL **MD01907** AND CONVERTED BY _ MDO CONVERSION _ .

SPECIFY _ IU EOS RG CMD GYRO SEL _ WITH ADDRESS **MDOA** AND CHANNEL **MD01909** AND CONVERTED BY _ MDO CONVERSION _ .

SPECIFY _ IU EOS RG SPARE GYRO SEL _ WITH ADDRESS **MDOA** AND CHANNEL **MD01910** AND CONVERTED BY _ MDO CONVERSION _ .

SPECIFY _ IU SIC BURN SUB _ WITH ADDRESS **MDOA** AND CHANNEL **MD02006** AND CONVERTED BY _ MDO CONVERSION _ .

SPECIFY _ IU SIVB BURN SUB _ WITH ADDRESS **MDOA** AND CHANNEL **MD02007** AND CONVERTED BY _ MDO CONVERSION _ .

SPECIFY _ IU SIVB COAST SUB _ WITH ADDRESS **MDOA** AND CHANNEL **MD02008** AND CONVERTED BY _ MDO CONVERSION _ .

SPECIFY _ IU SII BURN SUB _ WITH ADDRESS **MDOA** AND CHANNEL **MD02009** AND CONVERTED BY _ MDO CONVERSION _ .

DICTIONARY DATA BANK _ KAF2 DISC OUTPUTS TO VEH _ COMPLETE .
BEGIN DICTIONARY DATA BANK - DDAS SIGNAL FUNCTIONS -

SPECIFY - S1C/BURN - WITH ADDRESS **DP1A0-12J10-01** AND CHANNEL **12J10**
AND STATE CONVERTED BY - DDAS CONVERSION -

SPECIFY - S2 BURN - WITH ADDRESS **DP1A0-12J07-06** AND CHANNEL **12J07**
AND STATE CONVERTED BY - DDAS CONVERSION -

SPECIFY - S4B BURN - WITH ADDRESS **DP1A0-12J02-01** AND CHANNEL **12J02**
AND STATE CONVERTED BY - DDAS CONVERSION -

SPECIFY - P/SERVO/COMP - WITH ADDRESS **DP1A0-12J03-01** AND CHANNEL **12J03**
AND STATE CONVERTED BY - DDAS CONVERSION -

SPECIFY - Y/SERVO/COMP - WITH ADDRESS **DP1A0-12J04-01** AND CHANNEL **12J04**
AND STATE CONVERTED BY - DDAS CONVERSION -

SPECIFY - P/SPAT/COMP - WITH ADDRESS **DP1A0-12J06-01** AND CHANNEL **12J06**
AND STATE CONVERTED BY - DDAS CONVERSION -

SPECIFY - R-Y1/SP/COMP - WITH ADDRESS **DP1A0-12J05-01** AND CHANNEL **12J05**
AND STATE CONVERTED BY - DDAS CONVERSION -

SPECIFY - R-Y2/SP/COMP - WITH ADDRESS **DP1A0-12J07-01** AND CHANNEL **12J07**
AND STATE CONVERTED BY - DDAS CONVERSION -

SPECIFY - FCC/ON/+6J11 - WITH ADDRESS **DP1A0-12J01-03** AND CHANNEL **12J01**
AND STATE CONVERTED BY - DDAS CONVERSION -

SPECIFY - FCC/ON/+6D31 - WITH ADDRESS **DP1A0-12J01-04** AND CHANNEL **12J01**
AND STATE CONVERTED BY - DDAS CONVERSION -

SPECIFY - FCC/ON/+6D41 - WITH ADDRESS **DP1A0-12J01-05** AND CHANNEL **12J01**
AND STATE CONVERTED BY - DDAS CONVERSION -

SPECIFY - ROLL/COMP - WITH ADDRESS **DP1A0-12J08-02** AND CHANNEL **12J08**
AND STATE CONVERTED BY - DDAS CONVERSION -
SPECIFY _ YAW/COMP _ WITH ADDRESS **DP1AO-12J08-03** AND CHANNEL **12J08**
   AND STATE CONVERTED BY _ DDAS CONVERSION _.
SPECIFY _ PITCH/COMP _ WITH ADDRESS **DP1AC-12J08-04** AND CHANNEL **12J08**
   AND STATE CONVERTED BY _ DDAS CONVERSION _.
SPECIFY _ REF/ROLL _ WITH ADDRESS **DP1AO-03-05-00** AND CHANNEL **03-05**
   AND VALUE CONVERTED BY _ DDAS CONVERSION _.
SPECIFY _ REF/YAW _ WITH ADDRESS **DP1AO-03-04-00** AND CHANNEL **03-04**
   AND VALUE CONVERTED BY _ DDAS CONVERSION _.
SPECIFY _ REF/PITCH _ WITH ADDRESS **DP1AC-03-06-00** AND CHANNEL **03-06**
   AND VALUE CONVERTED BY _ DDAS CONVERSION _.
SPECIFY _ CMD/ROLL _ WITH ADDRESS **CP1AO-03-03-00** AND CHANNEL **03-03**
   AND VALUE CONVERTED BY _ DDAS CONVERSION _.
SPECIFY _ CMD/YAW _ WITH ADDRESS **CP1AC-03-02-00** AND CHANNEL **03-02**
   AND VALUE CONVERTED BY _ DDAS CONVERSION _.
SPECIFY _ CMD/PITCH _ WITH ADDRESS **CP1AC-03-01-00** AND CHANNEL **03-01**
   AND VALUE CONVERTED BY _ DDAS CONVERSION _.
SPECIFY _ CSP/POWER/ON _ WITH ADDRESS **DP1AO-12J01-06** AND CHANNEL **12J01**
   AND STATE CONVERTED BY _ DDAS CONVERSION _.
SPECIFY _ WH/SP/GR-1 _ WITH ADDRESS **DP1AO-12J08-05** AND CHANNEL **12J08**
   AND STATE CONVERTED BY _ DDAS CONVERSION _.
SPECIFY _ WH/SP/GR-2 _ WITH ADDRESS **DP1AC-12J08-06** AND CHANNEL **12J08**
   AND STATE CONVERTED BY _ DDAS CONVERSION _.
SPECIFY _ WH/SP/GR-3 _ WITH ADDRESS **DP1AO-12J08-07** AND CHANNEL **12J08**
   AND STATE CONVERTED BY _ DDAS CONVERSION _.

DICTIONARY DATA BANK _ DDAS SIGNAL FUNCTIONS _ COMPLETE.
BEGIN DICTIONARY DATA BANK

**DISC**RETE I/O FROM ESE PANELS

**SPECIFY IU** ZERO COMD LDI WITH ADDRESS ""LDIA"" AND CHANNEL ""LDI0378"
   AND CONVERTED BY _LDI CONV_

**SPECIFY IU** RAMP POSITIVE LDI WITH ADDRESS ""LDIA"" AND CHANNEL ""LDI0480"
   AND CONVERTED BY _LDI CONV_

**SPECIFY IU** RAMP NEGATIVE LDI WITH ADDRESS ""LDIA"" AND CHANNEL ""LDI0481"
   AND CONVERTED BY _LDI CONV_

**SPECIFY IU** ST-124M ON WITH ADDRESS ""LDIA"" AND CHANNEL ""LDI2570"
   AND CONVERTED BY _LDI CONV_

**SPECIFY IU** CONTROL RATE GYRO ON WITH ADDRESS ""LDIA"" AND CHANNEL ""LDI2572"
   AND CONVERTED BY _LDI CONV_

**SPECIFY IU** CONTROL RATE GYRO OFF WITH ADDRESS ""LDIA"" AND CHANNEL ""LDI2573"
   AND CONVERTED BY _LDI CONV_

**SPECIFY IU** YAW SELECT ON WITH ADDRESS ""LDIA"" AND CHANNEL ""LDI2590"
   AND CONVERTED BY _LDI CONV_

**SPECIFY IU** YAW SELECT OFF WITH ADDRESS ""LDIA"" AND CHANNEL ""LDI2591"
   AND CONVERTED BY _LDI CONV_

**SPECIFY IU** ROLL SELECT ON WITH ADDRESS ""LDIA"" AND CHANNEL ""LDI2592"
   AND CONVERTED BY _LDI CONV_

**SPECIFY IU** ROLL SELECT OFF WITH ADDRESS ""LDIA"" AND CHANNEL ""LDI2593"
   AND CONVERTED BY _LDI CONV_

**SPECIFY IU** PITCH SELECT ON WITH ADDRESS ""LDIA"" AND CHANNEL ""LDI2594"
   AND CONVERTED BY _LDI CONV_

**SPECIFY IU** PITCH SELECT OFF WITH ADDRESS ""LDIA"" AND CHANNEL ""LDI2595"
   AND CONVERTED BY _LDI CONV_
SPECIFY_IU TEST INPUT A ON WITH ADDRESS "LDIA" AND CHANNEL "LDI2596"
AND CONVERTED BY _LOI CONV_

SPECIFY_IU TEST INPUT B ON WITH ADDRESS "LDIA" AND CHANNEL "LDI2598"
AND CONVERTED BY _LOI CONV_

SPECIFY_IU TEST INPUT B OFF WITH ADDRESS "LDIA" AND CHANNEL "LDI2599"
AND CONVERTED BY _LOI CONV_

SPECIFY_IU S-IC BURN TEST ON WITH ADDRESS "LDIA" AND CHANNEL "LDI2600"
AND CONVERTED BY _LOI CONV_

SPECIFY_IU S-II BURN TEST ON WITH ADDRESS "LDIA" AND CHANNEL "LDI2602"
AND CONVERTED BY _LOI CONV_

SPECIFY_IU S-IVB BURN TEST ON WITH ADDRESS "LDIA" AND CHANNEL "LDI2604"
AND CONVERTED BY _LOI CONV_

SPECIFY_IU S-IVB COAST TEST ON WITH ADDRESS "LDIA" AND CHANNEL "LDI2606"
AND CONVERTED BY _LOI CONV_

SPECIFY_IU S-IVB COAST TEST OFF WITH ADDRESS "LDIA" AND CHANNEL "LDI2607"
AND CONVERTED BY _LOI CONV_

SPECIFY_IU STEP ENABLE ON WITH ADDRESS "LDIA" AND CHANNEL "LDI2630"
AND CONVERTED BY _LOI CONV_

SPECIFY_IU STEP ENABLE OFF WITH ADDRESS "LDIA" AND CHANNEL "LDI2631"
AND CONVERTED BY _LOI CONV_

SPECIFY_IU GUIDANCE FAILURE SUB ON WITH ADDRESS "LDIA" AND CHANNEL "LDI2662"
AND CONVERTED BY _LOI CONV_

SPECIFY_IU SPACECRAFT CONTROL ON WITH ADDRESS "LDIA" AND CHANNEL "LDI2664"
AND CONVERTED BY _LOI CONV_

SPECIFY_IU S-IC BURN SUB ON WITH ADDRESS "LDIA" AND CHANNEL "LDI3004"
AND CONVERTED BY _LOI CONV_

SPECIFY_IU S-IC BURN SUB OFF WITH ADDRESS "LDIA" AND CHANNEL "LDI3005"
AND CONVERTED BY _LOI CONV_
SPECIFY_IU S-IVB BURN SUB ON_WITH ADDRESS **LDIA** AND CHANNEL **LDI3006**
    AND CONVERTED BY _LDI CONV_.
SPECIFY_IU S-IVB BURN SUB OFF_WITH ADDRESS **LDIA** AND CHANNEL **LDI3007**
    AND CONVERTED BY _LDI CONV_.
SPECIFY_IU S-IVB COAST SUB ON_WITH ADDRESS **LDIA** AND CHANNEL **LDI3008**
    AND CONVERTED BY _LDI CONV_.
SPECIFY_IU S-II BURN SUB ON_WITH ADDRESS **LDIA** AND CHANNEL **LDI3010**
    AND CONVERTED BY _LDI CONV_.
SPECIFY_IU S-II BURN SUB OFF_WITH ADDRESS **LDIA** AND CHANNEL **LDI3011**
    AND CONVERTED BY _LDI CONV_.
SPECIFY_IU FCC SYSTEM PWR OFF WITH ADDRESS **LDIA** AND CHANNEL **LDI2639**
    AND CONVERTED BY _LDI CONV_.
SPECIFY_IU3 AUX HYD PUMP POWER WITH ADDRESS **LDOA** AND CHANNEL **L001705**
    AND CONVERTED BY _LDO CONV_.
SPECIFY_IU3 APS 2 ENG VALVE PWR WITH ADDRESS **LDOA** AND CHANNEL **L001855**
    AND CONVERTED BY _LDO CONV_.
SPECIFY_IU3 APS 1 ENG VALVE PWR WITH ADDRESS **LDOA** AND CHANNEL **L001937**
    AND CONVERTED BY _LDO CONV_.
SPECIFY_IU EDSRG ZERO TORQUE CMD LDI WITH ADDRESS **LDIA** AND CHANNEL
    **LDI0410** AND CONVERTED BY _LDI CONV_.
SPECIFY_IU RAMP POS LDI WITH ADDRESS **LDIA** AND CHANNEL **LDOI694**
    AND CONVERTED BY _LDI CONV_.
SPECIFY_IU RAMP NEG LDI WITH ADDRESS **LDIA** AND CHANNEL **LDOI695**
    AND CONVERTED BY _LDI CONV_.
SPECIFY_IU EDS RG SYSTEM POWER OFF WITH ADDRESS **LDIA** AND CHANNEL **LDI2799**
    AND CONVERTED BY _LDI CONV_.
SPECIFY_IU EDS RG ROLL AXIS SEL ON WITH ADDRESS **LDIA** AND CHANNEL **LDI2800**
    AND CONVERTED BY _LDI CONV_. 
SPECIFY_IU EDS RG ROLL AXIS SEL OFF_WITH ADDRESS "LDIA" AND CHANNEL "LDI2801" AND CONVERTED BY _LDI CONV_.

SPECIFY_IU EDS RG YAW AXIS SEL ON_WITH ADDRESS "LDIA" AND CHANNEL "LDI2802" AND CONVERTED BY _LDI CONV_.

SPECIFY_IU EDS RG YAW AXIS SEL OFF_WITH ADDRESS "LDIA" AND CHANNEL "LDI2803" AND CONVERTED BY _LDI CONV_.

SPECIFY_IU EDS RG PITCH AXIS SEL ON_WITH ADDRESS "LDIA" AND CHANNEL "LDI2804" AND CONVERTED BY _LDI CONV_.

SPECIFY_IU EDS RG PITCH AXIS SEL OFF_WITH ADDRESS "LDIA" AND CHANNEL "LDI2805" AND CONVERTED BY _LDI CONV_.

SPECIFY_IU EDS RG REF GYRO SEL ON_WITH ADDRESS "LDIA" AND CHANNEL "LDI2806" AND CONVERTED BY _LDI CONV_.

SPECIFY_IU EDS RG REF GYRO SEL OFF_WITH ADDRESS "LDIA" AND CHANNEL "LDI2807" AND CONVERTED BY _LDI CONV_.

SPECIFY_IU EDS RG CMD GYRO SEL ON_WITH ADDRESS "LDIA" AND CHANNEL "LDI2810" AND CONVERTED BY _LDI CONV_.

SPECIFY_IU EDS RG CMD GYRO SEL OFF_WITH ADDRESS "LDIA" AND CHANNEL "LDI2811" AND CONVERTED BY _LDI CONV_.

SPECIFY_IU EDS RG SPARE GYRO SEL ON_WITH ADDRESS "LDIA" AND CHANNEL "LDI2812" AND CONVERTED BY _LDI CONV_.

SPECIFY_IU EDS RG SPARE GYRO SEL OFF_WITH ADDRESS "LDIA" AND CHANNEL "LDI2813" AND CONVERTED BY _LDI CONV_.

SPECIFY_IU EDS RG REF GYRO SEL ON_WITH ADDRESS "LDIA" AND CHANNEL "LDI2806" AND CONVERTED BY _LDI CONV_.

SPECIFY_IU EDS RG REF GYRO SEL OFF_WITH ADDRESS "LDIA" AND CHANNEL "LDI2807" AND CONVERTED BY _LDI CONV_.

SPECIFY_IU EDS RG CMD GYRO SEL ON_WITH ADDRESS "LDIA" AND CHANNEL "LDI2810" AND CONVERTED BY _LDI CONV_.

SPECIFY_IU EDS RG CMD GYRO SEL OFF_WITH ADDRESS "LDIA" AND CHANNEL "LDI2811" AND CONVERTED BY _LDI CONV_.

SPECIFY_IU EDS RG SPARE GYRO SEL ON_WITH ADDRESS "LDIA" AND CHANNEL "LDI2812" AND CONVERTED BY _LDI CONV_.

SPECIFY_IU EDS RG SPARE GYRO SEL OFF_WITH ADDRESS "LDIA" AND CHANNEL "LDI2813" AND CONVERTED BY _LDI CONV_.
SPECIFY_FLAG 25 WITH ADDRESS "FLAG" USING FUNCTION CODE "STATE"
AND STATE CONVERTED BY_FLAG CONVERSION_

SPECIFY_FLAG 26 WITH ADDRESS "FLAG" USING FUNCTION CODE "STATE"
AND STATE CONVERTED BY_FLAG CONVERSION_

SPECIFY_FLAG 27 WITH ADDRESS "FLAG" USING FUNCTION CODE "STATE"
AND STATE CONVERTED BY_FLAG CONVERSION_

SPECIFY_FLAG 28 WITH ADDRESS "FLAG" USING FUNCTION CODE "STATE"
AND STATE CONVERTED BY_FLAG CONVERSION_

SPECIFY_FLAG 37 WITH ADDRESS "FLAG" USING FUNCTION CODE "STATE"
AND STATE CONVERTED BY_FLAG CONVERSION_

SPECIFY_FLAG 38 WITH ADDRESS "FLAG" USING FUNCTION CODE "STATE"
AND STATE CONVERTED BY_FLAG CONVERSION_

SPECIFY_FLAG 39 WITH ADDRESS "FLAG" USING FUNCTION CODE "STATE"
AND STATE CONVERTED BY_FLAG CONVERSION_

SPECIFY_FLAG 47 WITH ADDRESS "FLAG" USING FUNCTION CODE "STATE"
AND STATE CONVERTED BY_FLAG CONVERSION_

SPECIFY_TERMINATE_ WITH ADDRESS XXXXXX USING FUNCTION CODE YYYYYY AND STATE
CONVERTED BY _INTERRUPT_

DICTIONARY DATA BANK_DISCRETE I/O FROM ESE PANELS_COMPLETE.
BEGIN DICTIONARY DATA BANK - INPUT/OUTPUT DEVICES -

SPECIFY _CRT 1, LINE 1_ WITH ADDRESS XXXXX USING FUNCTION CODE A12 AND VALUE
CONVERTED BY _ CRT DISPLAY _

SPECIFY _CRT 1, LINE 2_ WITH ADDRESS XXXXX USING FUNCTION CODE A12 AND VALUE
CONVERTED BY _ CRT DISPLAY _

SPECIFY _CRT 1, LINE 3_ WITH ADDRESS XXXXX USING FUNCTION CODE A12 AND VALUE
CONVERTED BY _ CRT DISPLAY _

SPECIFY _CRT 1, LINE 4_ WITH ADDRESS XXXXX USING FUNCTION CODE A12 AND VALUE
CONVERTED BY _ CRT DISPLAY _

SPECIFY _CRT 1, LINE 5_ WITH ADDRESS XXXXX USING FUNCTION CODE A12 AND VALUE
CONVERTED BY _ CRT DISPLAY _

SPECIFY _CRT 1, LINE 6_ WITH ADDRESS XXXXX USING FUNCTION CODE A12 AND VALUE
CONVERTED BY _ CRT DISPLAY _

SPECIFY _CRT 1, LINE 7_ WITH ADDRESS XXXXX USING FUNCTION CODE A12 AND VALUE
CONVERTED BY _ CRT DISPLAY _

SPECIFY _CRT 1, LINE 8_ WITH ADDRESS XXXXX USING FUNCTION CODE A12 AND VALUE
CONVERTED BY _ CRT DISPLAY _

SPECIFY _CRT 1, LINE 9_ WITH ADDRESS XXXXX USING FUNCTION CODE A12 AND VALUE
CONVERTED BY _ CRT DISPLAY _

SPECIFY _CRT 1, LINE 10_ WITH ADDRESS XXXXX USING FUNCTION CODE A12 AND VALUE
CONVERTED BY _ CRT DISPLAY _

SPECIFY _CRT 1, LINE 11_ WITH ADDRESS XXXXX USING FUNCTION CODE A12 AND VALUE
CONVERTED BY _ CRT DISPLAY _

SPECIFY _CRT 1, LINE 12_ WITH ADDRESS XXXXX USING FUNCTION CODE A12 AND VALUE
CONVERTED BY _ CRT DISPLAY _

SPECIFY _CRT 1, LINE 13_ WITH ADDRESS XXXXX USING FUNCTION CODE A12 AND VALUE
CONVERTED BY _ CRT DISPLAY _
SPECIFY _CRT 1*LINE 14_ WITH ADDRESS XXXXXX USING FUNCTION CODE A12 AND VALUE
CONVERTED BY _CRT DISPLAY _.

SPECIFY _CRT 1*LINE 15_ WITH ADDRESS XXXXXX USING FUNCTION CODE A12 AND VALUE
CONVERTED BY _CRT DISPLAY _.

SPECIFY _CRT 1*LINE 16_ WITH ADDRESS XXXXXX USING FUNCTION CODE A12 AND VALUE
CONVERTED BY _CRT DISPLAY _.

SPECIFY _CRT 1*LINE 17_ WITH ADDRESS XXXXXX USING FUNCTION CODE A12 AND VALUE
CONVERTED BY _CRT DISPLAY _.

SPECIFY _CRT 1*LINE 18_ WITH ADDRESS XXXXXX USING FUNCTION CODE A12 AND VALUE
CONVERTED BY _CRT DISPLAY _.

SPECIFY _CRT 1*LINE 19_ WITH ADDRESS XXXXXX USING FUNCTION CODE A12 AND VALUE
CONVERTED BY _CRT DISPLAY _.

SPECIFY _CRT 1*LINE 20_ WITH ADDRESS XXXXXX USING FUNCTION CODE A12 AND VALUE
CONVERTED BY _CRT DISPLAY _.

SPECIFY _CRT 1*LINE 21_ WITH ADDRESS XXXXXX USING FUNCTION CODE A12 AND VALUE
CONVERTED BY _CRT DISPLAY _.

SPECIFY _CRT 1*LINE 22_ WITH ADDRESS XXXXXX USING FUNCTION CODE A12 AND VALUE
CONVERTED BY _CRT DISPLAY _.

SPECIFY _PRINTER_ WITH ADDRESS XXXXXX USING FUNCTION CODE YYYYYY AND VALUE
CONVERTED BY _PRINTER FORMAT_.

SPECIFY _MAG TAPE_ WITH ADDRESS XXXXXX USING FUNCTION CODE YYYYYY AND VALUE
CONVERTED BY _MAG TAPE FORMAT_.

DICTIONARY DATA BANK _ INPUT/OUTPUT DEVICES _ COMPLETE.
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BEGIN PROGRAM_KAF2_**FLIGHT CONTROL PREPARATIONS FOR AS509**. 

USE DICTIONARY DATA BANK_ KAF2 DISC OUTPUTS TO VEH _D2AS SIGNAL FUNCTIONS _D DISCRETE I/O FROM ESE PANELS _D INPUT/OUTPUT DEVICES _D 

DECLARE _CSP POWER ON TIME_ TIME. **SCM** 
DECLARE _GR-1 UP-TO-SPEED INDICATION TIME_ TIME. **SCX** 
DECLARE _GR-2 UP-TO-SPEED INDICATION TIME_ TIME. **SCY** 
DECLARE _GR-3 UP-TO-SPEED INDICATION TIME_ TIME. **SCZ** 
DECLARE _FCC POWER ON TIME_ TIME. **SCO** 
DECLARE _T2_ TIME. 
DECLARE _TEST COMPLETE TIME_ TIME. 
DECLARE _PR1_ NUMERIC. 
DECLARE _PR2_ NUMERIC. 
DECLARE _PR3_ NUMERIC. 
DECLARE _PR4_ NUMERIC. 
DECLARE _PR5_ NUMERIC. 
DECLARE _PR6_ NUMERIC. 
DECLARE _INDEX_ NUMERIC. 

REPLACE _T1_ FOR _FCC POWER ON TIME_. 
DECLARE TABLE_FC PREPS SCAN_
WITH 4 COLUMNS INDEXED BY_CN_LABELED

ROW NUMBER | FUNCTION | UNITS | _STATE_BOOLEAN
-------------|----------|-------|---------------------
**          | **LDI NO.** | **FCC SCAN LOIS** | **
1          | **"0378**_IU ZERO COMD LDI** | **ON/OFF** | **OFF AND**
2          | **"0480**_IU RAMP POSITIVE LDI** | **ON/OFF** | **OFF AND**
3          | **"0481**_IU RAMP NEGATIVE LDI** | **ON/OFF** | **OFF AND**
4          | **"2570**_IU ST-124M ON** | **ON/OFF** | **OFF AND**
5          | **"2572**_IU CONTROL RATE GYRO ON** | **ON/OFF** | **OFF AND**
6          | **"2573**_IU CONTROL RATE GYRO OFF** | **ON/OFF** | **OFF AND**
7          | **"2590**_IU YAW SELECT ON** | **ON/OFF** | **OFF AND**
8          | **"2591**_IU YAW SELECT OFF** | **ON/OFF** | **OFF AND**
9          | **"2592**_IU ROLL SELECT ON** | **ON/OFF** | **OFF AND**
10         | **"2593**_IU ROLL SELECT OFF** | **ON/OFF** | **OFF AND**
11         | **"2594**_IU PITCH SELECT ON** | **ON/OFF** | **OFF AND**
12         | **"2595**_IU PITCH SELECT OFF** | **ON/OFF** | **OFF AND**
13         | **"2596**_IU TEST INPUT A ON** | **ON/OFF** | **OFF AND**
14         | **"2598**_IU TEST INPUT B ON** | **ON/OFF** | **OFF AND**
15         | **"2599**_IU TEST INPUT B OFF** | **ON/OFF** | **OFF AND**
16         | **"2600**_IU S-IC BURN TEST ON** | **ON/OFF** | **OFF AND**
17         | **"2602**_IU S-II BURN TEST ON** | **ON/OFF** | **OFF AND**
18         | **"2604**_IU S-IVB BURN TEST ON** | **ON/OFF** | **OFF AND**
19         | **"2606**_IU S-IVB COAST TEST ON** | **ON/OFF** | **OFF AND**
20         | **"2607**_IU S-IVB COAST TEST OFF** | **ON/OFF** | **OFF AND**

| No. | Description                                      | Status   | Status | AND
|-----|--------------------------------------------------|----------|--------|------
| 21  | **2630**_IU STEP ENABLE ON_                     | ON/OFF   | OFF    | AND  
| 22  | **2631**_IU STEP ENABLE OFF_                    | ON/OFF   | OFF    | AND  
| 23  | **2662**_IU GUIDANCE FAILURE SUB ON_            | ON/OFF   | OFF    | AND  
| 24  | **2664**_IU SPACECRAFT CONTROL ON_              | ON/OFF   | OFF    | AND  
| 25  | **3004**_IU S-IC BURN SUB ON_                   | ON/OFF   | OFF    | AND  
| 26  | **3005**_IU S-IC BURN SUB OFF_                  | ON/OFF   | OFF    | AND  
| 27  | **3006**_IU S-IVB BURN SUB ON_                  | ON/OFF   | OFF    | AND  
| 28  | **3007**_IU S-IVB BURN SUB OFF_                 | ON/OFF   | OFF    | AND  
| 29  | **3008**_IU S-IVB COAST SUB ON_                 | ON/OFF   | OFF    | AND  
| 30  | **3010**_IU S-II BURN SUB ON_                   | ON/OFF   | OFF    | AND  
| 31  | **3011**_IU S-II BURN SUB OFF_                  | ON/OFF   | OFF    | AND  
| 32  | **2639**_IU FCC SYSTEM PWR OFF_                 | ON/OFF   | OFF    | AND  
|     | **LDO NO.**                                      |          |        |      
|     | **FCC SCAN LDO**                                |          |        |      
| 33  | **1705**_IVB AUX HYD PUMP POWER_                | ON/OFF   | OFF    | AND  
| 34  | **1855**_IVB APS 2 ENG VALVE PWR_               | ON/OFF   | OFF    | AND  
| 35  | **1937**_IVB APS 1 ENG VALVE PWR_               | ON/OFF   | OFF    | AND  

*
<table>
<thead>
<tr>
<th>LDI NO.</th>
<th>EDS/CRG SCAN LD1S</th>
</tr>
</thead>
<tbody>
<tr>
<td>36.</td>
<td>** 410** <em>IU EDSRG ZERO TORQUE CMD LD1</em></td>
</tr>
<tr>
<td>37.</td>
<td>** 694** <em>IU RAMP POS LD1</em></td>
</tr>
<tr>
<td>38.</td>
<td>** 695** <em>IU RAMP NEG LD1</em></td>
</tr>
<tr>
<td>39.</td>
<td>** 2799** <em>IU EDS RG SYSTEM POWER OFF</em></td>
</tr>
<tr>
<td>40.</td>
<td>** 2800** <em>IU EDS RG ROLL AXIS SEL ON</em></td>
</tr>
<tr>
<td>41.</td>
<td>** 2801** <em>IU EDS RG ROLL AXIS SEL OFF</em></td>
</tr>
<tr>
<td>42.</td>
<td>** 2802** <em>IU EDS RG YAW AXIS SEL ON</em></td>
</tr>
<tr>
<td>43.</td>
<td>** 2803** <em>IU EDS RG YAW AXIS SEL OFF</em></td>
</tr>
<tr>
<td>44.</td>
<td>** 2804** <em>IU EDS RG PITCH AXIS SEL ON</em></td>
</tr>
<tr>
<td>45.</td>
<td>** 2805** <em>IU EDS RG PITCH AXIS SEL OFF</em></td>
</tr>
<tr>
<td>46.</td>
<td>** 2806** <em>IU EDS RG REF GYRO SEL ON</em></td>
</tr>
<tr>
<td>47.</td>
<td>** 2807** <em>IU EDS RG REF GYRO SEL OFF</em></td>
</tr>
<tr>
<td>48.</td>
<td>** 2810** <em>IU EDS RG CMD GYRO SEL ON</em></td>
</tr>
<tr>
<td>49.</td>
<td>** 2811** <em>IU EDS RG CMD GYRO SEL OFF</em></td>
</tr>
<tr>
<td>50.</td>
<td>** 2812** <em>IU EDS RG SPARE GYRO SEL ON</em></td>
</tr>
<tr>
<td>51.</td>
<td>** 2813** <em>IU EDS RG SPARE GYRO SEL OFF</em></td>
</tr>
</tbody>
</table>
DECLARE FC FLAG TABLE WITH 9 COLUMNS INDEXED BY SC AND LABELED
ROW NUMBER, FUNCTION, UNITS, ST1_BOOLEAN, ST2_BOOLEAN, ST3_BOOLEAN, ST4_BOOLEAN, ST5_BOOLEAN, ST6_BOOLEAN, HAVING 8 ROWS
INDEXED BY FR WITH ENTRIES

`| FR | FUNCTION | UNITS | ST1 | ST2 | ST3 | ST4 | ST5 | ST6 |
<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><em>FLAG 25</em></td>
<td>ON/OFF</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>2</td>
<td><em>FLAG 26</em></td>
<td>ON/OFF</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>3</td>
<td><em>FLAG 27</em></td>
<td>ON/OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>4</td>
<td><em>FLAG 28</em></td>
<td>ON/OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>5</td>
<td><em>FLAG 29</em></td>
<td>ON/OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>6</td>
<td><em>FLAG 30</em></td>
<td>ON/OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td>7</td>
<td><em>FLAG 31</em></td>
<td>ON/OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td>8</td>
<td><em>FLAG 32</em></td>
<td>ON/OFF</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
</tr>
</tbody>
</table>
DECLARE_FLAG 1_BOOLEAN = OFF.
DECLARE_FLAG 2_BOOLEAN = OFF.
DECLARE_FLAG 3_BOOLEAN = OFF.
DECLARE_FLAG 4_BOOLEAN = OFF.
DECLARE_FLAG 5_BOOLEAN = OFF.
DECLARE_FLAG 6_BOOLEAN = OFF.
DECLARE_FLAG 7_BOOLEAN = OFF.
DECLARE_FLAG 8_BOOLEAN = OFF.
DECLARE_FLAG 9_BOOLEAN = OFF.
DECLARE_FLAG 10_BOOLEAN = OFF.
DECLARE_FLAG 11_BOOLEAN = OFF.
DECLARE_FLAG 12_BOOLEAN = OFF.
DECLARE_FLAG 13_BOOLEAN = OFF.
DECLARE_FLAG 14_BOOLEAN = OFF.
DECLARE TABLE _KAF2 TERM FUNCTIONS_ WITH 4 COLUMNS INDEXED BY _FN_ Labeled

** Row Number **  ** Function **  ** Units **  ** State **

1. ** 0480**  IU RAMP POSITIVE ON  2  3  4  5
   1. ** 0694**  IU RAMP POS  2  3  4  5
   2. ** 0695**  IU RAMP NEG  2  3  4  5
   3. ** 1790**  IU CONTROL RATE GYRO  2  3  4  5
   4. ** 1799**  IU YAW SELECT  2  3  4  5
   5. ** 1801**  IU PITCH SELECT  2  3  4  5
   6. ** 1803**  IU TEST INPUT B  2  3  4  5
   7. ** 1807**  IU SIVB COAST TEST  2  3  4  5
   8. ** 1819**  IU STEP ENABLE  2  3  4  5
   9. ** 1904**  IU EDS RG ROLL AXIS SEL  2  3  4  5
  10. ** 1905**  IU EDS RG YAW AXIS SEL  2  3  4  5
  11. ** 1906**  IU EDS RG PITCH AXIS SEL  2  3  4  5
  12. ** 1907**  IU EDS RG REF GYRO SEL  2  3  4  5
  13. ** 1910**  IU EDS RG SPARE GYRO SEL  2  3  4  5
  14. ** 2006**  IU SIC BURN SUB  2  3  4  5
  15. ** 2007**  IU SIVB BURN SUB  2  3  4  5
  16. ** 2008**  IU SIVB COAST SUB  2  3  4  5
  17. ** 2009**  IU SII BURN SUB  2  3  4  5
  18. ** 2009**  IU SII BURN SUB  2  3  4  5
  19. ** 0378**  IU ZERO COMD ON  2  3  4  5
  20. ** 0410**  IU EDSRG ZERO TORQUE CMD ON  2  3  4  5
  21. ** 0410**  IU EDSRG ZERO TORQUE CMD ON  2  3  4  5
  22. ** 0410**  IU EDSRG ZERO TORQUE CMD ON  2  3  4  5
  23. ** 0410**  IU EDSRG ZERO TORQUE CMD ON  2  3  4  5
  24. ** 1909**  IU EDS RG CMD GYRO SEL  2  3  4  5

** Notes: **
- Rows 1 through 24 list functions with their corresponding entries.
- Functions include various controls and inputs such as ramps, control rates, and selection controls.
- Entries are listed as on/off states.
BEGIN_RETRY OR TERMINATE...**IVXF3**

DISPLAY TEXT

(***PROGRAM CANNOT CONTINUE WITH THIS ERROR)  ON_CRT 1*LINE 1-

DISPLAY TEXT

(***CONDITION. PROGRAM WILL TERMINATE AFTER 10)  ON_CRT 1*LINE 2-

DISPLAY TEXT

(***SECOND DELAY UNLESS THE SIC BURN MODE SWITCH)  ON_CRT 1*LINE 3-

DISPLAY TEXT

(***IS PLACED IN THE OFF POSITION BEFORE DELAY)  ON_CRT 1*LINE 4-

DISPLAY TEXT

(***EXPIRES. WHEN SIC BURN MODE SWITCH IS PLACED)  ON_CRT 1*LINE 5-

DISPLAY TEXT

(***BACK IN AUTO POSITION. PROGRAM WILL ENTER A RETRY.) ON_CRT 1*LINE 6-

S185300 VERIFYIU SIC BURN SUB OFF IS ON WITHIN 10SEC  **LDI3005**

OTHERWISE GOTO S189998.

DISPLAY_CRT 1 CLEAR-

DISPLAY TEXT

(***PROGRAM BEING DELAYED BY CCIS PANEL OPERATOR.*)  ON_CRT 1*LINE 1-

DISPLAY TEXT

(***PROGRAM WILL RETRY THE FAILED CONDITION WHEN)  ON_CRT 1*LINE 2-

DISPLAY TEXT

(***THE SIC BURN MODE SWITCH IS RETURNED TO AUTO.*)  ON_CRT 1*LINE 3-
S185600 ASSIGN_FLAG 14_ON.
S185700 VERIFY_IU SIC BURN SUB OFF IS OFF WITHIN 10SEC
   OTHERWISE GOTO S185300.
   DISPLAY TEXT
   (PROGRAM IS RETESTING FAILED CONDITION) ON_CRT 1\LINE 4_.
S189998 END_RETRY OR TERMINATE_.
S189999 REQUEST TEXT (***TEST STEP SUBSEQUENT TO THE RETURN OPERATOR***) ON
   _CRT 1\LINE 1_.
   REQUEST TEXT (***OF SUBROUTINE VXF3 HAS BEEN EXECUTED. PROGRAM***) ON
   _CRT 1\LINE 2_
   REQUEST TEXT (***IS NOW IN UNRESTRICTED SEMI***) ON _CRT 1\LINE 3_.
SOOO100 BEGIN CRITICAL _TERMINATION SUBROUTINE_ WITH INPUT _TERM TABLE_.
SOOO200 APPLY _TERMINATION TABLE_ FUNCTIONS _STATE_.
SOOO300 DISPLAY _PROG NAME_+, TEXT (HAS BEEN FORCIBLY TERMINATED) ON _CONSOLE CODE_.
SOOO400 END CRITICAL _TERMINATION SUBROUTINE_.

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S100000 WHEN INTERRUPT _TERMINATE_ OCCURS THEN PERFORM _TERMINATION SUBROUTINE_.

WITH INPUT _KAF2 TERM FUNCTIONS_.

S100100 ENABLE _TERMINATE_.

""STEPS 6 THRU 12 IN KAF2 ATOLL PROG NOT REQUIRED IN ALOFT AS TABLES AND FLAGS ARE NOT DEDICATED STORAGE LOCATIONS. FLAGS SET IN ATOLL ARE ASSIGNED IN ALOFT. EXTERNAL FLAGS MUST BE SPECIFIED WHILE INTERNAL FLAGS MUST BE DECLARED. ""

S100200 DISPLAY _CRT 1: CLEAR_.

""START FLAG SET UP ROUTINE"

VERIFY_FLAG 47 IS ON OTHERWISE GO TO S101000.
VERIFY_FC FLAG TABLE_FUNCTIONS ARE EQUAL TO_St1_THen GO TO S201000.
VERIFY_FC FLAG TABLE_FUNCTIONS ARE EQUAL TO_St2_THen GO TO S202000.
VERIFY_FC FLAG TABLE_FUNCTIONS ARE EQUAL TO_St3_THen GO TO S203000.
VERIFY_FC FLAG TABLE_FUNCTIONS ARE EQUAL TO_St4_THen GO TO S204000.
VERIFY_FC FLAG TABLE_FUNCTIONS ARE EQUAL TO_St5_THen GO TO S205000.
VERIFY_FC FLAG TABLE_FUNCTIONS ARE EQUAL TO_St6_THen GO TO S206000.
S101000 DISPLAY TEXT

(KAF2 MANUAL OPTION SELECT ROUTINE) ONCRT 1:LINE 1_

DISPLAY TEXT

( KAF2 PRIMARY OPTIONS. ENTER OPTION DESIRED) ONCRT 1:LINE 2_

DISPLAY TEXT

( 1. FCC AND EDS/CRG PREPS) ONCRT 1:LINE 3_

DISPLAY TEXT

( 2. FCC PREPS ONLY) ONCRT 1:LINE 3_

DISPLAY TEXT

( 3. EDS/CRG PREPS ONLY) ONCRT 1:LINE 4_

S102000 REQUEST TEXT

( TYPE 1, 2, OR 3) ONCRT 1:LINE 5_

AND SAVE AS .PRIME OPTION_.

DISPLAY-CRT 1:LINE 6 CLEARED_.

IF .PRIME OPTION IS EQUAL TO 1 THEN GO TO S105000.

IF .PRIME OPTION IS EQUAL TO 2 THEN GO TO S106000.

IF .PRIME OPTION IS EQUAL TO 3 THEN GO TO S107000.

DISPLAY TEXT

( INPUT ERROR) ONCRT 1:LINE 6_

GO TO S102000.

S105000 DISPLAY TEXT

( OPTION 1 SELECTED) ONCRT 1:LINE 6_

ASSIGN_FLAG 1_ON.

ASSIGN_FLAG 2_ON.

GO TO S110000.
S106000 DISPLAY TEXT
  ( OPTION 2 SELECTED) ON_CRT 1*LINE 6._
  ASSIGN_FLAG 1_ON
  GO TO S110000.

S107000 DISPLAY TEXT
  ( OPTION 3 SELECTED) ON_CRT 1*LINE 6._
  ASSIGN_FLAG 2_ON
  GO TO S110000.

S110000 DISPLAY TEXT
  ( KAF2 SECONDARY OPTIONS. ENTER OPTION DESIRED) ON_CRT 1*LINE 8._
  DISPLAY TEXT
  ( 1. FCC AND EDS/CRG COMPARATORS RESET) ON_CRT 1*LINE 9._
  DISPLAY TEXT
  ( 2. FCC COMPARATORS SET) ON_CRT 1*LINE 10._
  DISPLAY TEXT
  ( 3. EDS/CRG COMPARATORS SET) ON_CRT 1*LINE 11._
  DISPLAY TEXT
  ( 4. FCC AND EDS/CRG COMPARATORS SET) ON_CRT 1*LINE 12._

S112000 REQUEST TEXT
  ( TYPE 1, 2, 3, OR 4) ON_CRT 1*LINE 13_AND
  SAVE AS_SECONDARY OPTION_.
  DISPLAY_CRT 1*LINE 14 CLEARED_.
  IF_SECONDARY_OPTION_IS EQUAL TO 1 THEN GO TO S115000.
  IF_SECONDARY_OPTION_IS EQUAL TO 2 THEN GO TO S116000.
  IF_SECONDARY_OPTION_IS EQUAL TO 3 THEN GO TO S117000.
  IF_SECONDARY_OPTION_IS EQUAL TO 4 THEN GO TO S117000.
  DISPLAY TEXT
  ( INPUT ERROR) ON_CRT 1*LINE 14._
  GO TO S112000.
S115000 DISPLAY TEXT
  SECONDARY OPTION 1 ENTERED) ON_CRT 1.LINE 13.
  GO TO S30000.
S116000 DISPLAY TEXT
  SECONDARY OPTION 2 ENTERED) ON_CRT 1.LINE 13.
  IF_FLAG 1 IS OFF GO TO S300000.
  ASSIGN_FLAG 3 ON.
  GO TO S30000.
S117000 DISPLAY TEXT
  SECONDARY OPTION 3 ENTERED) ON_CRT 1.LINE 13.
  IF_FLAG 2 IS OFF GO TO S300000.
  ASSIGN_FLAG 4 ON.
  GO TO S30000.
S118000 DISPLAY TEXT
  SECONDARY OPTION 4 ENTERED) ON_CRT 1.LINE 13.
  IF_FLAG 1 IS OFF GO TO S118000.
  ASSIGN_FLAG 3 ON.
S118400 IF_FLAG 2 IS OFF GO TO S30000.
  ASSIGN_FLAG 4 ON.
  GO TO S30000.
S201000 ASSIGN_FLAG 1 ON.
  GO TO S30000.
S202000 ASSIGN_FLAG 2 ON.
  GO TO S30000.
S203000 ASSIGN_FLAG 1 ON.
  ASSIGN_FLAG 2 ON.
  GO TO S30000.
S204000 ASSIGN_FLAG 1_ON.
ASSIGN_FLAG 2_ON.
ASSIGN_FLAG 4_ON.
GO TO S300000.

S205000 ASSIGN_FLAG 1_ON.
ASSIGN_FLAG 2_ON.
ASSIGN_FLAG 3_ON.
GO TO S300000.

S206000 ASSIGN_FLAG 1_ON.
ASSIGN_FLAG 2_ON.
ASSIGN_FLAG 3_ON.
ASSIGN_FLAG 4_ON.
C.30

S300000 ACTIVATE_FC PREPS SCAN_ALL.
S300100 IF_FLAG 1 IS ON GO TO S300500.
    LET_RN_=1.
S300110 DEACTIVATE_FC PREPS SCAN_ROW(_RN_).
    LET_RN_=RN_+1.
    IF_RN_ IS LESS THAN 36 THEN GO TO S300110.
    GO TO S300600.
S300500 IF_FLAG 2 IS ON GO TO S300600.
    LET_RN_=36.
S300510 DEACTIVATE_FCC PREPS SCAN_ROW(_RN_).
    LET_RN_=RN_+1.
    IF_RN_ IS LESS THAN 52 GO TO S300510.
S300600 VERIFY FC PREPS SCAN_FUNCTIONS ARE EQUAL TO_STATE OTHERWISE GO TO S600000.
S300700 IF_FLAG 1_ IS OFF THEN GO TO S301500.
S300800 VERIFY _FCC/ON/*6011 _ IS OFF OTHERWISE GOTO S327200.
S300900 READ GMT INTO _FCC POWER ON TIME_.
S301000 TURN _ IU FCC SYSTEM PWR _ ON.
S301100 DISPLAY _CRT 1 CLEAR_.
S301200 DISPLAY TEXT ( IU FCC SYSTEM PWR ON ) ON _CRT 1 LINE 1_.
S301300 ASSIGN _FLAG 6_ *FCC POWERED ON BY PROGRAM** ON.
S301400 IF_FLAG 2_ IS OFF THEN GOTO S302100.
S301500 VERIFY _CSP/POWER/ON _ IS OFF OTHERWISE GOTO S327700.
S301600 READ GMT INTO _CSP POWER ON TIME_.
S301700 TURN _ IU EDS RG SYS POWER _ ON.
S301800 DISPLAY TEXT ( IU EDS RG SYS POWER ON ) ON _CRT 1 LINE 2_.
S301900 ASSIGN _FLAG 5_ *CSP POWERED ON BY PROGRAM** ON.
S302000 IF_FLAG 1_ IS OFF THEN GOTO S304500.
S302100 TURN _ IU ZERO COMMAND _ ON FOR 100MSEC.
S302200 TURN _ IU ST-124M _ OFF.
S302300 TURN _ IU CONTROL RG _ ON.
S302400 TURN _ IU YAW SELECT _ OFF.
S302500 TURN _ IU ROLL SELECT _ OFF.
S302600 TURN _ IU PITCH SELECT _ ON.
S302700 TURN _ IU TEST INPUT A _ OFF.
S302800 TURN _ IU TEST INPUT B _ ON.
S302900 TURN _ IU SIC BURN TEST _ OFF.
S303000 TURN _ IU SII BURN TEST _ OFF.
S303100 TURN _ IU SIVB BURN TEST _ OFF.
S303200 TURN _ IU SIVB COAST TEST _ OFF.
S303300 TURN _ IU STEP ENABLE _ ON.
S303400 TURN _ IU SIVB BURN SUB _ OFF.
S303500 TURN _ IU SIVB COAST SUB _ OFF.
S303600 TURN _ IU SII BURN SUB _ OFF.
S303700 DISPLAY TEXT (FCC MODE CHECKS IN PROGRESS) ON _CRT 1_ LINE 3_
S303800 TURN _ IU SIC BURN SUB _ ON FOR 100MSEC.
S303900 VERIFY _ FCC/ON/+6011 _ IS OFF THEN GOTO S328300.
S304000 VERIFY _ FCC/ON/+6031 _ IS OFF THEN GOTO S328300.
S304100 VERIFY _ FCC/ON/+6041 _ IS OFF THEN GOTO S328300.
S304200 VERIFY _ SIC BURN SUB _ IS OFF THEN GOTO S328500.
S304300 TURN _ IU SII BURN SUB _ ON.
S304400 IF _FLAG 2_ IS OFF THEN GOTO S305600.
S304500 VERIFY _ CSP/POWER/ON _ IS OFF THEN GOTO S328700.
S304600 DISPLAY TEXT (GYRO RAMP EXERCISE AND COMPARATOR SET IN PROGRESS) ON _CRT 1_ LINE 4_.
S304800 TURN_ EDS/RG ZERO TORQUE COMMAND ON FOR 100MSEC.
S304900 TURN_ IU EDS RG ROLL AXIS SEL OFF.
S305000 TURN_ IU EDS RG YAW AXIS SEL OFF.
S305100 TURN_ IU EDS RG PITCH AXIS SEL ON.
S305200 TURN_ IU EDS RG REF GYRO SEL ON.
S305300 TURN_ IU EDS RG CMD GYRO SEL ON.
S305400 TURN_ IU EDS RG SPARE GYRO SEL OFF.
S305500 IF_FLAG 1_ IS OFF THEN GOTO S306700.
S305600 VERIFY_ S2 BURN_ IS OFF THEN GOTO S328900.
S305700 TURN_ IU SIV3 BURN SUB ON.
S305800 TURN_ IU SII BURN SUB OFF.
S305900 LET_INDEX_ = 1.
S306000 read GMT INTO _T2_.
S306100 IF_T2_ IS LESS THAN _T1_ + 8SEC THEN GOTO S306300.
S306200 GOTO S306600.
S306300 TURN_ IU RAMP POSITIVE ON FOR 1SEC.
S306400 LET_INDEX_ = INDEX_+ 1.
S306500 IF_INDEX_+1 IS LESS THAN 6 THEN GOTO S306100.
S306600 IF_FLAG 2_ IS OFF THEN GOTO S329200.
S306700 IF_FLAG 5_ IS OFF THEN GOTO S308600.
S306800 IF_FLAG 7_ IS ON THEN GOTO S307200.
S306900 VERIFY_ WH/SP/GR-1_ IS ON OTHERWISE GOTO S307200.
S307000 read GMT INTO _GR-1 UP-TO-SPEED INDICATION TIME_.
S307100 ASSIGN_FLAG 7_ **GR-1 UP-TO-SPEED DATA TAKEN** ON.
S307200 IF_FLAG 8_ IS ON THEN GOTO S307600.
S307300 VERIFY_ WH/SP/GR-2_ IS ON OTHERWISE GOTO S307600.
S307400 read GMT INTO _GR-2 UP-TO-SPEED INDICATION TIME_.
S307500 ASSIGN_FLAG 8_ **GR-2 UP-TO-SPEED DATA TAKEN** ON.
S307600 IF_FLAG 9_ IS ON THEN GOTO S308000.
S307700 VERIFY _WH/SP/GR-3_ IS ON OTHERWISE GOTO S308400.
S307800 READ GMT INTO _GR-3_ UP-TO-SPED INDICATION TIME_.
S307900 ASSGN _FLAG 9_ **GR-3 UP-TO-SPEED DATA TAKEN** ON.
S308000 IF_Flag 7_ IS OFF GOTO S308400.
S308100 IF_Flag 8_ IS OFF THEN GOTO S308400.
S308200 IF_Flag 9_ IS ON THEN GOTO S308600.
S308300 READ GMT INTO _T3_.
S308400 IF _T3_ IS LESS THAN _T1_+20SEC THEN GOTO S306800.
S308500 GOTO S329200.
S308600 TURN _IU RAMP POSITIVE_ ON FOR 3SEC. **MD0694**
S308700 VERIFY _REF/PITCH_ IS BETWEEN 3.00VDC AND 4.00VDC OTHERWISE GOTO S329400. **VOLTS CONVERTED TO DEGREES/SEC BY SUBROUTINE**
S308800 READ _REF/PITCH_ AND SAVE AS _PR1_.
S308900 IF _CMD/PITCH_ IS NOT BETWEEN _PR1_+0.10V AND _PR1_−0.10V THEN GO TO S329500.
S309000 TURN _EDS/RG ZERO TORQUE COMMAND_ ON FOR 100MSEC. **MD0410**
S309100 VERIFY _IU EDS RG ZERO TORQUE COMMAND_ = 0 WITHIN 10SEC OTHERWISE GOTO S309200. **MD0635**
S309200 TURN _IU RAMP NEGATIVE_ ON FOR 3SEC. **MD0695**
S309300 VERIFY _REF/PITCH_ IS NOT BETWEEN 1.00V AND 2.00V THEN GOTO S329800.
S309400 READ _REF/PITCH_ AND SAVE AS _PR2_.
S309500 IF _CMD/PITCH_ IS NOT BETWEEN _PR2_+0.10V AND _PR2_−0.10V THEN GO TO S330000.
S309600 TURN _IU EDS RG REF GYRO SEL_ OFF. **MD01907**
S309700 TURN _IU RAMP POSITIVE_ ON. **MD0694**
S309800 VERIFY _PITCH/COMP_ IS ON WITHIN 3SEC OTHERWISE GOTO S309900. **MD0694**
S309900 TURN _IU RAMP POSITIVE_ OFF. **MD0694**
S310000 VERIFY _PITCH/COMP_ IS OFF THEN GOTO S330200.
S310100 TURN _ IU EDS RG CMDGYROSEL OFF. **MD01909**
S310200 TURN _ IU EDS RG SPAREGYROSEL ON. **MD01910**
S310300 TURN _ IU RAMP POSITIVE ON FOR 3SEC. **MD0694**
S310400 VERIFY _ CMD/PITCH _ IS NOT BETWEEN 3.00VOLTS AND 4.00VOLTS THEN GOTO S330400. **MD0910**
S310500 TURN _ EDS/RG ZERO TORQUE COMMAND ON FOR 100MSEC. **MD1635**
S310600 VERIFY _ IU EDS RG ZERO TORQUE COMMAND IS OFF WITHIN 10SEC OTHERWISE GOTO S310700. **MD0695**
S310700 TURN _ IU RAMP NEGATIVE ON FOR 3SEC. **MD1807**
S310800 VERIFY _ CMD/PITCH _ IS NOT BETWEEN 1.00VOLT AND 2.00VOLTS THEN GOTO S330600. **MD0410**
S310900 TURN _ EDS/RG ZERO TORQUE COMMAND ON FOR 100MSEC. **MD0410**
S311000 IF_FLAG 1_ IS OFF THEN GOTO S312300. **MD01909**
S311100 DISPLAY TEXT (FCC COMPARATOR SET ROUTINE IN PROGRESS) ON _CRT1_ LINE 5_ **MD01807**
S311200 TURN _ IU S-IVB COAST TEST ON. **MD01807**
S311300 VERIFY _ S4B BURN _ IS OFF THEN GOTO S330800. **MD01807**
S311400 LET _INDEX_=_INDEX_+1.
S311500 IF_INDEX_+1=6 THEN GOTO S331000.
S311600 VERIFY _ P/SERVO/COMP_ IS ON WITHIN 3SEC OTHERWISE GOTO S331400. **MD01799**
S311700 TURN _ IU YAW SELECT ON. **MD01801**
S311800 TURN _ IU PITCH SELECT OFF. **MD01801**
S311900 VERIFY _ Y/SERVO/COMP _ IS ON WITHIN 3SEC OTHERWISE GOTO S331600. **MD01807**
S312000 TURN _ IU S-IVB COAST TEST OFF. **MD02007**
S312100 TURN _ IU SIVB BURN SUB OFF. **MD02007**
S312200 IF_FLAG 2_ IS OFF THEN GOTO S315400.
S312300 TURN _ IU EDS RG YAW AXIS SEL _ ON.
S312400 TURN _ IU EDS RG PITCH AXIS SEL _ OFF.
S312500 TURN _ IU EDS RG REF GYRO SEL _ ON.
S312600 TURN _ IU EDS RG CMD GYRO SEL _ ON.
S312700 TURN _ IU EDS RG SPARE GYRO SEL _ OFF.
S312800 VERIFY _ IU EDS RG ZERO TORQUE COMMAND _ IS OFF WITHIN 10SEC **MD01635** 
OTHERWISE GOTO S312900.
S312900 TURN _ IU RAMP POSITIVE _ ON FOR 3SEC. **MD01909**
S313000 VERIFY _ REF/YAW _ IS NOT BETWEEN 3.00V AND 4.00V THEN GOTO S331800.
S313100 READ _ REF/YAW _ AND SAVE AS _PR3_.
S313200 VERIFY _ CMD/YAW _ IS NOT BETWEEN _PR3_+0.10 AND _PR3_-0.10 THEN GOTO S332000.
S313300 TURN _ EDS/RG ZERO TORQUE COMMAND _ ON FOR 100MSEC. **MD01906**
S313400 VERIFY _ IU EDS RG ZERO TORQUE COMMAND _ IS OFF WITHIN 10SEC **MD01635** 
OTHERWISE GOTO S313500.
S313500 TURN _ IU RAMP NEGATIVE _ ON FOR 3SEC. **MD01910**
S313600 VERIFY _ REF/YAW _ IS NOT BETWEEN 1.00V AND 2.00V THEN GOTO S332200.
S313700 READ _ REF/YAW _ AND SAVE AS _PR4_.
S313800 VERIFY _ CMD/YAW _ IS NOT BETWEEN _PR4_+0.10 AND _PR4_-0.10 THEN GOTO S332400.
S313900 TURN _ IU EDS RG REF GYRO SEL _ OFF. **MD01907**
S314000 TURN _ IU RAMP POSITIVE _ ON. **MD01906**
S314100 VERIFY _ YAW/COMP _ IS ON WITHIN 3SEC OTHERWISE GOTO S314200. **MD01910**
S314200 TURN _ IU RAMP POSITIVE _ OFF. **MD01910**
S314300 VERIFY _ YAW/COMP _ IS OFF THEN GOTO S332600. **MD01909**
S314400 TURN _ IU EDS RG CMD GYRO SEL _ OFF. **MD01907**
S314500 TURN _ IU EDS RG SPARE GYRO SEL _ ON. **MD01910**
S314600 TURN _ IU RAMP POSITIVE _ ON FOR 3SEC. **MD01909**
S314700 VERIFY _ CMD/YAW _ IS NOT BETWEEN 3.00V AND 4.00V THEN GOTO S332800. **MD01910**
S314800 TURN _ EDS/RG ZERO TORQUE COMMAND _ ON FOR 100MSEC.

S314900 VERIFY _ IU EDS RG ZERO TORQUE COMMAND _ IS OFF WITHIN 10SEC

OTHERWISE GOTO S315000.

S315000 TURN _ IU RAMP NEGATIVE _ ON FOR 3SEC.

S315100 VERIFY _ CMD/YAW _ IS NOT BETWEEN 1.00V AND 2.00V THEN GOTO S333600.

S315200 TURN _ EDS/RG ZERO TORQUE COMMAND _ ON FOR 100MSEC.

S315300 IF _FLAG_1_ IS OFF THEN GOTO S316700.

S315400 TURN _ IU S-IVB COAST TEST _ ON.

S315500 VERIFY _ R-Y1/SP/COMP _ IS ON WITHIN 3SEC OTHERWISE GOTO S333200.

S315600 VERIFY _ R-Y2/SP/COMP _ IS ON WITHIN 3SEC OTHERWISE GOTO S333400.

S315700 TURN _ IU PITCH SELECT _ ON.

S315800 TURN _ IU YAW SELECT _ OFF.

S315900 VERIFY _ P/SPAT/COMP _ IS ON WITHIN 3SEC OTHERWISE GOTO S333600.

S316000 TURN _ IU ZERO COMMAND _ ON FOR 100MSEC.

S316100 TURN _ IU CONTROL RG _ OFF.

S316200 TURN _ IU PITCH SELECT _ OFF.

S316300 TURN _ IU TEST INPUT B _ OFF.

S316400 TURN _ IU S-IVB COAST TEST _ OFF.

S316500 TURN _ IU STEP ENABLE _ OFF.

S316600 IF _FLAG_2_ IS OFF THEN GOTO S322500.

S316700 TURN _ IU EDS RG ROLL AXIS SEL _ ON.

S316800 TURN _ IU EDS RG YAW AXIS SEL _ OFF.

S316900 TURN _ IU EDS RG REF GYRO SEL _ ON.

S317000 TURN _ IU EDS RG CMD GYRO SEL _ ON.

S317100 TURN _ IU EDS RG SPARE GYRO SEL _ OFF.

S317200 VERIFY _ IU EDS RG ZERO TORQUE COMMAND _ IS OFF WITHIN 10SEC

OTHERWISE GOTO S317300.

S317300 TURN _ IU RAMP POSITIVE _ ON FOR 3SEC.

S317400 VERIFY _ REF/ROLL _ IS NOT BETWEEN 3.00V AND 4.00V THEN GOTO S333800.
S317500 READ _ PEF/ROLL _ AND SAVE AS _PR5_.
S317600 VERIFY _ CMD/ROLL _ IS NOT BETWEEN _PR5_-0.10V AND _PR5_-0.10V THEN 
GOTO S334000.
S317700 TURN _ EDS/RG ZERO TORQUE COMMAND _ ON FOR 100MSEC.  **MD0410**
S317800 VERIFY _ IU EDS RG ZERO TORQUE COMMAND _ IS OFF WITHIN 10SEC  **MDI635**
OTHERWISE GOTO S317900.
S317900 TURN _ IU RAMP NEGATIVE _ ON FOR 3SEC.  **MD0695**
S318000 VERIFY _ REF/ROLL _ IS NOT BETWEEN 1.00V AND 2.00V THEN GOTO S334200.
S318100 READ _ REF ROLL _ AND SAVE AS _PR6_.
S318200 VERIFY _ CMD/ROLL _ IS NOT BETWEEN _PR6_-0.10V AND _PR6_-1 THEN 
GOTO S334400.
S318300 TURN _ IU EDS RG REF GYRO SEL _ ON.  **MD01907**
S318400 TURN _ IU RAMP POSITIVE _ ON. **MD0694**
S318500 VERIFY _ ROLL/COMP _ IS ON WITHIN 3SEC OTHERWISE GOTO S318600.
S318600 TURN _ IU RAMP POSITIVE _ OFF.  **MD0694**
S318700 VERIFY _ ROLL/COMP _ IS OFF THEN GOTO S334600.
S318800 TURN _ IU EDS RG CMD GYRO SEL _ OFF.  **MD01909**
S318900 TURN _ IU EDS RG SPARE GYRO SEL _ ON.  **MD01910**
S319000 TURN _ IU RAMP POSITIVE _ ON FOR 3SEC.  **MD0694**
S319100 VERIFY _ CMD/ROLL _ IS NOT BETWEEN 3.00V AND 4.00V THEN GOTO S334800.
S319200 TURN _ EDS/RG ZERO TORQUE COMMAND _ ON FOR 100MSEC.  **MD0410**
S319300 VERIFY _ IU EDS RG ZERO TORQUE COMMAND _ IS OFF WITHIN 10SEC  **MDI635**
OTHERWISE GOTO S319400.
S319400 TURN _ IU RAMP NEGATIVE _ ON FOR 3SEC.  **MD00695**
S319500 VERIFY _ CMD/ROLL _ IS NOT BETWEEN 1.00V AND 2.00V THEN GOTO S335000.
S319600 TURN _ EDS/RG ZERO TORQUE COMMAND _ ON FOR 100MSEC.  **MD0410**
S319700 IF _FLAG 5_ IS OFF GOTO S321700.
S319800 DISPLAY TEXT (EDS/CRG SYSTEM POWER APPLICATION) ON _CRT 1*LINE 6_.
S319900 DISPLAY _CSP POWER ON TIME_ ON _CRT 1*LINE 7_.
S320000 PRINT TEXT (EDS/CRG SYS PWR APP)* _CSP POWER ON TIME_ ON _PRINTER_.
S320100 RECORD TEXT (EDS/CRG SYS PWR APP)* _CSP POWER ON TIME_ ON _MAG TAPE_.
S320200 IF _FLAG 7_ IS OFF GOTO S320700.
S320300 DISPLAY TEXT (GROUP 1, UP TO SPEED) ON _CRT 1*LINE 8_.
S320400 DISPLAY _GR-1 UP-TO-SPEED INDICATION TIME_ ON _CRT 1*LINE 9_.
S320500 PRINT TEXT (GROUP 1 UP-TO-SPEED)* _GR-1 UP-TO-SPEED INDICATION TIME_ ON _PRINTER_.
S320600 RECORD TEXT (GROUP 1 UP-TO-SPEED)* _GR-1 UP-TO-SPEED INDICATION TIME_ ON _MAG TAPE_.
S320700 IF _FLAG 8_ IS OFF THEN GOTO S321200.
S320800 DISPLAY TEXT (GROUP 2, UP TO SPEED) ON _CRT 1*LINE 9_.
S320900 DISPLAY _GR-2 UP-TO-SPEED INDICATION TIME_ ON _CRT 1*LINE 10_.
S321000 PRINT TEXT (GROUP 2, UP-TO-SPEED TIME)* _GR-2 UP-TO-SPEED INDICATION TIME_ ON _PRINTER_.
S321100 RECORD TEXT (GROUP 2, UP-TO-SPEED TIME)* _GR-2 UP-TO-SPEED INDICATION TIME_ ON _MAG TAPE_.
S321200 IF _FLAG 9_ IS OFF THEN GOTO S321700.
S321300 DISPLAY TEXT (GROUP 3, UP TO SPEED) ON CRT 1, LINE 11.
S321400 DISPLAY GR-3 UP-TO-SPEED INDICATION TIME ON CRT 1, LINE 12.
S321500 PRINT TEXT (GROUP 3, UP-TO-SPEED TIME), GR-3 UP-TO-SPEED INDICATION TIME ON PRINTER.
S321600 RECORD TEXT (GROUP 3 UP-TO-SPEED TIME), GR-3 UP-TO-SPEED INDICATION TIME ON MAG TAPE.
S321700 TURN IU EDS RG ROLL AXIS SEL OFF.
S321800 TURN IU EDS RG YAW AXIS SEL OFF.
S321900 TURN IU EDS RG PITCH AXIS SEL OFF.
S322000 TURN IU EDS RG REF GYRO SEL OFF.
S322100 TURN IU EDS RG CMD GYRO SEL OFF.
S322200 TURN IU EDS RG SPARE GYRO SEL OFF.
S322300 IF_FLAG 1 IS OFF THEN GOTO S323600. **FCC OPTION NOT SELECTED**
**DID PROGRAM TURN ON FCC?**

S322500 IF_FLAG 6_IS OFF THEN GOTO S322900 **NO**

S322600 DISPLAY TEXT (**FCC SYSTEM POWER APPLICATION**) ON_CRT 1*LINE 1*

S322700 DISPLAY_FCC POWER ON TIME.ON_CRT 1*LINE 2*

S322800 LET FCC POWER ON TIME_EQUAL 0.

S322900 DISPLAY TEXT (**FCC PREPS PERFORMED**) ON_CRT 1*LINE 3*

**IS FCC COMP_SET OPTION SELECTED?**

S323100 IF_FLAG 3_IS ON THEN GOTO S323400 **YES**

S323200 TURN _ COMPARATOR RESET _ ON FOR 100MSEC.

S323300 GOTO S323500 .

S323400 DISPLAY TEXT (**FCC COMPARATORS REMAINED SET**) ON_CRT 1*LINE 4*

S323500 IF_FLAG 2_IS OFF THEN GOTO S324100 .

S323600 DISPLAY TEXT (**EDS/CRG PREPS PERFORMED**) ON_CRT 1*LINE 5*

**IS EDS/CRG COMP_SET OPTION SELECTED?**

S323700 IF_FLAG 4_IS ON THEN GOTO S324000 **YES**

S323800 TURN _ EDS COMP MNTR RESET _ ON FOR 100MSEC.

S323900 GOTO S324100 .

S324000 DISPLAY TEXT (**EDS/CRG COMPARATORS REMAINED SET**) ON_CRT 1*LINE 6*

S324100 ASSIGN_FLAG 1_OFF.

S324200 ASSIGN_FLAG 2_OFF.

S324300 ASSIGN_FLAG 3_OFF.

S324400 ASSIGN_FLAG 4_OFF.

S324500 ASSIGN_FLAG 5_OFF.

S324600 ASSIGN_FLAG 6_OFF.

S324700 ASSIGN_FLAG 7_OFF.

S324800 ASSIGN_FLAG 8_OFF.

S324900 ASSIGN_FLAG 9_OFF.
S325000 LET_FCC POWER ON TIME_EQUAL 0.
S325100 LET_CSP POWER ON TIME_EQUAL 0.
S325200 LET_GR1 UP TO SPEED INDICATION TIME_EQUAL 0.
S325300 LET_GR2 UP TO SPEED INDICATION TIME_EQUAL 0.
S325400 LET_GR3 UP TO SPEED INDICATION TIME_EQUAL 0.
S325500 LET_RN_EQUAL 1.
S325600 DEACTIVATE_FC/preps SCAN_ROW(-RN-).
S325700 LET_RN_EQUAL_RN+1.
S325800 IF_RN IS LESS THAN 36 THEN GOTO S325600.
S325900 DISPLAY_CRT 1 CLEAR__
S326000 DISPLAY TEXT (KAF2 COMPLETE) ON_CRT 1*LINE 1__
S326100 READ GMT INTO_TEST COMPLETE TIME__
S326200 DISPLAY TEXT (AT TIME )_TEST COMPLETE TIME_ON_CRT 1*LINE 2__
S326300 PRINT TEXT (KAF2 COMPLETE AT TIME )_TEST COMPLETE TIME_ON_PRINTER__
S326400 RECORD TEXT (KAF2 COMPLETE AT TIME )_TEST COMPLETE TIME_ON_MAG_TAPE__
S326500 PROGRAM_KAF2_COMPLETE.
**KAF2 ERROR Routines**

S326600 DISPLAY _CRT 1 CLEAR_
S326700 DISPLAY TEXT (CONFIGURATION SCAN UNSUCCESSFUL) ON _CRT 1*LINE 1_
S326800 PERFORM _RETRY OR TERMINATE_
S326900 IF _FLAG 14_ IS OFF THEN GO TO S324100.
S327000 ASSIGN _FLAG 14_ OFF.
S327100 GOTO S300000.
S327200 VERIFY _FCC/ON/+6D31_ IS OFF THEN GOTO S327500.
S327300 VERIFY _FCC/ON/+6D41_ IS OFF THEN GOTO S327500.
S327400 GOTO S301400.
S327500 DISPLAY TEXT (FCC POWER++6D11++6D31++6D41 NOT IN SAME STATE) ON _CRT 1*LINE 2_
S327600 GOTO S301400.
S327700 VERIFY _WH/SP/GR-1_ IS OFF THEN GOTO S328100.
S327800 VERIFY _WH/SP/GR-2_ IS OFF THEN GOTO S328100.
S327900 VERIFY _WH/SP/GR-3_ IS OFF THEN GOTO S328100.
S328000 GOTO S302000.
S328100 DISPLAY TEXT (ALL EDS/CRG UP TO SPEED INDICATIONS NOT ON) ON _CRT 1*LINE 3_
S328200 GOTO S302000.
S328300 DISPLAY TEXT (FCC POWER INDICATION DID NOT COME ON) ON _CRT 1*LINE 4_
S328400 GOTO S304200.
S328500 DISPLAY TEXT (SIC BURN MODE INDICATION DID NOT COME ON) ON _CRT 1*LINE 5_
S328600 GOTO S304300.
S328700 DISPLAY TEXT (CSP SYSTEM POWER INDICATION DID NOT COME ON) ON CRT 1*LINE 6*

S328800 GOTO S304800.

S328900 VERIFY _S2 BURN_ IS ON WITHIN 5SEC THEN GOTO S305700.

S329000 DISPLAY TEXT (SII BURN MODE INDICATION DID NOT COME ON) ON CRT 1*LINE 7*

S329100 GOTO S305800.

S329200 DISPLAY TEXT (ALL UP TO SPEED IND. DID NOT COME ON WITHIN 20SEC) ON CRT 1*LINE 8*

S329300 GOTO S308600.

S329400 DISPLAY TEXT (REF PITCH PCS NOT WITHIN +2 TO +6 DEG/SEC) ON CRT 1*LINE 9*

S329500 GOTO S308000.

S329600 DISPLAY TEXT (CMD PITCH POS NOT WITHIN 0.4 DEG/SEC OF REF) ON CRT 1*LINE 10*

S329700 GOTO S309000.

S329800 DISPLAY TEXT (REF PITCH NEG NOT WITHIN -2 TO -6 DEG/SEC) ON CRT 1*LINE 11*

S329900 GOTO S309400.

S330000 DISPLAY TEXT (CMD PITCH NEG NOT WITHIN 0.4 DEG/SEC OF REF) ON CRT 1*LINE 12*

S330100 GO TO S309600.

S330200 DISPLAY TEXT (EDS/CRG PITCH COMPARATOR DID NOT SET) ON CRT 1*LINE 13*

S330300 GOTO S329700.
S330400 DISPLAY TEXT (SPARE PITCH POS NOT WITHIN +2 TO +6 DEG/SEC) ON _CRT 1*LINE 14_.
S330500 GOTO S310500.
S330600 DISPLAY TEXT (SPARE PITCH NEG NOT WITHIN -2 TO -6 DEG/SEC) ON _CRT 1*LINE 15_.
S330700 GOTO S310900.
S330800 DISPLAY TEXT (SIVB BURN MODE INDICATION DID NOT COME ON) ON _CRT 1*LINE 16_.
S330900 GOTO S311500.
**INCREMENT ROUTINE FOR FCC TEST INPUTS**

S331000 TURN _IU RAMP POSITIVE_ ON FOR 1SEC.

S331100 LET _INDEX_=_INDEX_+1.

S331200 IF _INDEX_+1=7 THEN GOTO S331000.

S331300 GOTO S311600.

S331400 DISPLAY TEXT (FCC PITCH SERVO COMPARATOR DID NOT SET) ON _CRT 1*LINE 17_.

S331500 GOTO S311700.

S331600 DISPLAY TEXT (FCC YAW SERVO COMPARATOR DID NOT SET) ON _CRT 1*LINE 18_.

S331700 GOTO S312100.

S331800 DISPLAY TEXT (REF YAW POS NOT WITHIN +2 TO +6 DEG/SEC) ON _CRT 1*LINE 19_.

S331900 GOTO S313100.

S332000 DISPLAY TEXT (CMD YAW POS NOT WITHIN 0.4 DEG/SEC OF REF) ON _CRT 1*LINE 20_.

S332100 GOTO S313300.

S332200 DISPLAY TEXT (REF YAW NEG NOT WITHIN -2 TO -6 DEG/SEC) ON _CRT 1*LINE 2_.

S332300 GOTO S313700.

S332400 DISPLAY TEXT (CMD YAW NEG NOT WITHIN 0.4 DEG/SEC OF REF) ON _CRT 1*LINE 3_.

S332500 GOTO S313900.

S332600 DISPLAY TEXT (EDS/CRG YAW COMPARATOR DID NOT SET) ON _CRT 1*LINE 4_.

S332700 GOTO S314500.

S332800 DISPLAY TEXT (SPARE YAW POS NOT WITHIN +2 TO +6 DEG/SEC) ON _CRT 1*LINE 5_.

S332900 GOTO S314800.
S333000 DISPLAY TEXT (SPARE YAW NEG NOT WITHIN -2 TO -6 DEG/SEC) ON _CRT 1*LINE 6_.
S333100 GOTO S315200.
S333200 DISPLAY TEXT (FCC R-Y1 SPATIAL COMPARATOR DID NOT SET) ON _CRT 1*LINE 7_.
S333300 GOTO S315600.
S333400 DISPLAY TEXT (FCC R-Y2 SPATIAL COMPARATOR DID NOT SET) ON _CRT 1*LINE 8_.
S333500 GOTO S315700.
S333600 DISPLAY TEXT (FCC PITCH SPATIAL COMPARATOR DID NOT SET) ON _CRT 1*LINE 9_.
S333700 GOTO S316000.
S333800 DISPLAY TEXT (REF ROLL POS NOT WITHIN +2 TO +6 DEG/SEC) ON _CRT 1*LINE 10_.
S333900 GOTO S317500.
S334000 DISPLAY TEXT (CMD ROLL POS NOT WITHIN 0.4 DEG/SEC OF REF) ON _CRT 1*LINE 11_.
S334100 GOTO S317700.
S334200 DISPLAY TEXT (REF ROLL NEG NOT WITHIN -2 TO -6 DEG/SEC) ON _CRT_ 1 LINE 12_

S3343 GOTO S318100.

S3344 DISPLAY TEXT (CMD ROLL NEG NOT WITHIN 0.4 DEG/SEC OF REF) ON _CPT_ 1 LINE 13_

S3345 GOTO S318300.

S3346 DISPLAY TEXT (EDS/CRI ROLL COMPARATOR DID NOT SET) ON _CRT_ 1 LINE 14_

S3347 GOTO S318800.

S3348 DISPLAY TEXT (SPARE ROLL POS NOT WITHIN +2 TO +6 DEG/SEC) ON _CRT_ 1 LINE 15_

S3349 GOTO S319200.

S3350 DISPLAY TEXT (SPARE ROLL NEG NOT WITHIN -2 TO -6 DEG/SEC) ON _CRT_ 1 LINE 16_

S3351 GOTO S319600.

S335200 DISABLE _TERMINATE_.

S335300 PROGRAM _KAF2_ "FLIGHT CONTROL PREPARATIONS AS509" COMPLETE.
**The portion of an Aloft program which follows defines a subroutine which is used to illustrate the differences between the use of a subroutine and the use of a macro.**

BEGIN_ADJUST_WITH_INPUTS_VALUE_OF_X_,_FINAL_VALUE_,_ADJUST_FUNCTION_ AND_FUNCTION_OF_X_AND_OUTPUT_RESULT_.

DECLARE_Y_NUMERIC.
DECLARE_VALUE_OF_X_NUMERIC.
DECLARE_FINAL_VALUE_NUMERIC.
DECLARE_RESULT_NUMERIC.

LET_RESULT_EQUAL_0.
SET CLOCK 1 TO 0MSEC. AND SEND_ADJUST_FUNCTION_**THE**_VALUE_OF_X_.
AFTER CLOCK 1 IS 5MSEC. MEASURE_FUNCTION_OF_X_AND_SAVE_AS_Y_.
IF_Y_IS_GREATER_THAN_OR_EQUAL_TO_FINAL_VALUE_ THEN
    LET_RESULT_EQUAL_VALUE_OF_X_.
END_ADJUST_.


**THE FOLLOWING IS A PORTION OF THE PROGRAM USING THE PREVIOUSLY DEFINED SUBROUTINE_ADJUST_*. AS IT WOULD BE WRITTEN AND AS IT WOULD APPEAR ON A FINAL LISTING. DECLARATIONS AND SPECIFICATIONS REQUIRED ARE ASSUMED.**

**OTHER STATEMENTS**

LET_START_EQUAL 5.0V.

STATEMENT 100 PERFORM_ADJUST_WITH INPUTS_START_, 55.0DEG_, POSITION DRIVER_ AND_POSITION AND OUTPUT_VOLTIN_.

IF_VOLTIN_IS_NOT_EQUAL_TO 0 THEN GOTO STATEMENT 101.

LET_START_EQUAL_START_+ 1.0V.

GOTO STATEMENT 100.

STATEMENT 101 "PROGRAM CONTINUES"

**OTHER STATEMENTS**

LET_VALUE_SENT_EQUAL 24.0INHG.

STATEMENT 200 PERFORM_ADJUST_WITH INPUTS_VALUE_SENT_, 110.0DEGF_, PRESSURE_ AND_TEMPERATURE AND OUTPUT_TOTAL PRESS_.

IF_TOTAL_PRESS_IS_NOT_EQUAL_TO 0 THEN GOTO STATEMENT 201.

LET_VALUE_SENT_EQUAL_VALUE_SENT_+ 2.0INHG.

GOTO STATEMENT 200.

STATEMENT 201 "PROGRAM CONTINUES"

**AT EACH PERFORM_ADJUST_STATEMENT CONTROL WOULD BE TRANSFERRED TO THE PREVIOUSLY DEFINED_ADJUST_SUBROUTINE WITH THE APPROPRIATE INFORMATION AS INDICATED IN THE PERFORM STATEMENT. WHEN THE SUBROUTINE IS COMPLETE, CONTROL IS RETURNED TO THE STATEMENT FOLLOWING THE PERFORM STATEMENT. THIS ACTIVITY OCCURS AT RUN TIME.**
**THE PORTION OF AN ALOFT PROGRAM WHICH FOLLOWES DEFINES A MACRO WHICH IS
USED TO ILLUSTRATE THE DIFFERENCE BETWEEN THE USE OF A SUBROUTINE AND
THE USE OF A MACRO.**

MACRO ADJUST_VALUE OF X_**FINAL VALUE**.ADJUST FUNCTION.FUNCTION OF X_
AND_RESULT.

LET_RESULT_EQUAL 0.
SET CLOCK 1 TO CMSEC. AND
SEND_ADJUST FUNCTION.THE VALUE OF X_.
AFTER CLOCK 1 IS 5MSEC.
MEASURE_FUNCTION OF X. AND SAVE AS_Y_.
IF_Y_ IS GREATER THAN OR EQUAL TO_FINAL VALUE_THEN
LETR_RESULT_EQUAL_VALUE OF X_.
END.
**THE FOLLOWING IS A PORTION OF THE PROGRAM USING THE PREVIOUSLY DEFINED MACRO ADJUST AS IT WOULD BE WRITTEN. DECLARATIONS AND SPECIFICATIONS REQUIRED ARE ASSUMED.**

**OTHER STATEMENTS**

LET_START_EQUAL_SOV.

STATEMENT 100 EXECUTE ADJUST_START_+55.0DEG.+POSITION DRIVER_.

POSITION_AND_VOLTIN._

IF_VOLTIN_IS NOT EQUAL TO O THEN GOTO STATEMENT 101.

LET_START_EQUAL_START_+1.0V.

GOTO STATEMENT 100.

STATEMENT 101 **PROGRAM CONTINUES**

**OTHER STATEMENTS**

LET_VALUE SENT_EQUAL 24.0INHG.

STATEMENT 200 EXECUTE ADJUST_VALUE SENT_+110.0DEGF.+PRESSURE_.

TEMPERATURE_AND_TOTAL PRESS_.

IF_TOTAL PRESS IS NOT EQUAL TO O THEN GOTO STATEMENT 201.

LET_VALUE SENT_EQUAL_VALUE SENT_+2.0INHG.

GOTO STATEMENT 200.

STATEMENT 201 **PROGRAM CONTINUES**

**AT EACH EXECUTE ADJUST STATEMENT THE LANGUAGE PROCESSOR WOULD INSERT THE ACTUAL BODY OF THE MACRO WITH THE APPROPRIATE INFORMATION SUBSTITUTED INTO THE MACRO BODY. THIS ACTIVITY OCCURS AT SOURCE STATEMENT PROCESSING TIME.**
**THE FOLLOWING IS THE PORTION OF THE PROGRAM PREVIOUSLY WRITTEN USING THE EXECUTE ADJUST, AS IT WOULD APPEAR ON A FINAL LISTING.**

**"OTHER STATEMENTS"**

LET START_EQUAL 5.OV.

STATEMENT 100 LET VOLTIN_EQUAL 0.

SET CLOCK 1 TO OMSEC. AND
SEND POSITION DRIVER_**THE**_START_
AFTER CLOCK 1 IS 5MSEC.
MEASURE_POSITION AND SAVE AS_T_.

IF_Y_ IS GREATER THAN OR EQUAL TO 55.0DEG THEN
LET VOLTIN_EQUAL START_.

IF_VOLTIN_IS NOT EQUAL TO 0 THEN GOTO STATEMENT 101.
LET START_EQUAL START_+1.OV.
GOTO STATEMENT 100.

STATEMENT 101 **"PROGRAM CONTINUES"**
**OTHER STATEMENTS**

LET_VALUE SENT_EQUAL 24.0INHG.

STATEMENT 200 LET_TOTAL PRESS_EQUAL 0.

SET CLOCK 1 TO OMSEC. AND
SEND_PRESSURE_ THE**_VALUE SENT_.

AFTER CLOCK 1 IS SMSEC.

MEASURE_TEMPERATURE_AND_SAVE AS_Y_.

IF_Y_IS GREATER THAN OR EQUAL TO 110.0DEGF THEN

LET_TOTAL PRESS_EQUAL_VALUE SENT_.

IF_TOTAL PRESS_IS NOT EQUAL TO 0 THEN GOTO STATEMENT 201.

LET_VALUE SENT_EQUAL_VALUE SENT_+2.0INHG.

GOTO STATEMENT 200.

STATEMENT 201 **PROGRAM CONTINUES**

**EACH EXECUTE ADJUST STATEMENT HAS BEEN REPLACED BY THE BODY OF THE MACRO AND THE APPROPRIATE INFORMATION HAS BEEN SUBSTITUTED INTO THE MACRO BODY AT LANGUAGE PROCESSOR TIME. AT RUN TIME ONLY THE RESULTING STATEMENTS (APPEARING ABOVE) ARE RECOGNIZED AND EXECUTED.**