# Honeywell

# DFZ-800 TROUBLESHOOTING GUIDE

## for the Dassault Falcon 900

PRELIMINARY
5 September 89

**FALCON 900**
**Trouble Shooting Guide**
**Table of Contents**

PURPOSE:

This Tips guide is meant to aide aircraft line technicians (and anyone else who works with the SPZ-8000) in troubleshooting flight guidance computer problems in the Falcon 900 SPZ-8000 system.

USAGE:

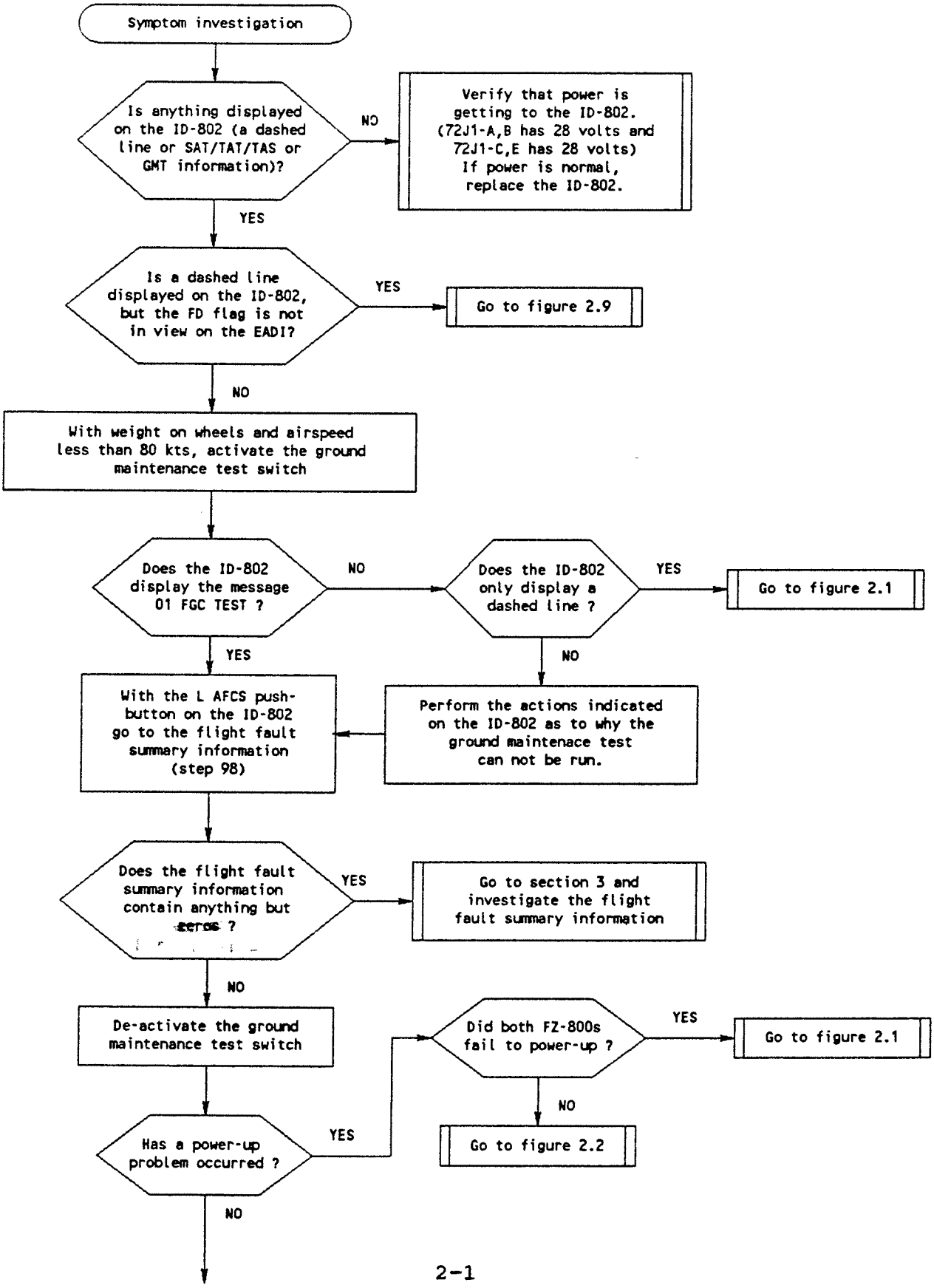
If the flight fault summary information is available for a problem, section 3 of this manual will indicate what actions should be taken.

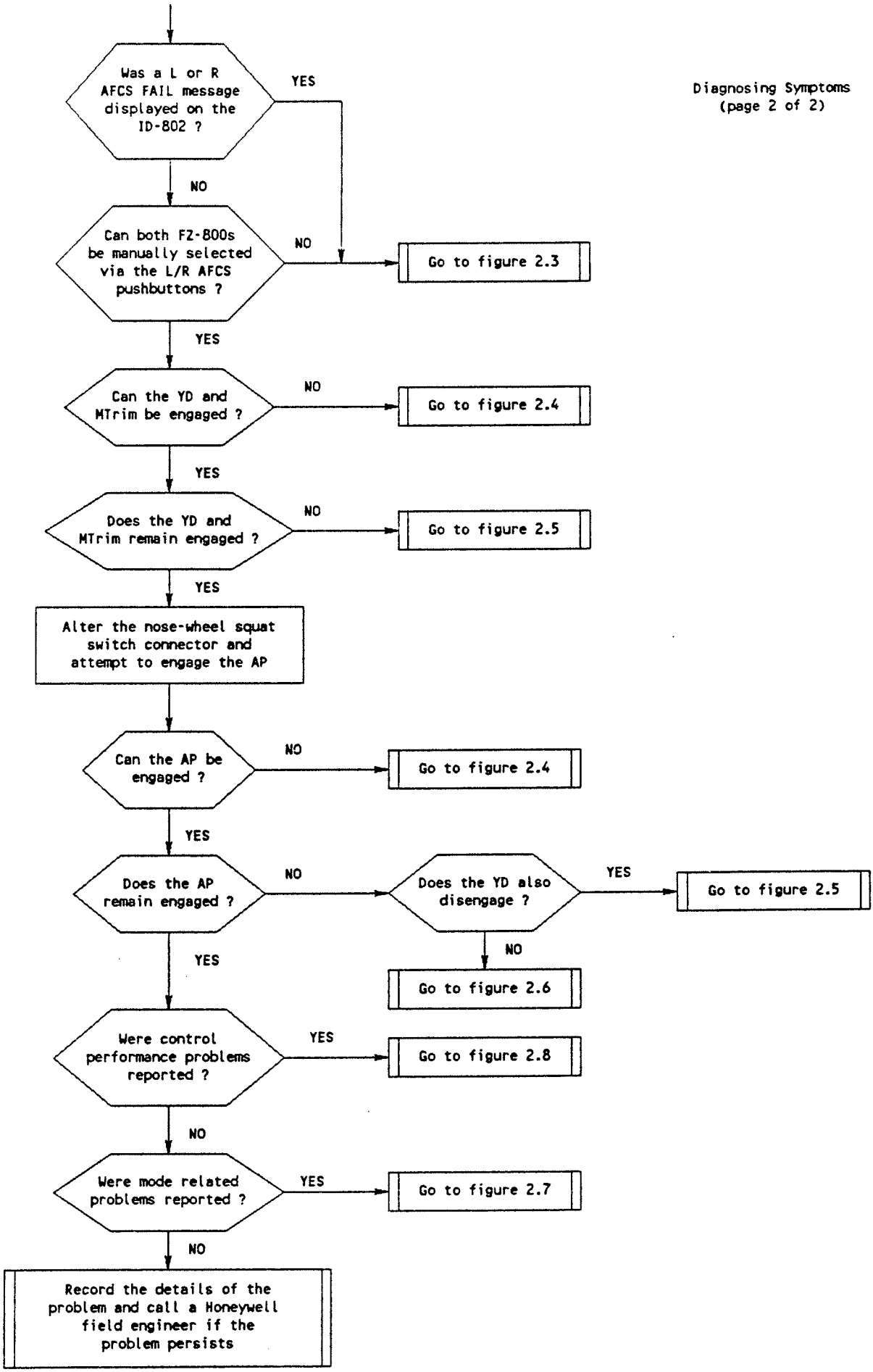
If the flight fault summary information is not available, section 2 can be used to help trouble shoot the system from the symptoms.

REFERENCE DOCUMENTS:

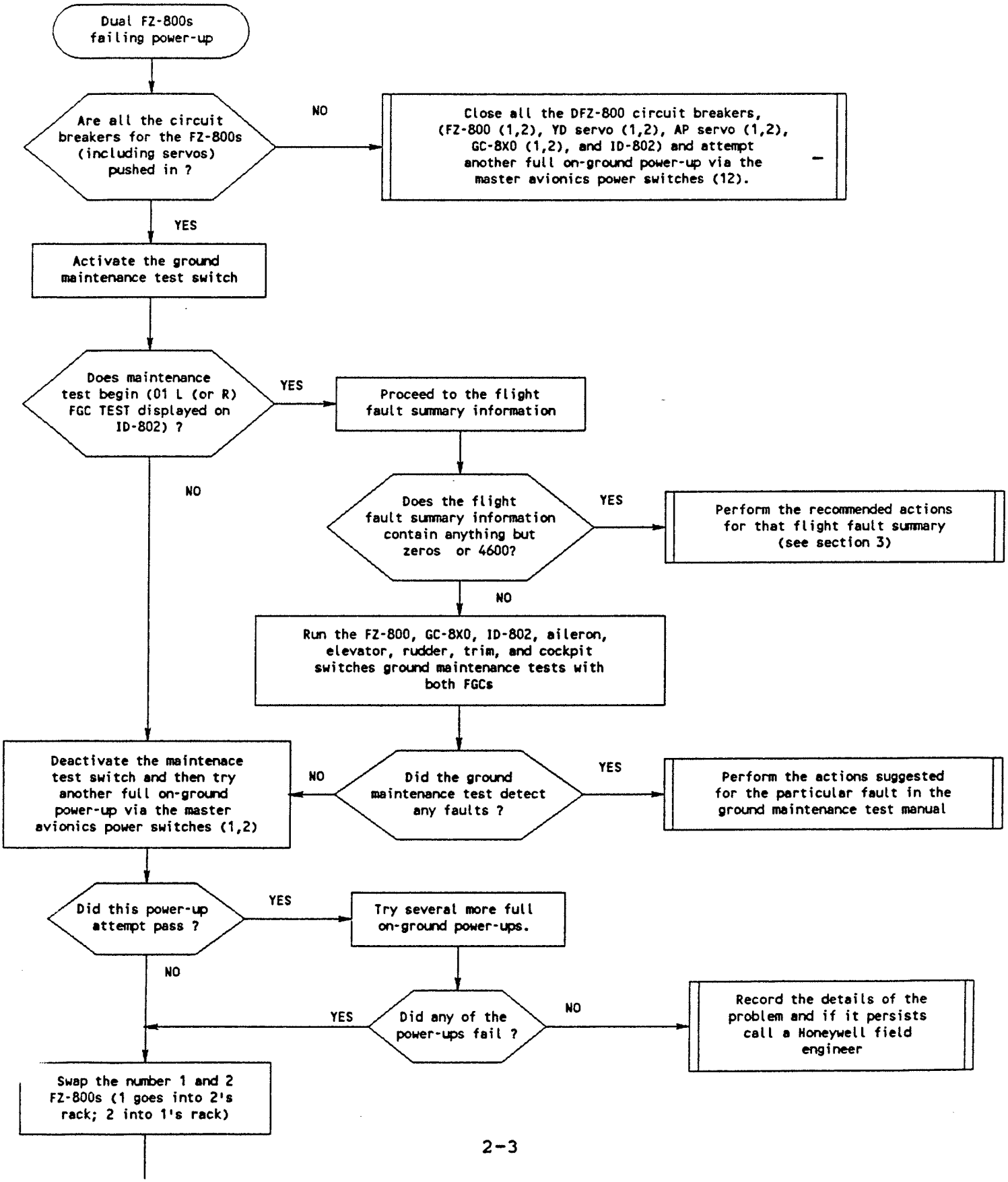
| | |
|---|---|
| A15-11??-?? | SPZ-8000 Digital Automatic Flight Control System Falcon F-900 Maintenance Manual |
| EB7009611 | Engineering Bulletin for the installation of the Digital DFZ-800 AFCS for the Falcon F-900 |

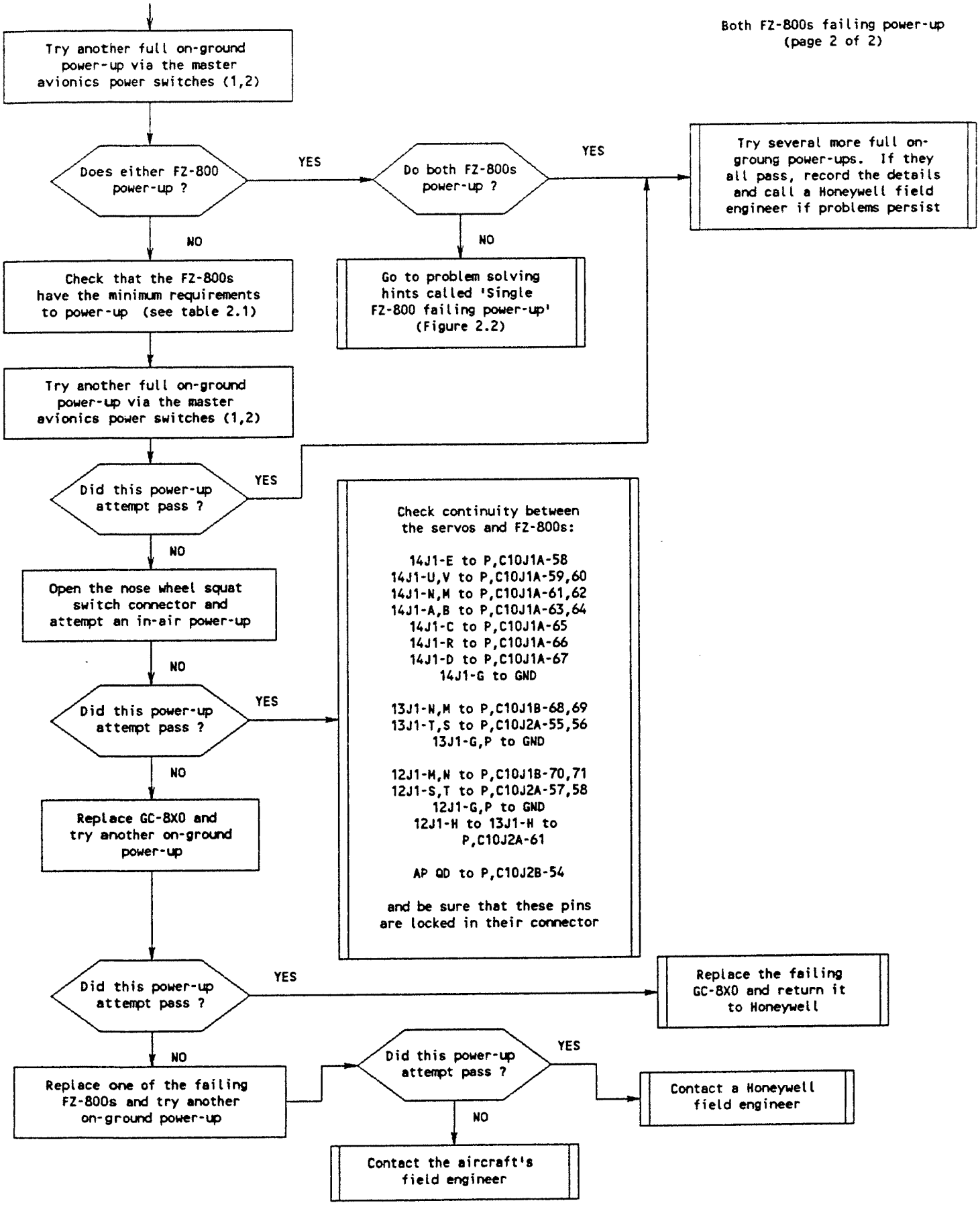
# Figure 2.0
# Diagnosing Symptoms




Was a L or R AFCS FAIL message displayed on the ID-802 ?
YES
NO
Can both FZ-800s be manually selected via the L/R AFCS pushbuttons ?
NO
Go to figure 2.3
YES
Can the YD and MTrim be engaged ?
NO
Go to figure 2.4
YES
Does the YD and MTrim remain engaged ?
NO
Go to figure 2.5
YES
Alter the nose-wheel squat switch connector and attempt to engage the AP
Can the AP be engaged ?
NO
Go to figure 2.4
YES
Does the AP remain engaged ?
NO
Does the YD also disengage ?
YES
Go to figure 2.5
NO
Go to figure 2.6
YES
Were control performance problems reported ?
YES
Go to figure 2.8
NO
Were mode related problems reported ?
YES
Go to figure 2.7
NO
Record the details of the problem and call a Honeywell field engineer if the problem persists

# Figure 2.1
# Both FZ-800s failing power-up
# (Dashed line or L and R AFCS FAIL messages on advisory display)




Try another full on-ground power-up via the master avionics power switches (1,2)
Does either FZ-800 power-up ?
YES
Do both FZ-800s power-up ?
YES
Try several more full on-groung power-ups. If they all pass, record the details and call a Honeywell field engineer
NO
NO
Check that the FZ-800s have the minimum requirements to power-up (see table 2.1)
Go to problem solving hints called 'Single FZ-800 failing power-up' (Figure 2.2)
Try another full on-ground power-up via the master avionics power switches (1,2)
Did this power-up attempt pass ?
YES
Check continuity between the servos and FZ-800s:
14J1-E to P,C10J1A-58
14J1-U,V to P,C10J1A-59,60
14J1-N,M to P,C10J1A-61,62
14J1-A,B to P,C10J1A-63,64
14J1-C to P,C10J1A-65
14J1-R to P,C10J1A-66
14J1-D to P,C10J1A-67
14J1-G to GND
13J1-N,M to P,C10J1B-68,69
13J1-T,S to P,C10J2A-55,56
13J1-G,P to GND
12J1-M,N to P,C10J1B-70,71
12J1-S,T to P,C10J2A-57,58
12J1-G,P to GND
12J1-H to 13J1-H to P,C10J2A-61
AP QD to P,C10J2B-54
and be sure that these pins are locked in their connector
NO
Open the nose wheel squat switch connector and attempt an in-air power-up
NO
Did this power-up attempt pass ?
YES
NO
Replace GC-8X0 and try another on-ground power-up
Did this power-up attempt pass ?
YES
Replace the failing GC-8X0 and return it to Honeywell
NO
Replace one of the failing FZ-800s and try another on-ground power-up
Did this power-up attempt pass ?
YES
Contact a Honeywell field engineer
NO
Contact the aircraft's field engineer

# Table 2.1
# Minimum wiring/power requirement for FZ-800 to run ASCB

GC-800/810 MUST BE INSTALLED
1 - FZ-800 " " "
1 - S6 " " " FOR SECONDARY SEQUENCING

FZ-800 power:

28 v to P,C 10J1A-1,2
28 v to P,C 10J1A-4,5
28 v to P,C 10J1A-6,7
28 v to P,C 10J1A-7,8
28 v to P,C 10J2A-4,5
28 v to P,C 10J2B-65

ASCB connections to:

10J1B-1,2 to C10J1B-1,2
10J1B-4,5 to C10J1B-4,5
10J2B-1,2 to C10J2B-1,2
10J2B-4,5 to C10J2B-4,5

Configuration discretes

Gnd to P,C 10J1B-76
Gnd to P,C 10J1B-77
Gnd to P,C 10J1B-78
Gnd to P10J1B-102
Gnd to C10J1B-103
Gnd to P,C 10J2B-66
Gnd to P,C 10J2B-67

Miscellaneous:

AP QD to P,C 10J2B-54

Cross FZ-800 strapping:

10J2A-41 to C10J2A-42
10J2A-42 to C10J2A-41
10J2A-43 to C10J2A-44
10J2A-44 to C10J2A-43
10J2A-45 to C10J2A-46
10J2A-46 to C10J2A-45
10J2A-47 to C10J2A-48
10J2A-48 to C10J2A-47
10J2A-49 to C10J2A-50
10J2A-50 to C10J2A-49

Pilot FZ-800 to GC-8X0:

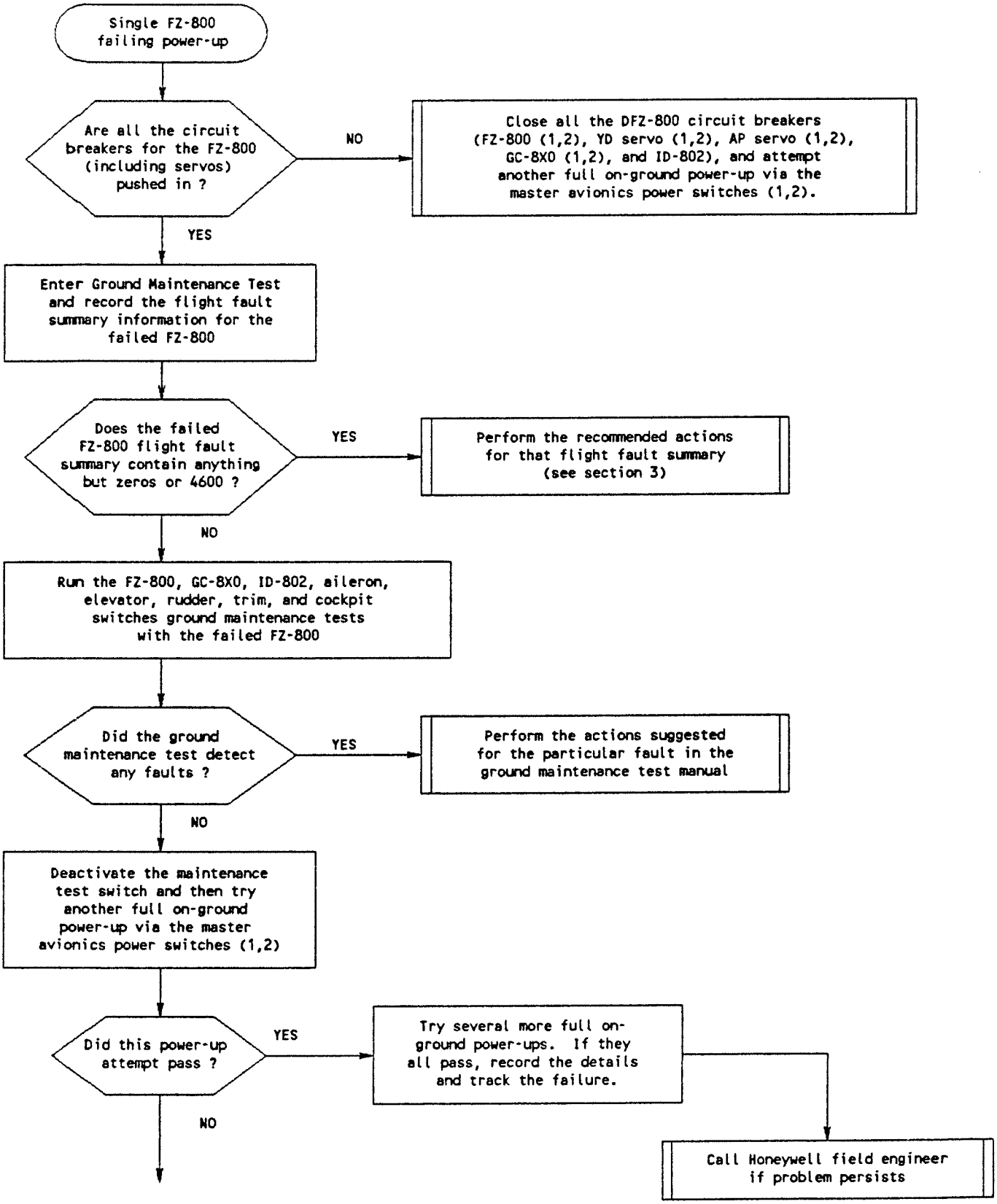
28 v TO 11J1-19,20
10J2A-65.66 to 11J1-17,18
10J2B-89 to 11J1-57
10J2B-96,97 to 11J1-5,6
10J2B-98,99 to 11J1-3,4
10J2B-100,101 to 11J1-7,8
10J2B-102,103 to 11J1-1,2
10J2B-106 to 11J1-47

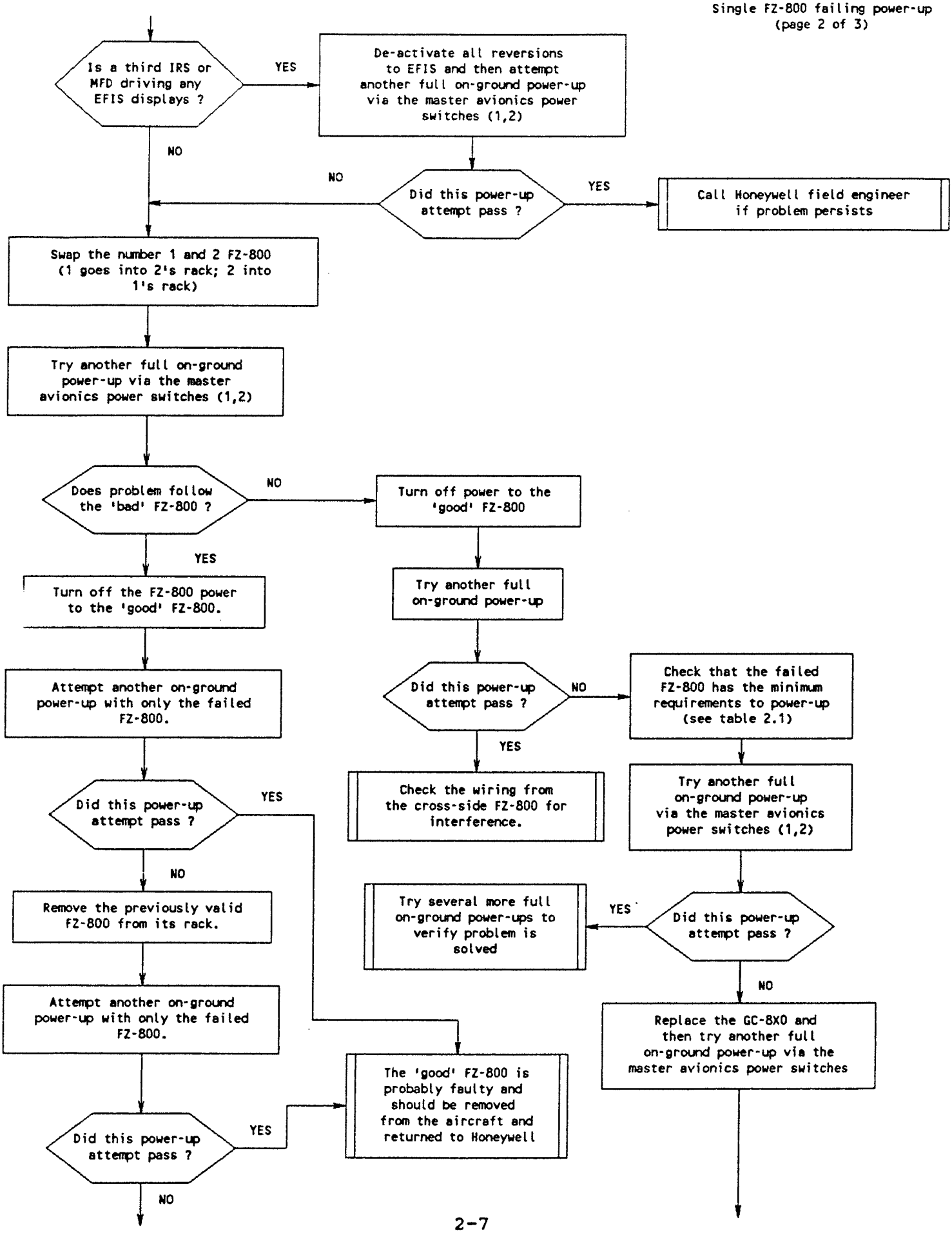
Copilot FZ-800 to GC-8X0:

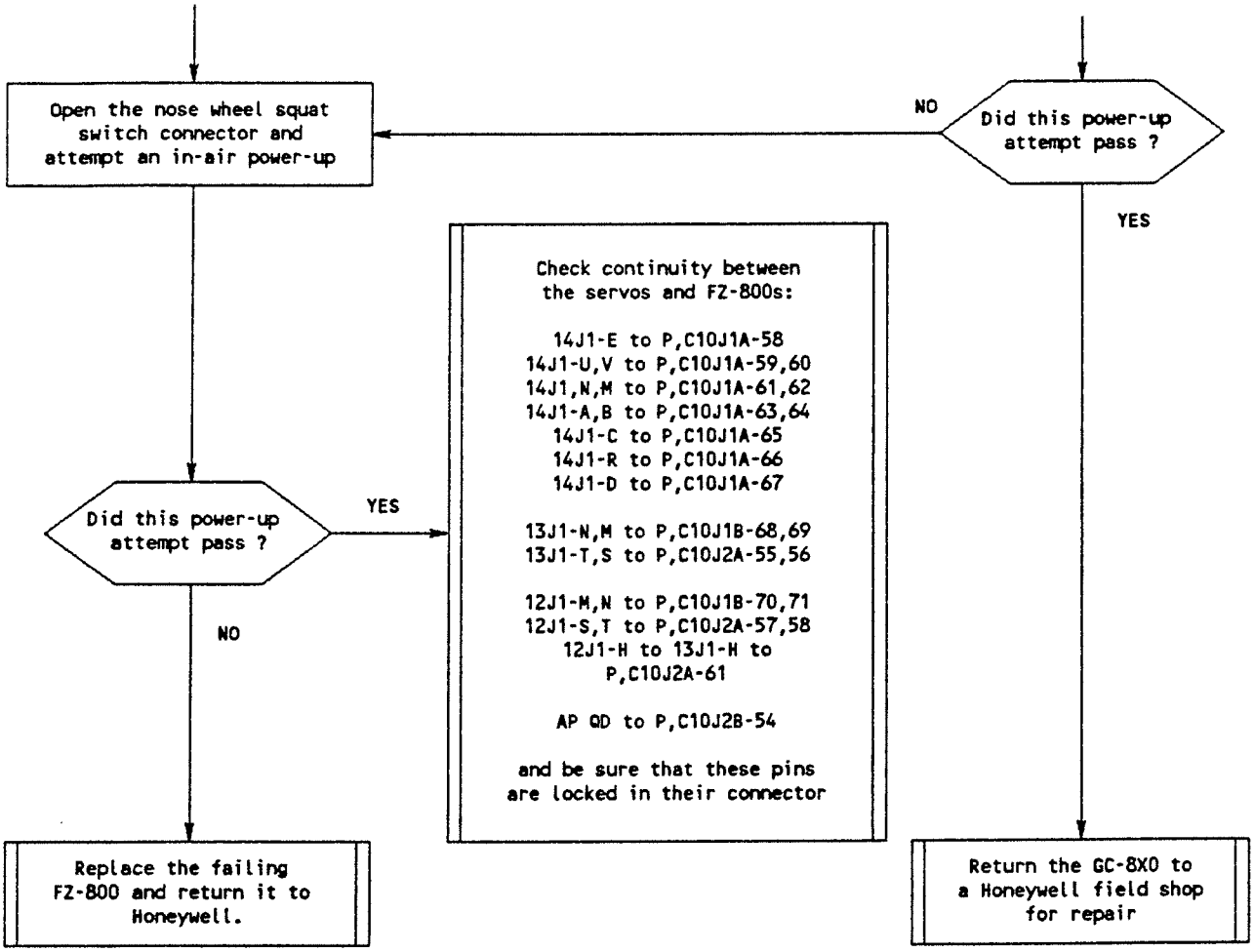
28 v TO 11J2-19,20
C10J2A-65.66 to 11J2-17,18
C10J2B-89 to 11J2-57
C10J2B-96,97 to 11J2-5,6
C10J2B-98,99 to 11J2-3,4
C10J2B-100,101 to 11J2-7,8
C10J2B-102,103 to 11J2-1,2
C10J2B-106 to 11J2-47

Note:
The full wiring required is documented in the Honeywell installation manual (EB7009611) The wiring listed here should allow entry into the ground maintenance test, so that the flight fault summary information can be used.

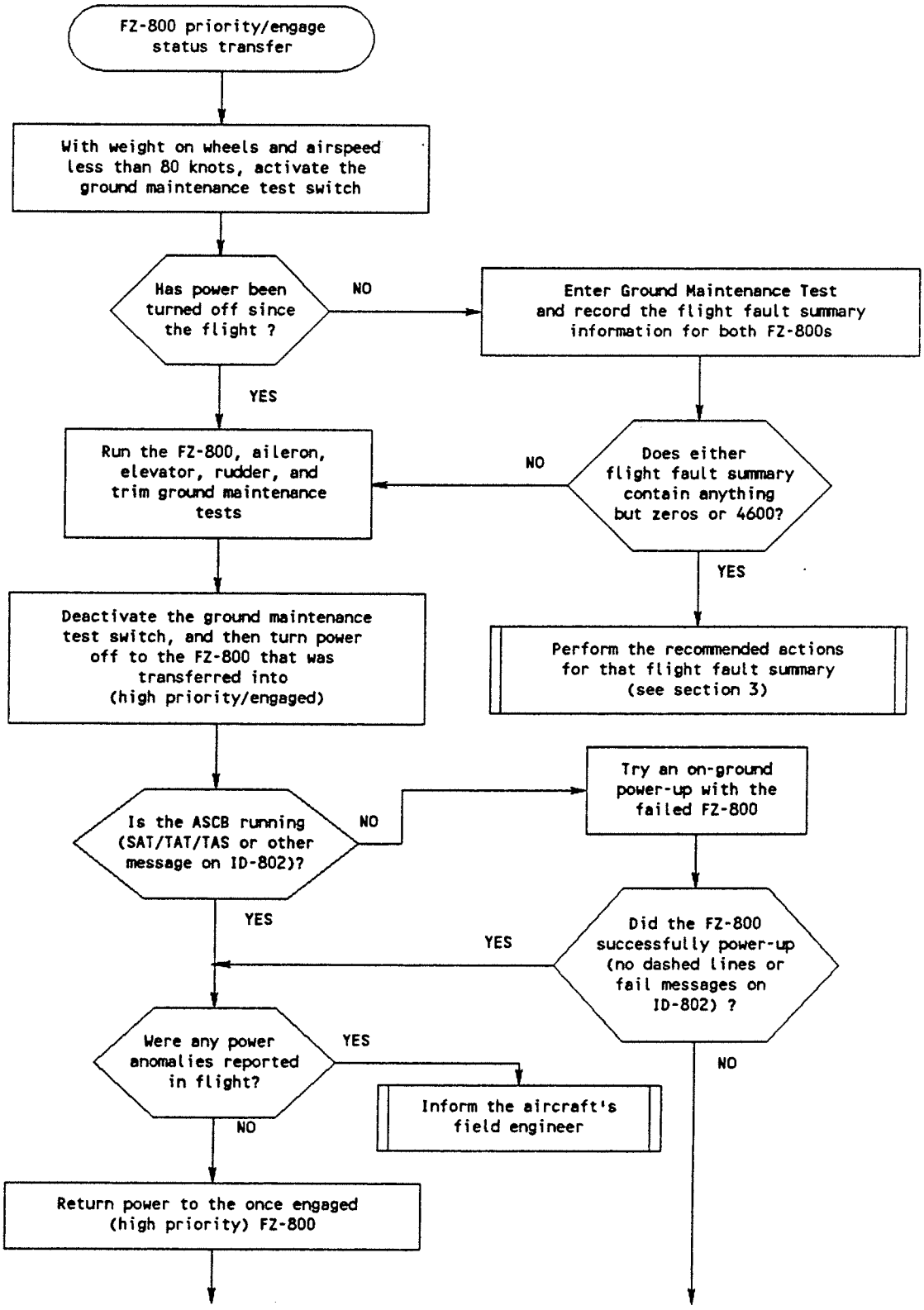
# Figure 2.2
# Single FZ-800 failing power-up
# (L or R AFCS FAIL annunciated)

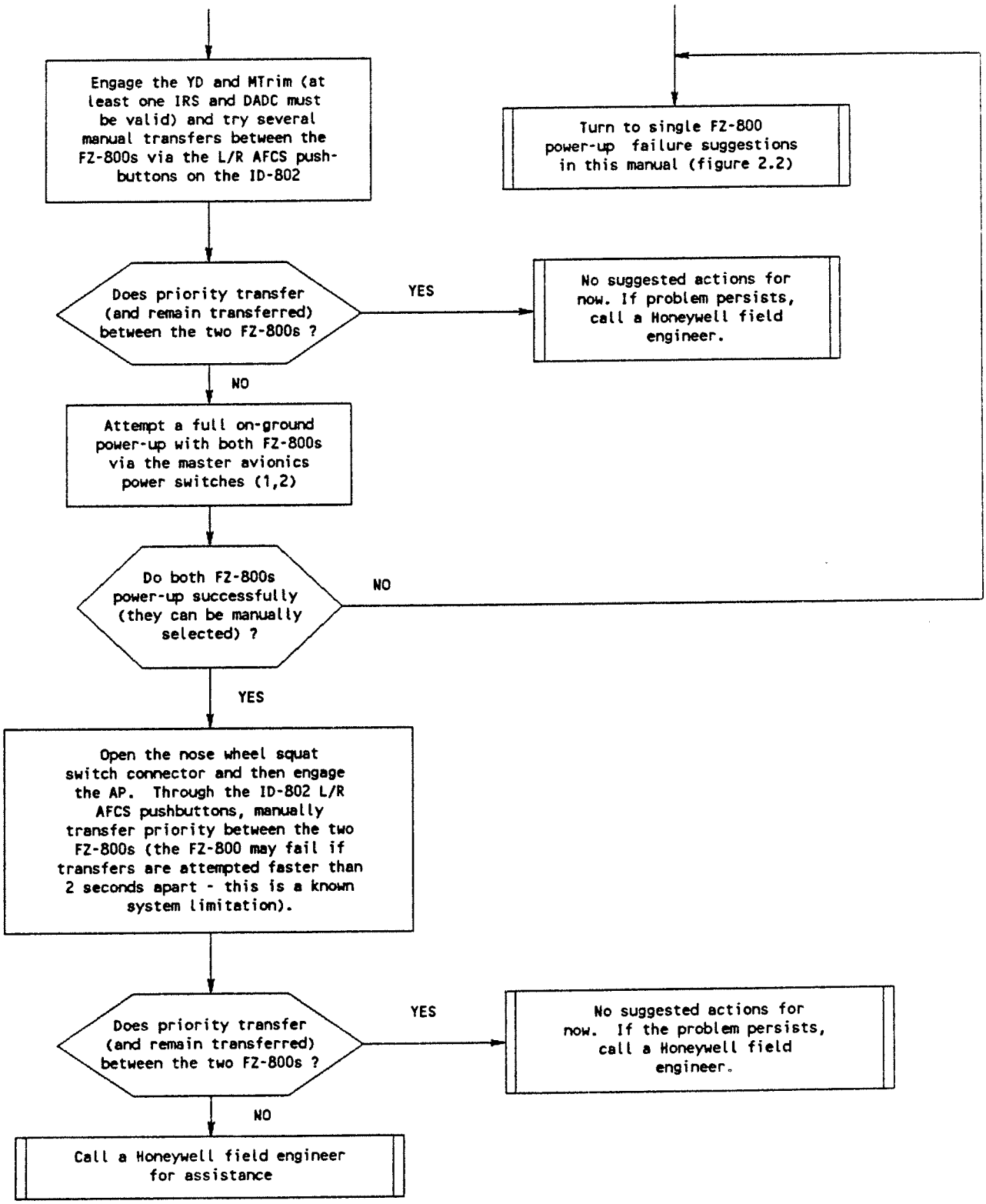



Is a third IRS or MFD driving any EFIS displays ?
YES
De-activate all reversions to EFIS and then attempt another full on-ground power-up via the master avionics power switches (1,2)
NO
Did this power-up attempt pass ?
NO
YES
Call Honeywell field engineer if problem persists
Swap the number 1 and 2 FZ-800 (1 goes into 2's rack; 2 into 1's rack)
Try another full on-ground power-up via the master avionics power switches (1,2)
Does problem follow the 'bad' FZ-800 ?
NO
Turn off power to the 'good' FZ-800
YES
Turn off the FZ-800 power to the 'good' FZ-800.
Try another full on-ground power-up
Attempt another on-ground power-up with only the failed FZ-800.
Did this power-up attempt pass ?
NO
Check that the failed FZ-800 has the minimum requirements to power-up (see table 2.1)
YES
Check the wiring from the cross-side FZ-800 for interference.
Try another full on-ground power-up via the master avionics power switches (1,2)
Did this power-up attempt pass ?
YES
NO
Remove the previously valid FZ-800 from its rack.
Try several more full on-ground power-ups to verify problem is solved
YES
Did this power-up attempt pass ?
NO
Attempt another on-ground power-up with only the failed FZ-800.
Replace the GC-8X0 and then try another full on-ground power-up via the master avionics power switches
The 'good' FZ-800 is probably faulty and should be removed from the aircraft and returned to Honeywell
Did this power-up attempt pass ?
YES
NO

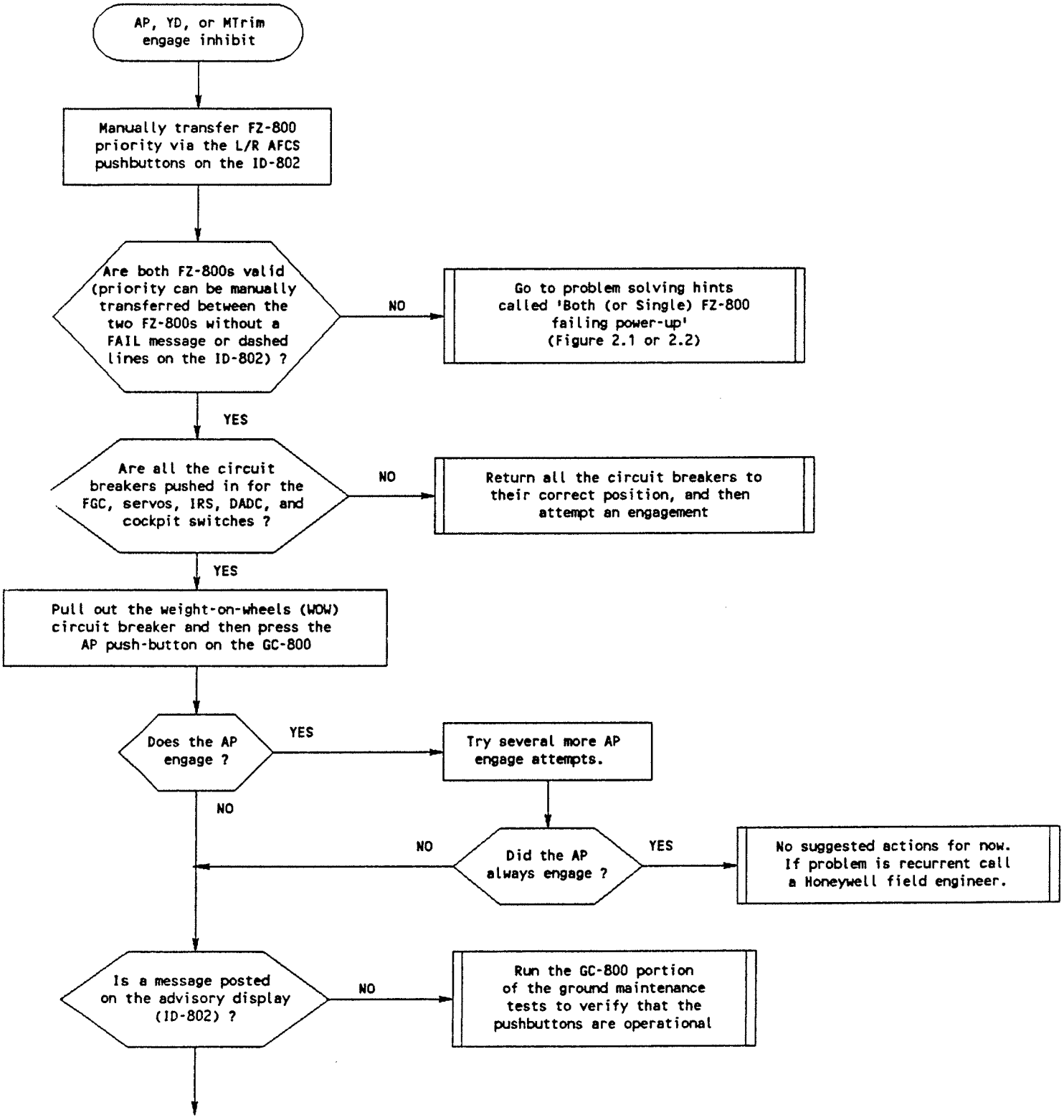

Open the nose wheel squat switch connector and attempt an in-air power-up
Did this power-up attempt pass ?
NO
YES
Did this power-up attempt pass ?
YES
NO
Check continuity between the servos and FZ-800s:
14J1-E to P,C10J1A-58
14J1-U,V to P,C10J1A-59,60
14J1,N,M to P,C10J1A-61,62
14J1-A,B to P,C10J1A-63,64
14J1-C to P,C10J1A-65
14J1-R to P,C10J1A-66
14J1-D to P,C10J1A-67
13J1-N,M to P,C10J1B-68,69
13J1-T,S to P,C10J2A-55,56
12J1-M,N to P,C10J1B-70,71
12J1-S,T to P,C10J2A-57,58
12J1-H to 13J1-H to P,C10J2A-61
AP QD to P,C10J2B-54
and be sure that these pins are locked in their connector
Replace the failing FZ-800 and return it to Honeywell.
Return the GC-8X0 to a Honeywell field shop for repair

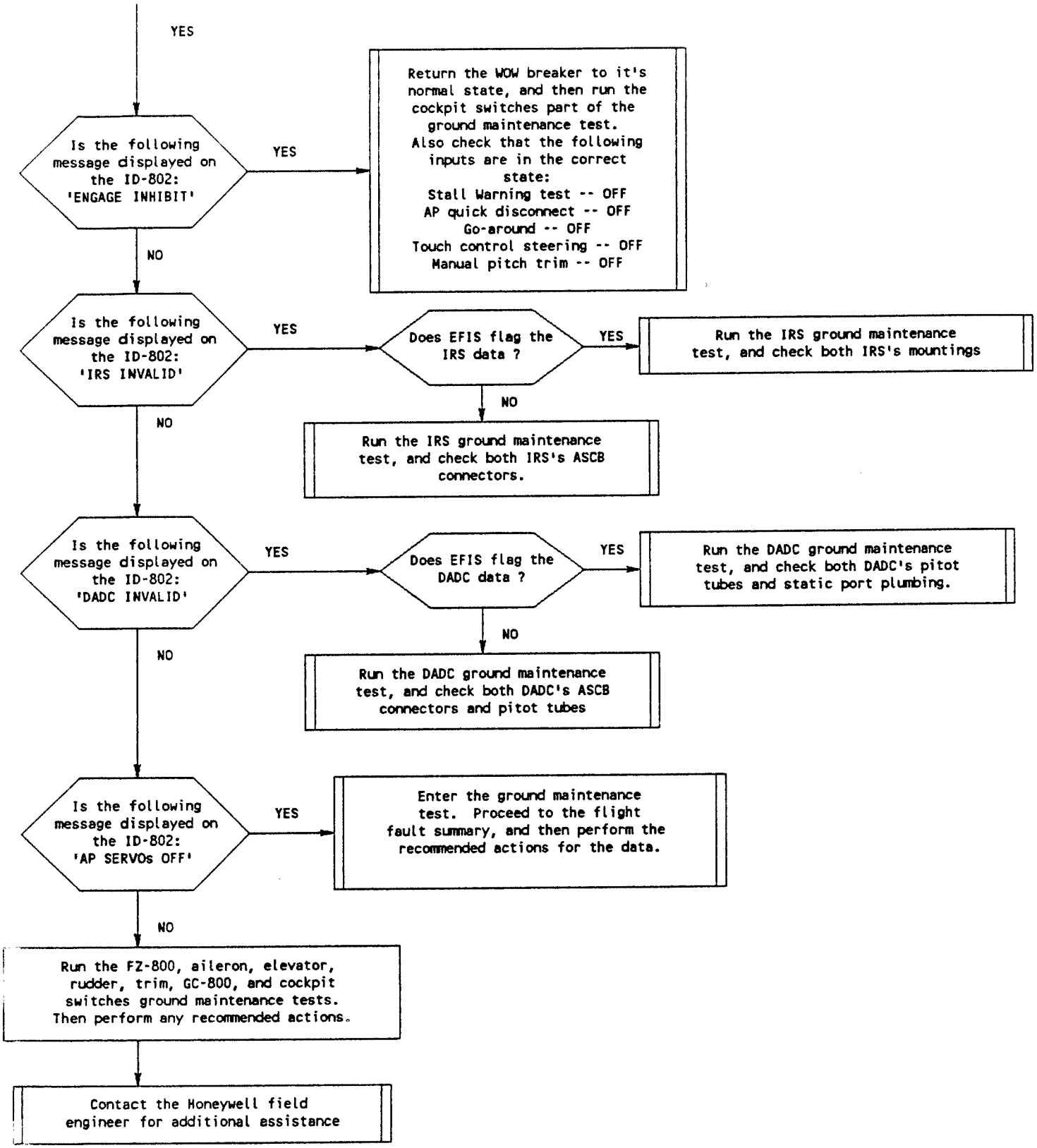
# Figure 2.3
# Unintended Priority transfers



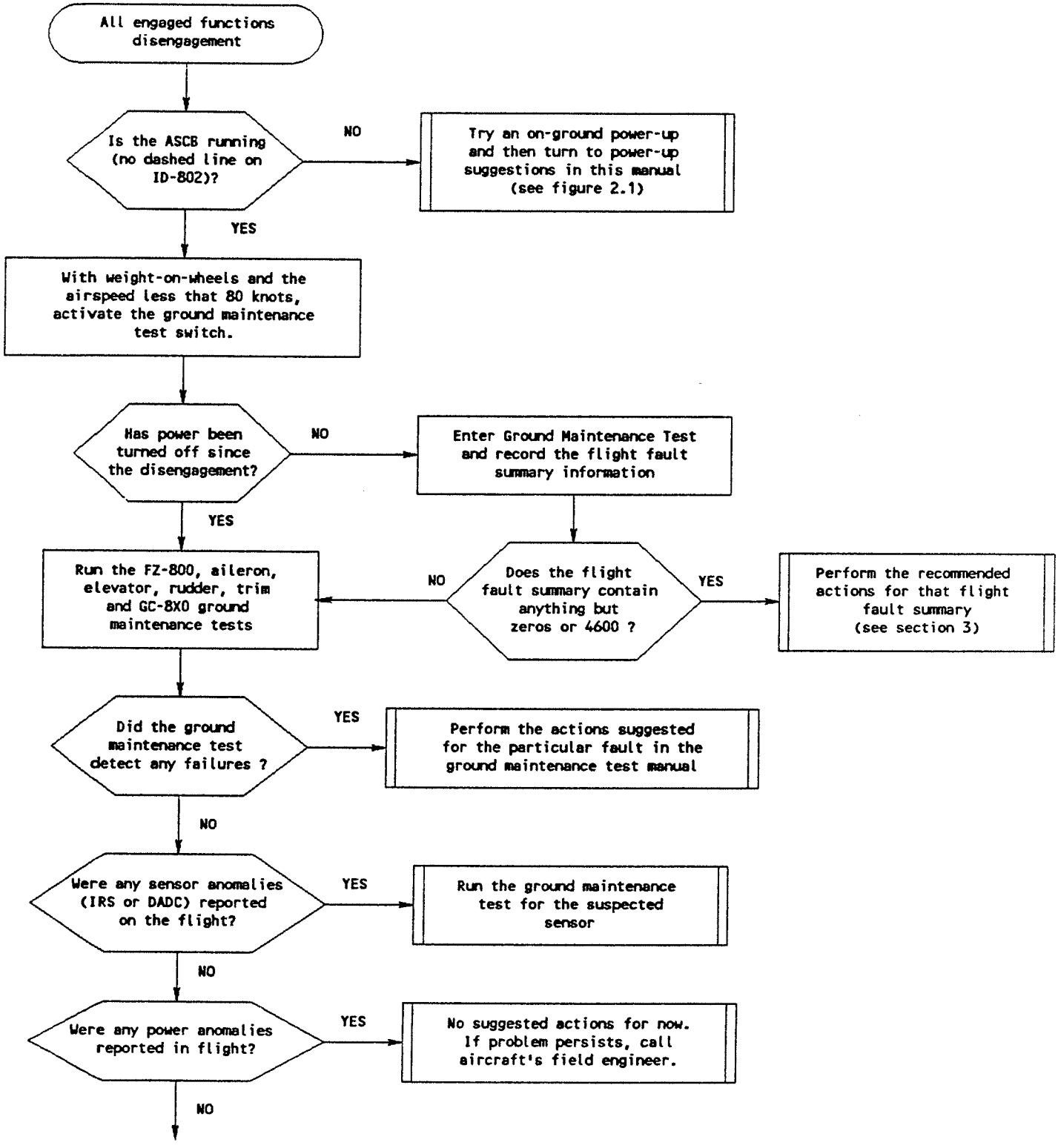

Engage the YD and MTrim (at least one IRS and DADC must be valid) and try several manual transfers between the FZ-800s via the L/R AFCS push-buttons on the ID-802
Turn to single FZ-800 power-up failure suggestions in this manual (figure 2.2)
Does priority transfer (and remain transferred) between the two FZ-800s ?
YES
No suggested actions for now. If problem persists, call a Honeywell field engineer.
NO
Attempt a full on-ground power-up with both FZ-800s via the master avionics power switches (1,2)
Do both FZ-800s power-up successfully (they can be manually selected) ?
NO
YES
Open the nose wheel squat switch connector and then engage the AP. Through the ID-802 L/R AFCS pushbuttons, manually transfer priority between the two FZ-800s (the FZ-800 may fail if transfers are attempted faster than 2 seconds apart - this is a known system limitation).
Does priority transfer (and remain transferred) between the two FZ-800s ?
YES
No suggested actions for now. If the problem persists, call a Honeywell field engineer.
NO
Call a Honeywell field engineer for assistance

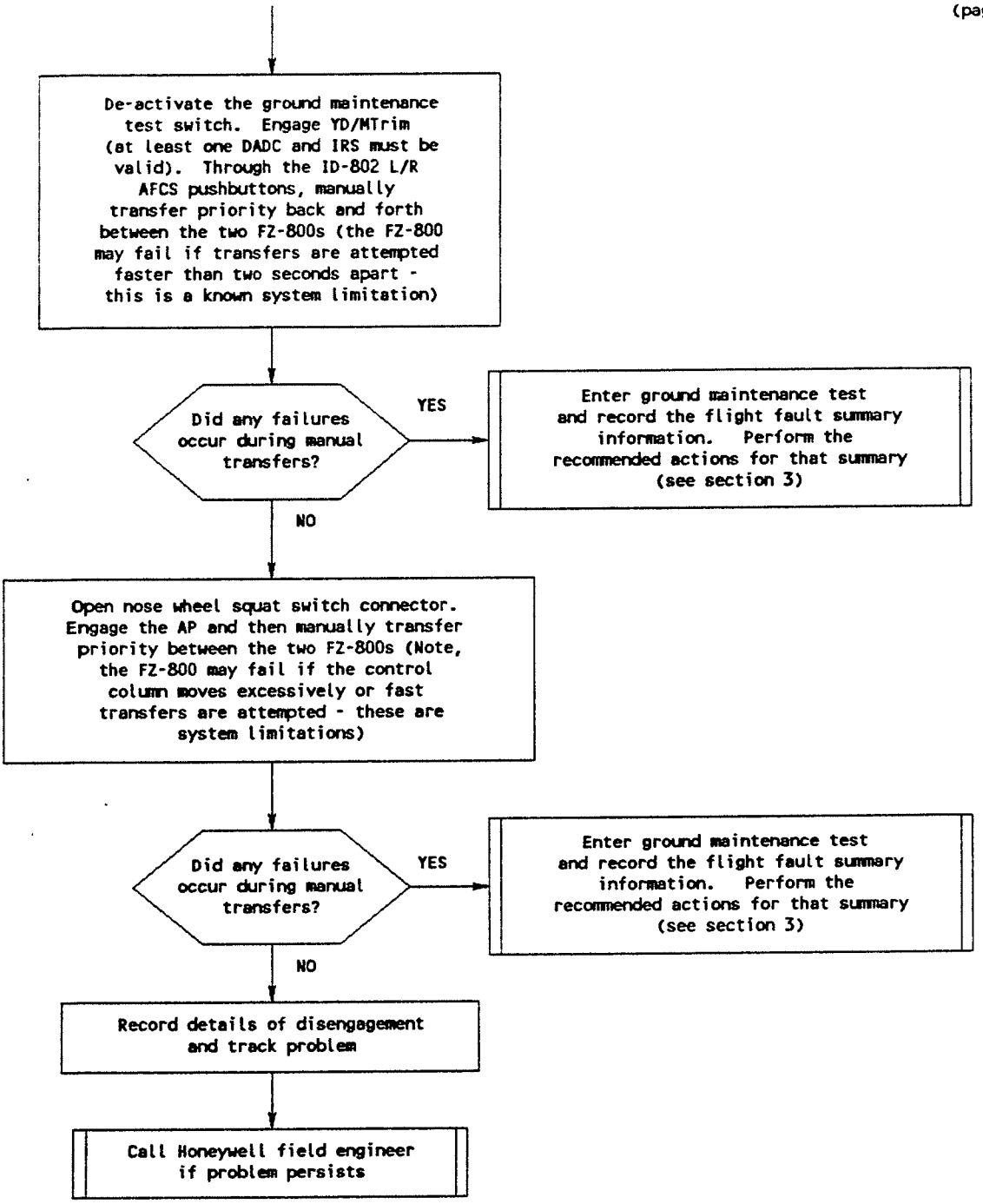
# Figure 2.4
# AP, YD, or MTrim engagement inhibited



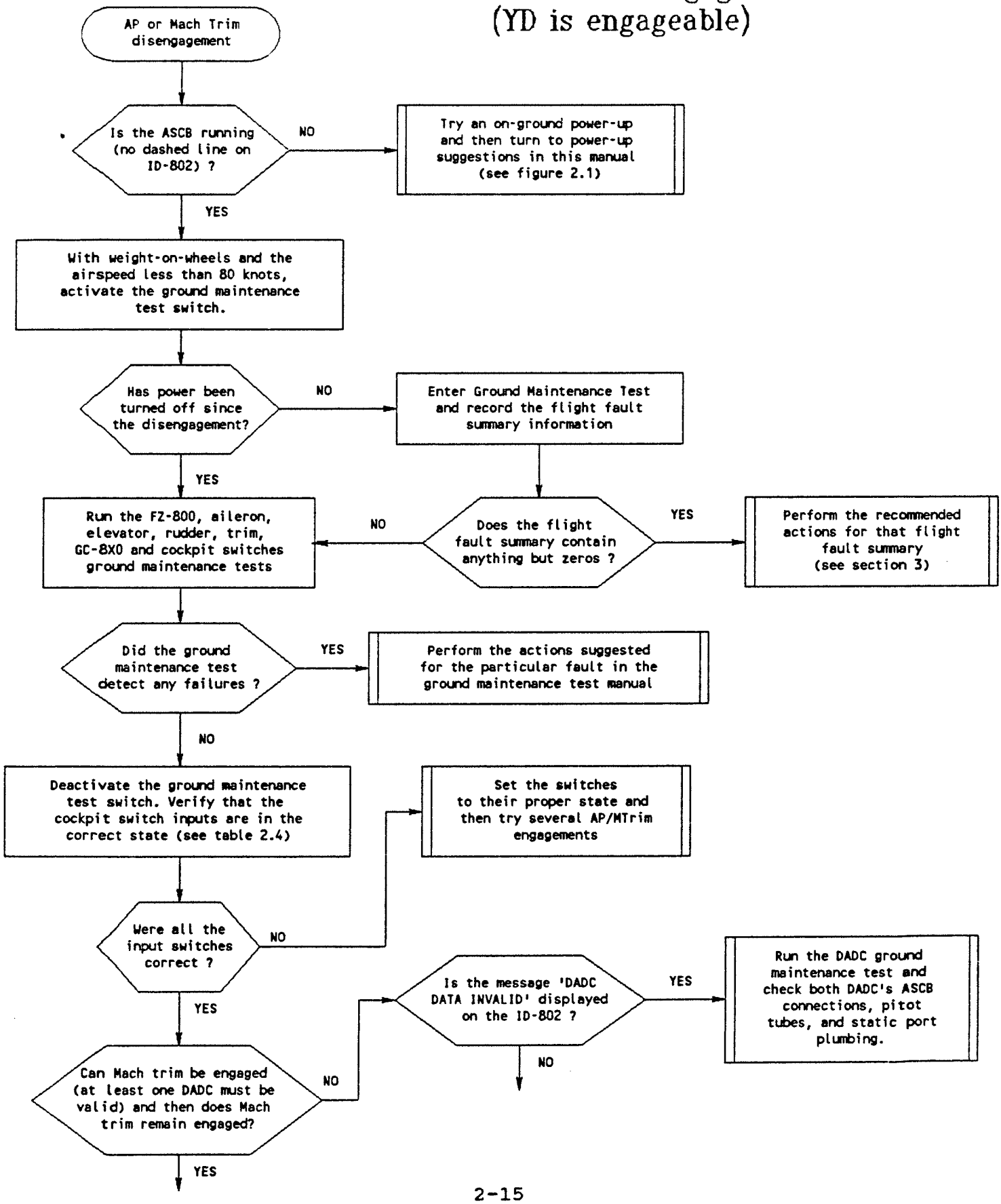

YES
Is the following message displayed on the ID-802: 'ENGAGE INHIBIT'
YES
Return the WOW breaker to it's normal state, and then run the cockpit switches part of the ground maintenance test. Also check that the following inputs are in the correct state:
Stall Warning test -- OFF
AP quick disconnect -- OFF
Go-around -- OFF
Touch control steering -- OFF
Manual pitch trim -- OFF
NO
Is the following message displayed on the ID-802: 'IRS INVALID'
YES
Does EFIS flag the IRS data ?
YES
Run the IRS ground maintenance test, and check both IRS's mountings
NO
Run the IRS ground maintenance test, and check both IRS's ASCB connectors.
NO
Is the following message displayed on the ID-802: 'DADC INVALID'
YES
Does EFIS flag the DADC data ?
YES
Run the DADC ground maintenance test, and check both DADC's pitot tubes and static port plumbing.
NO
Run the DADC ground maintenance test, and check both DADC's ASCB connectors and pitot tubes
NO
Is the following message displayed on the ID-802: 'AP SERVOs OFF'
YES
Enter the ground maintenance test. Proceed to the flight fault summary, and then perform the recommended actions for the data.
NO
Run the FZ-800, aileron, elevator, rudder, trim, GC-800, and cockpit switches ground maintenance tests. Then perform any recommended actions.
Contact the Honeywell field engineer for additional assistance

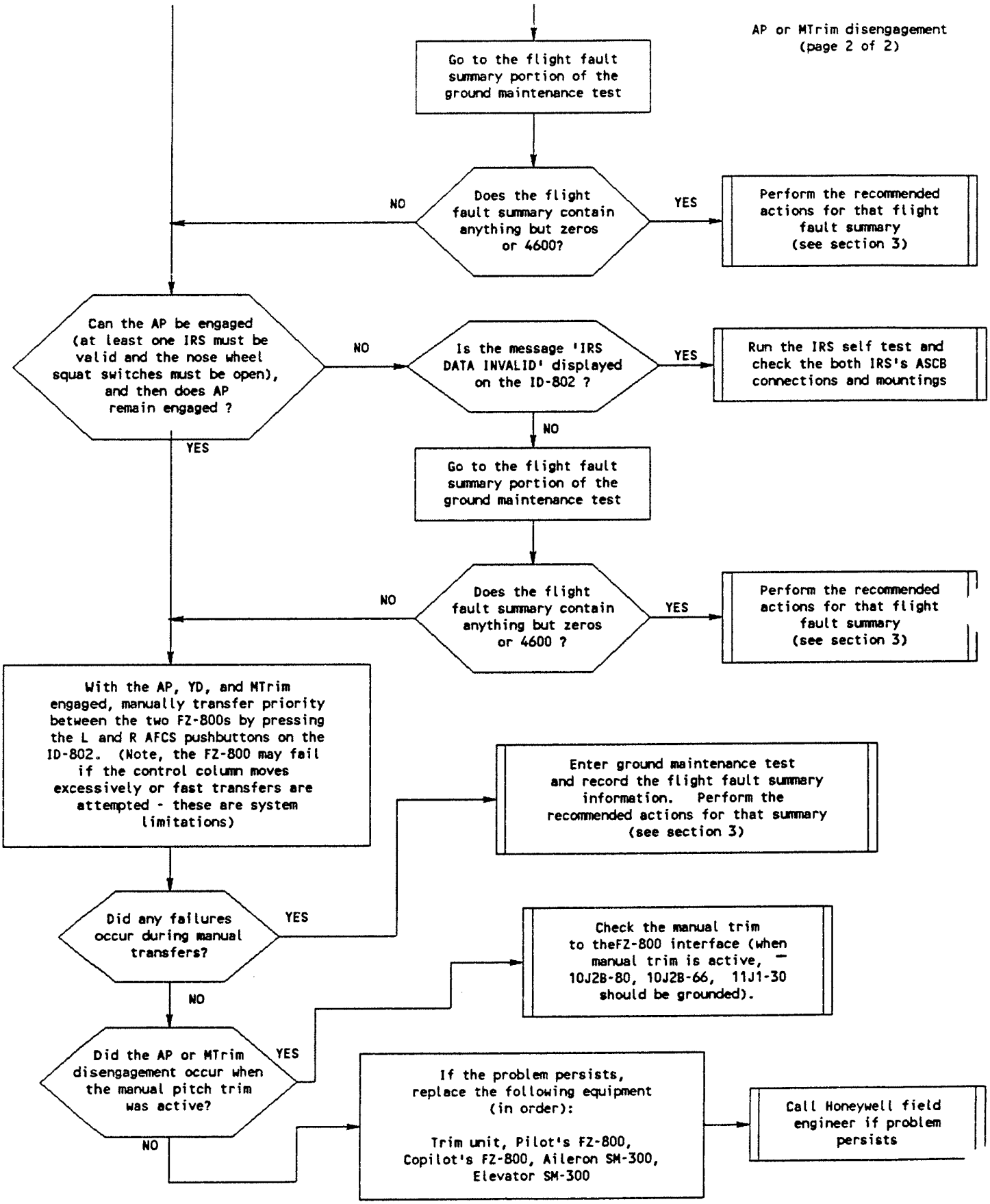
# Figure 2.5
# AP, YD, MTrim disengagement
# (all engaged functions)



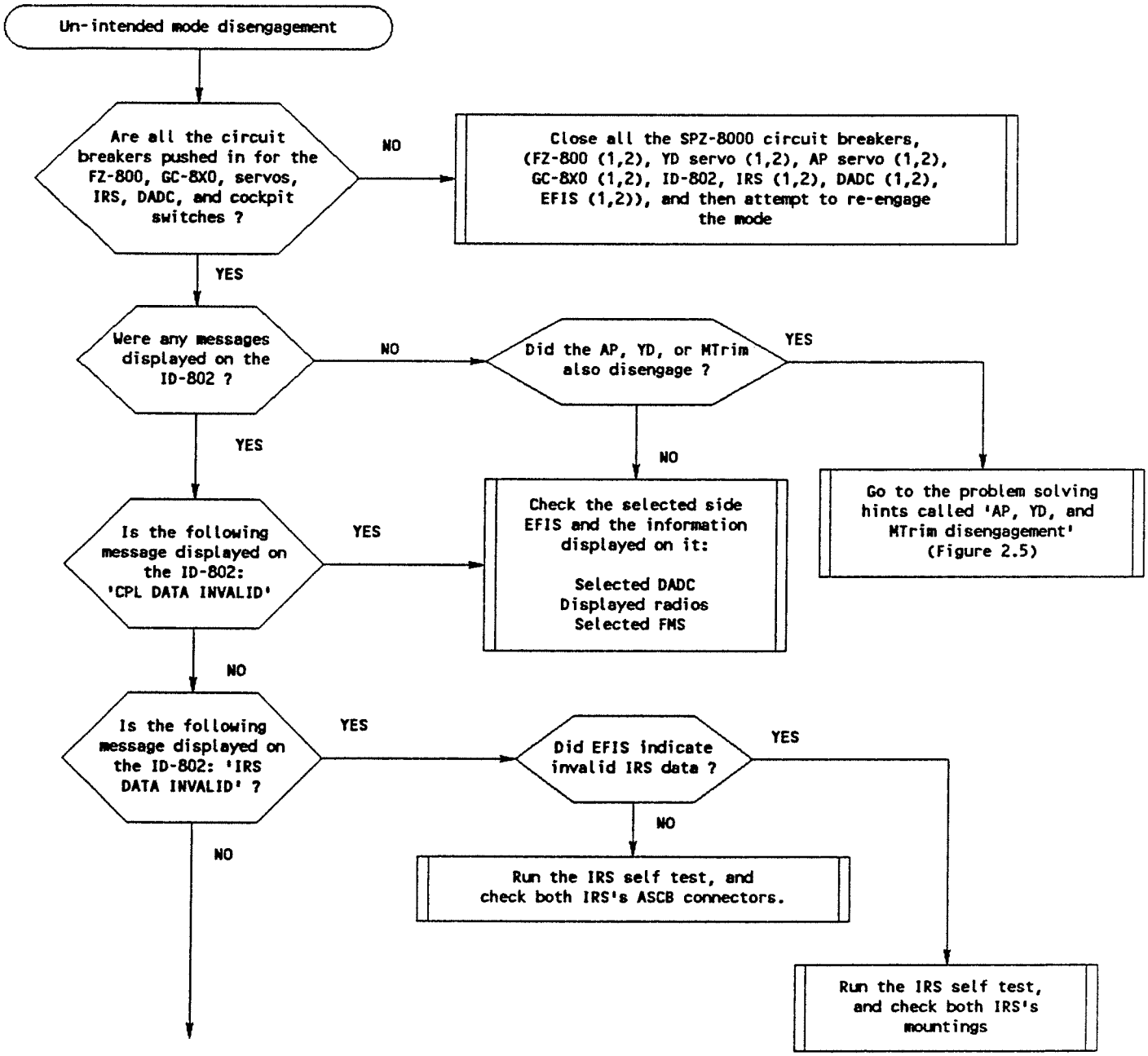

De-activate the ground maintenance test switch. Engage YD/MTrim (at least one DADC and IRS must be valid). Through the ID-802 L/R AFCS pushbuttons, manually transfer priority back and forth between the two FZ-800s (the FZ-800 may fail if transfers are attempted faster than two seconds apart - this is a known system limitation)
Did any failures occur during manual transfers?
YES
Enter ground maintenance test and record the flight fault summary information. Perform the recommended actions for that summary (see section 3)
NO
Open nose wheel squat switch connector. Engage the AP and then manually transfer priority between the two FZ-800s (Note, the FZ-800 may fail if the control column moves excessively or fast transfers are attempted - these are system limitations)
Did any failures occur during manual transfers?
YES
Enter ground maintenance test and record the flight fault summary information. Perform the recommended actions for that summary (see section 3)
NO
Record details of disengagement and track problem
Call Honeywell field engineer if problem persists

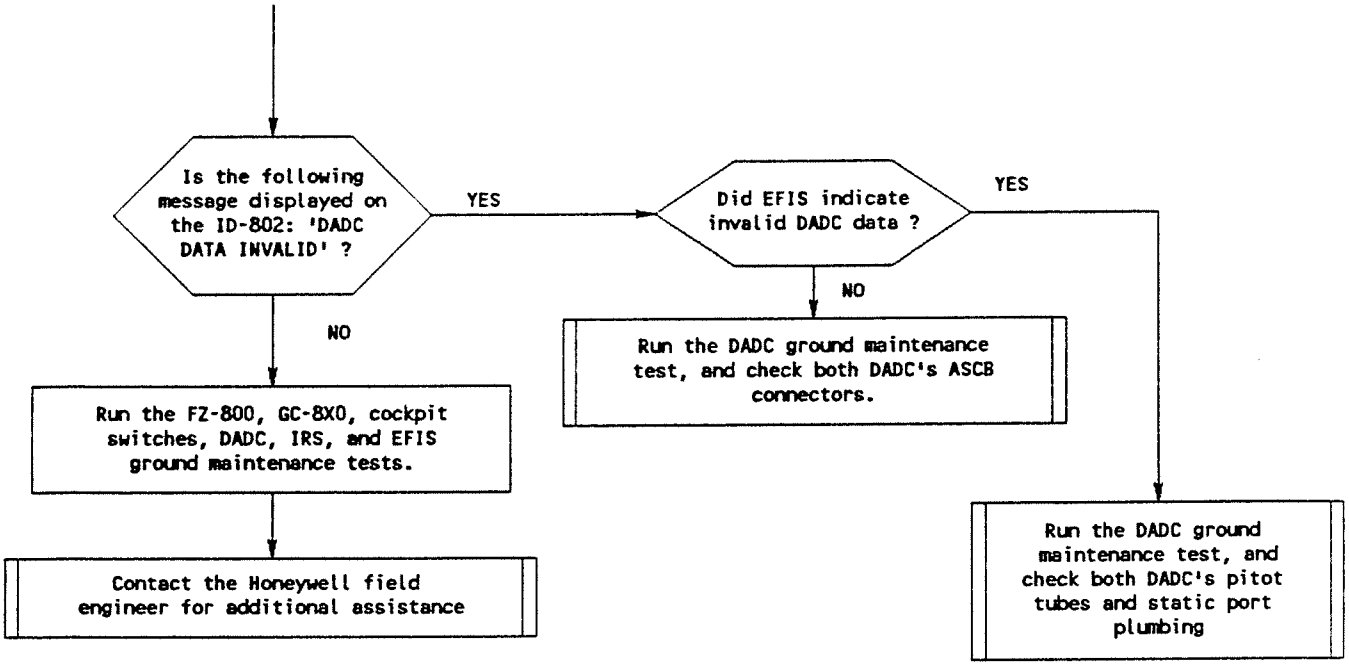
# Figure 2.6
# AP or MTrim disengagement
# (YD is engageable)



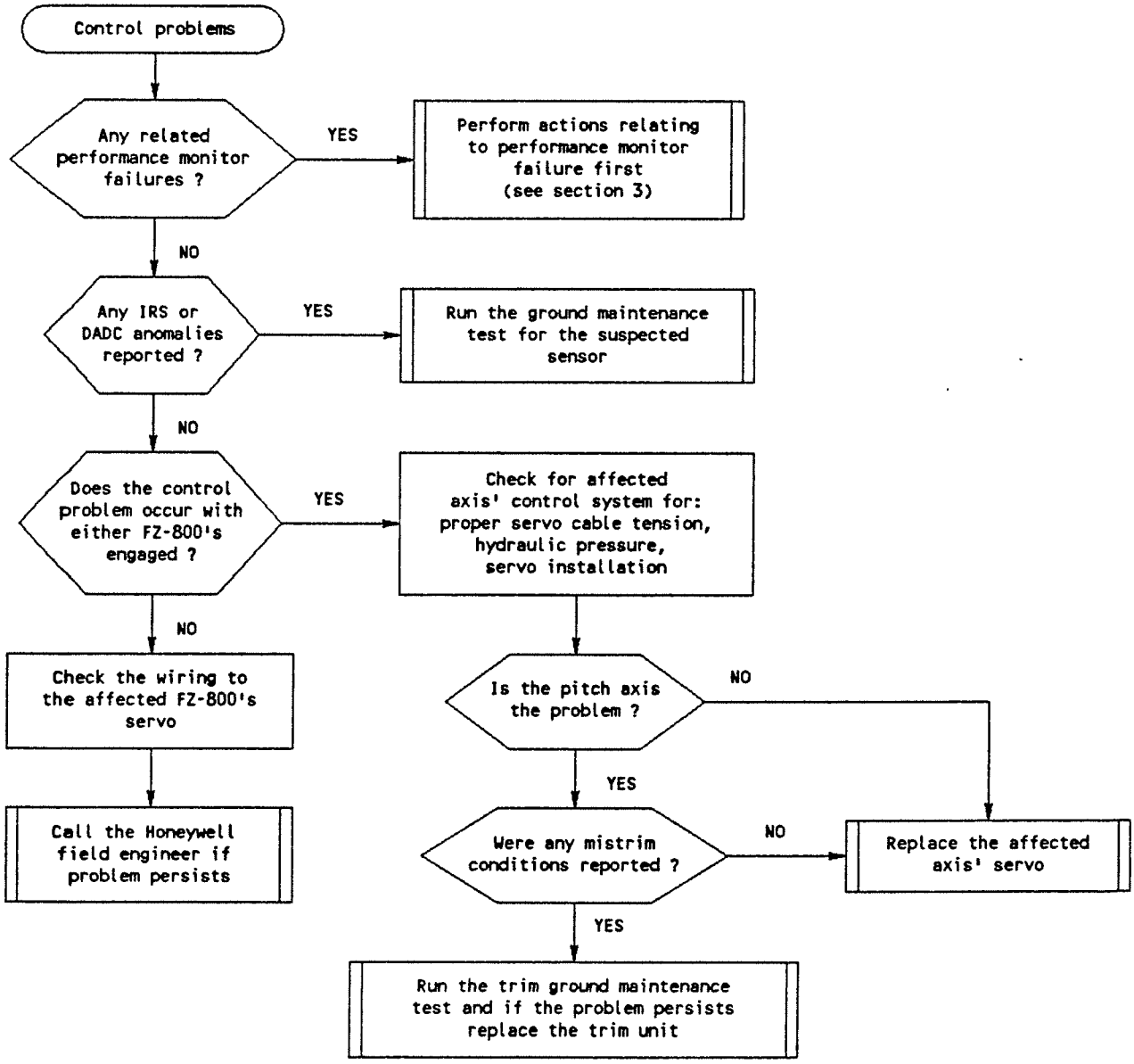

Go to the flight fault summary portion of the ground maintenance test
Does the flight fault summary contain anything but zeros or 4600?
NO
YES
Perform the recommended actions for that flight fault summary (see section 3)
Can the AP be engaged (at least one IRS must be valid and the nose wheel squat switches must be open), and then does AP remain engaged ?
NO
Is the message 'IRS DATA INVALID' displayed on the ID-802 ?
YES
Run the IRS self test and check the both IRS's ASCB connections and mountings
NO
YES
Go to the flight fault summary portion of the ground maintenance test
Does the flight fault summary contain anything but zeros or 4600 ?
NO
YES
Perform the recommended actions for that flight fault summary (see section 3)
With the AP, YD, and MTrim engaged, manually transfer priority between the two FZ-800s by pressing the L and R AFCS pushbuttons on the ID-802. (Note, the FZ-800 may fail if the control column moves excessively or fast transfers are attempted - these are system limitations)
Enter ground maintenance test and record the flight fault summary information. Perform the recommended actions for that summary (see section 3)
Did any failures occur during manual transfers?
YES
NO
Check the manual trim to theFZ-800 interface (when manual trim is active, — 10J2B-80, 10J2B-66, 11J1-30 should be grounded).
Did the AP or MTrim disengagement occur when the manual pitch trim was active?
YES
NO
If the problem persists, replace the following equipment (in order):
Trim unit, Pilot's FZ-800, Copilot's FZ-800, Aileron SM-300, Elevator SM-300
Call Honeywell field engineer if problem persists

# Figure 2.7
# Un-intended mode disengagement

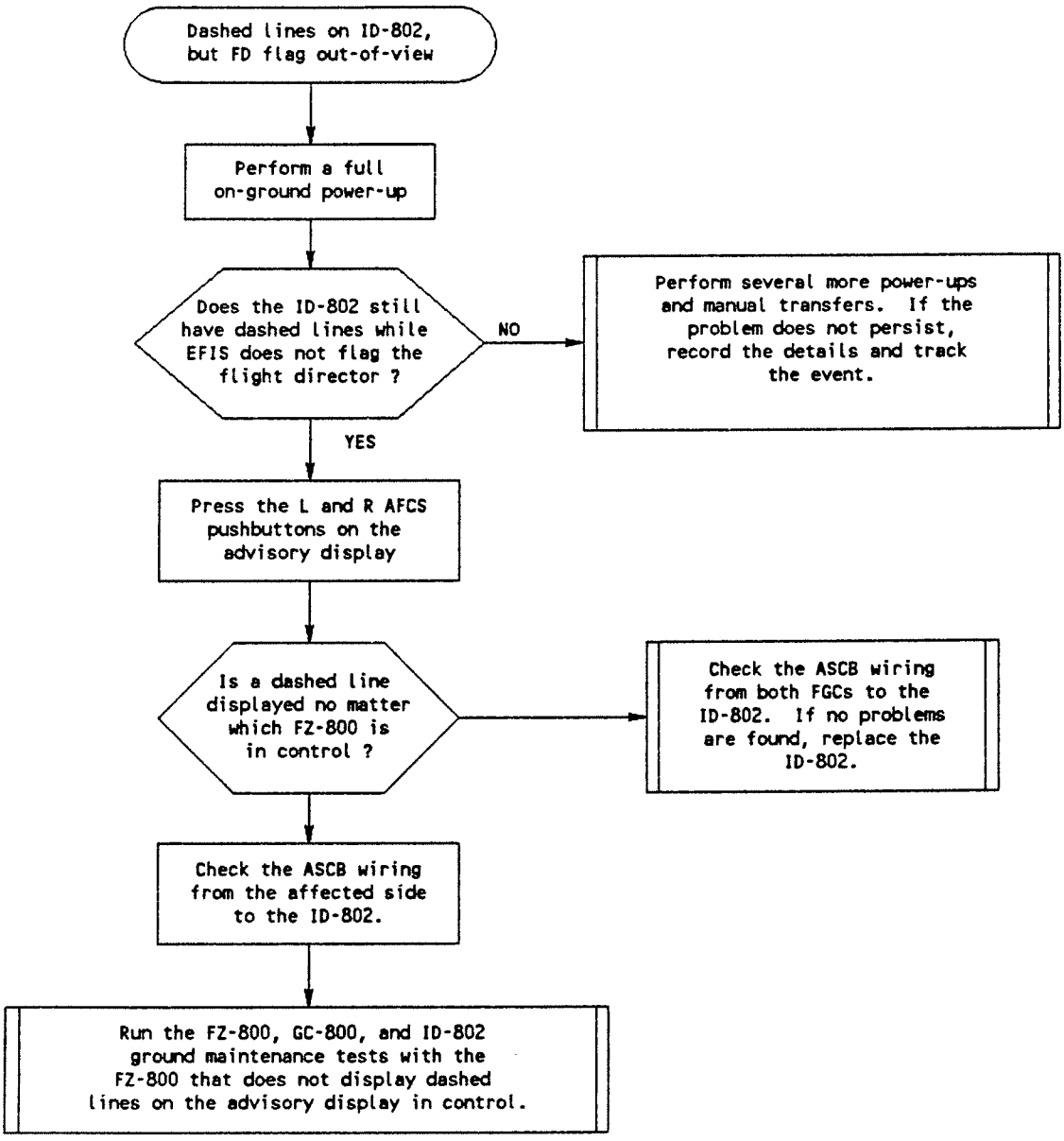



Is the following message displayed on the ID-802: 'DADC DATA INVALID' ?
YES
Did EFIS indicate invalid DADC data ?
YES
NO
Run the DADC ground maintenance test, and check both DADC's ASCB connectors.
NO
Run the FZ-800, GC-8X0, cockpit switches, DADC, IRS, and EFIS ground maintenance tests.
Run the DADC ground maintenance test, and check both DADC's pitot tubes and static port plumbing
Contact the Honeywell field engineer for additional assistance

# Figure 2.8
# AP, YD, or Mach trim control problems (oscillations, kicks, sluggishness, etc.)



# Figure 2.9
# Dashed lines on advisory display but no FD flag on EFIS



## 3. USING THE FLIGHT FAULT SUMMARY

The flight fault summary (FFS) is a collection of fault data words that are stored in RAM in the Flight Guidance Computer (FZ-800). These data words (16 Bit Words) are displayed in hexadecimal (hex) format on the Advisory Display (ID-802). These fault data words will store power-up failures, performance monitor trips, hardware monitor trips, and engage state conditions following automatic disconnects.

The FFS be can accessed only through Ground Maintenance Test (GMT), when the "RESET" button is pushed on the ID-802 with the FFS option being displayed. For further information on accessing and using GMT refer to the Ground Check Section of the DAFCS Maintenance Manual.

The information stored in the FFS can be used to help troubleshoot the avionics. This section will show the reader how to use the FFS data to assist in determining which LRU is at fault or where to look for miswires or other aircraft anomalies.

Figure 3.1 shows the layout of the FFS data words. The first two lines, lines A & B, each contain 4 words of hex data. The last line, line C, contains 6 words of hex data that is displayed in two groups of three words each.

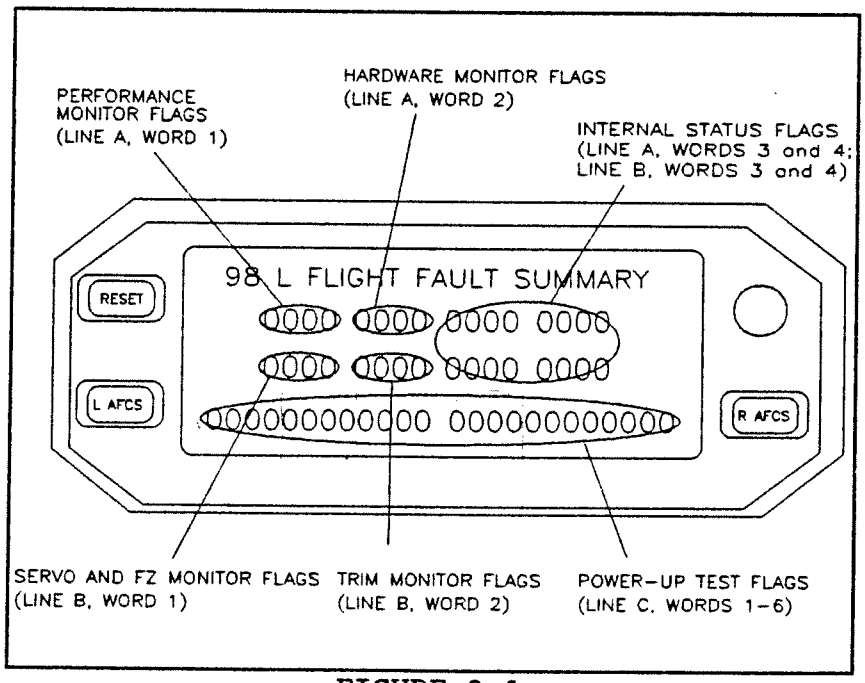



FIGURE 3.1

CHECK LINE A WORD 1 & 2

CHECK LINE B WORD 1 & 2

CHECK LINE C IF NOT ALL 0'S FIRST

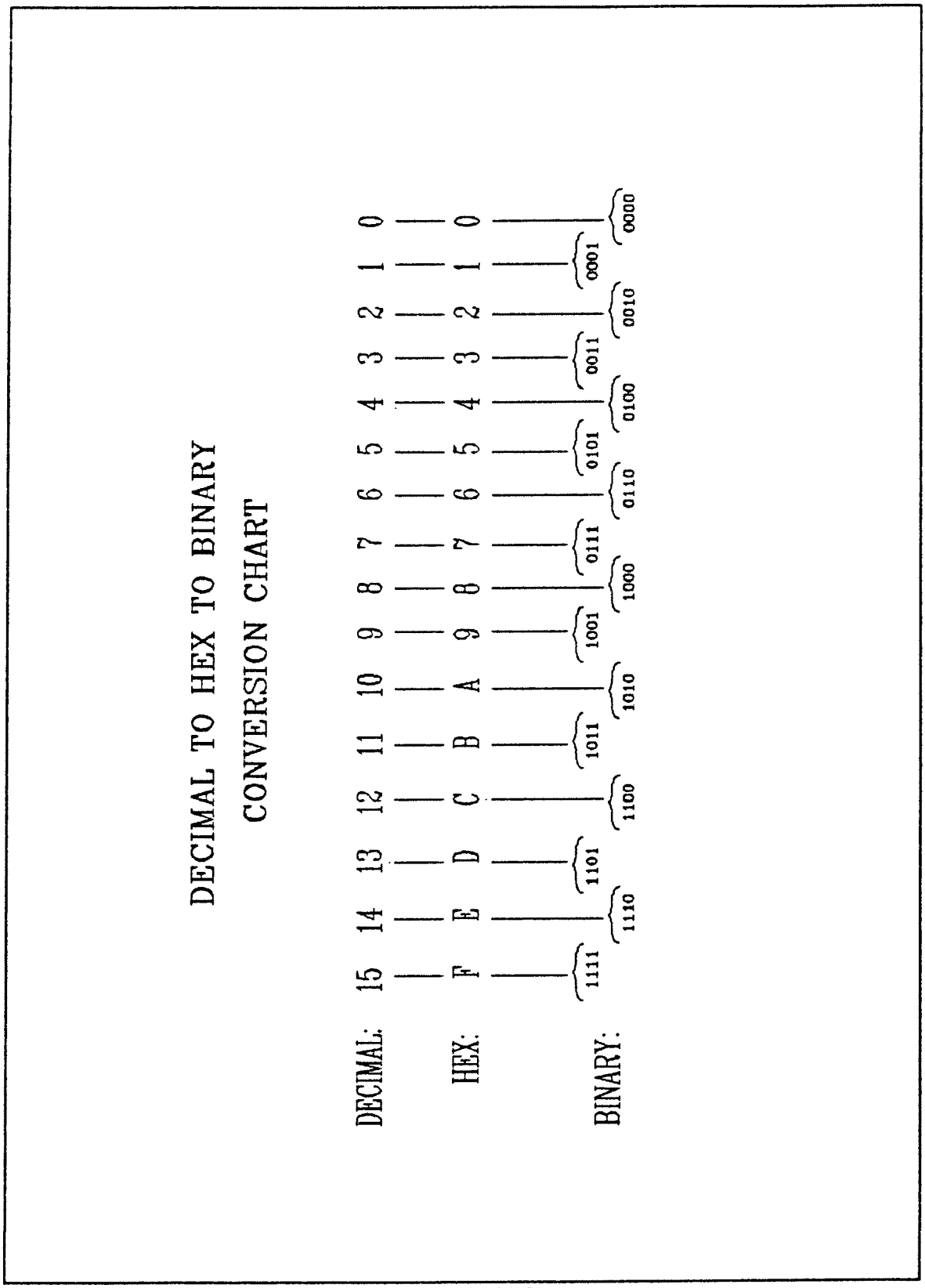

DECIMAL TO HEX TO BINARY
CONVERSION CHART
DECIMAL: 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
HEX: F E D C B A 9 8 7 6 5 4 3 2 1 0
BINARY: 1111 1110 1101 1100 1011 1010 1001 1000 0111 0110 0101 0100 0011 0010 0001 0000

FIGURE 3.2

To be useful the hex data needs to be broken into their binary pattern. Figure 3.2 shows a chart with the conversions between hex, decimal and binary. Use this chart to convert each of the words in the FFS display into binary. An example for one word is shown in Figure 3.3.

Once the binary conversion is done flip to the Recommended Action Map for the words that contain any "1"s. The mappings will show which recommended action should be followed for any failure. The mappings for internal status flags is not available at this time.

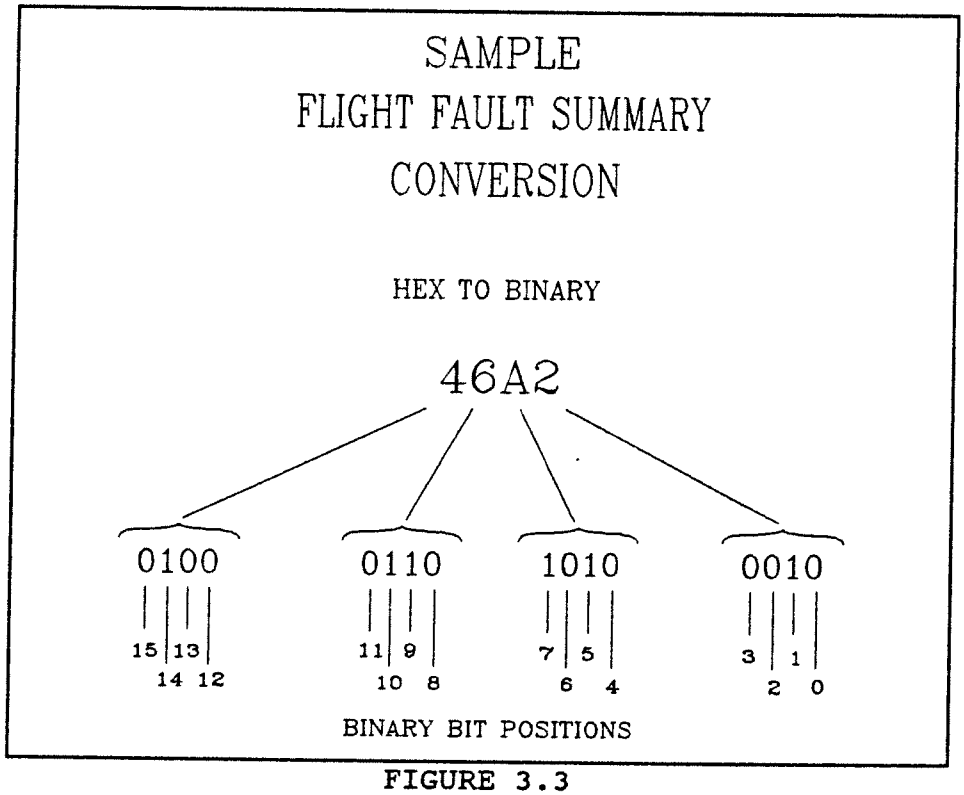
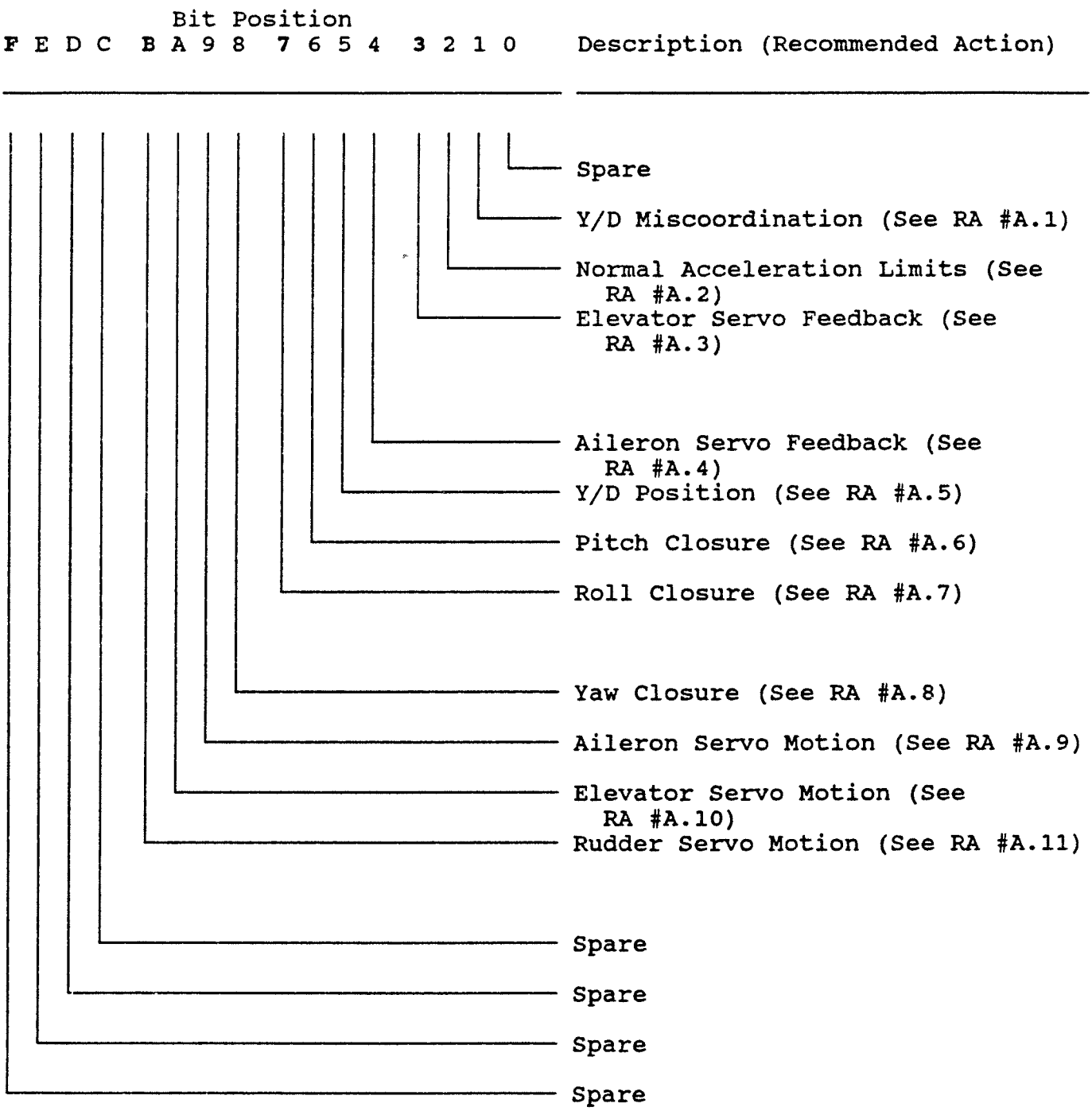



FIGURE 3.3

## RECOMMENDED ACTION MAP

Performance Monitor Flags

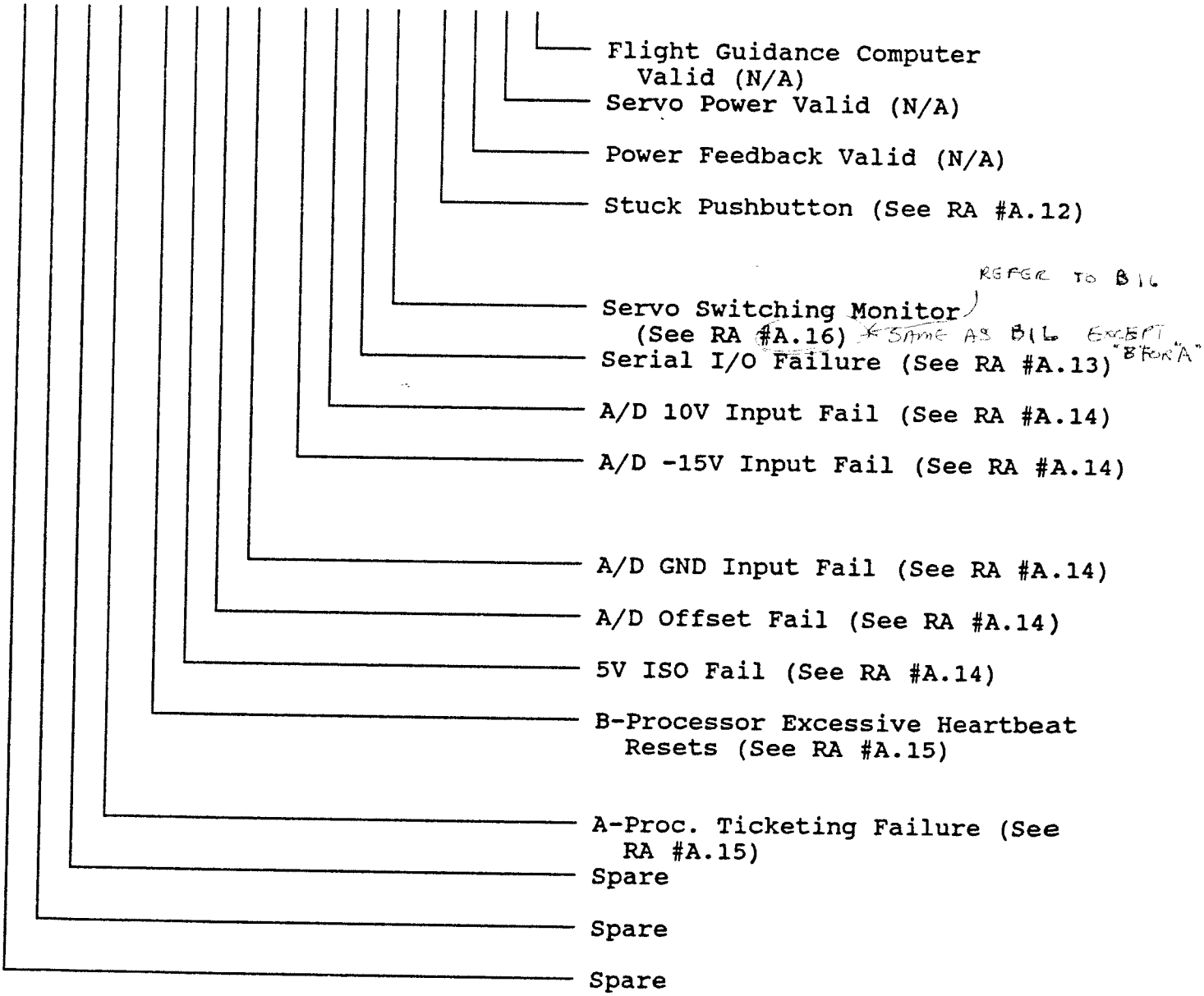
**LINE A, WORD 1**



## RECOMMENDED ACTION MAP

Hardware Monitor Flags

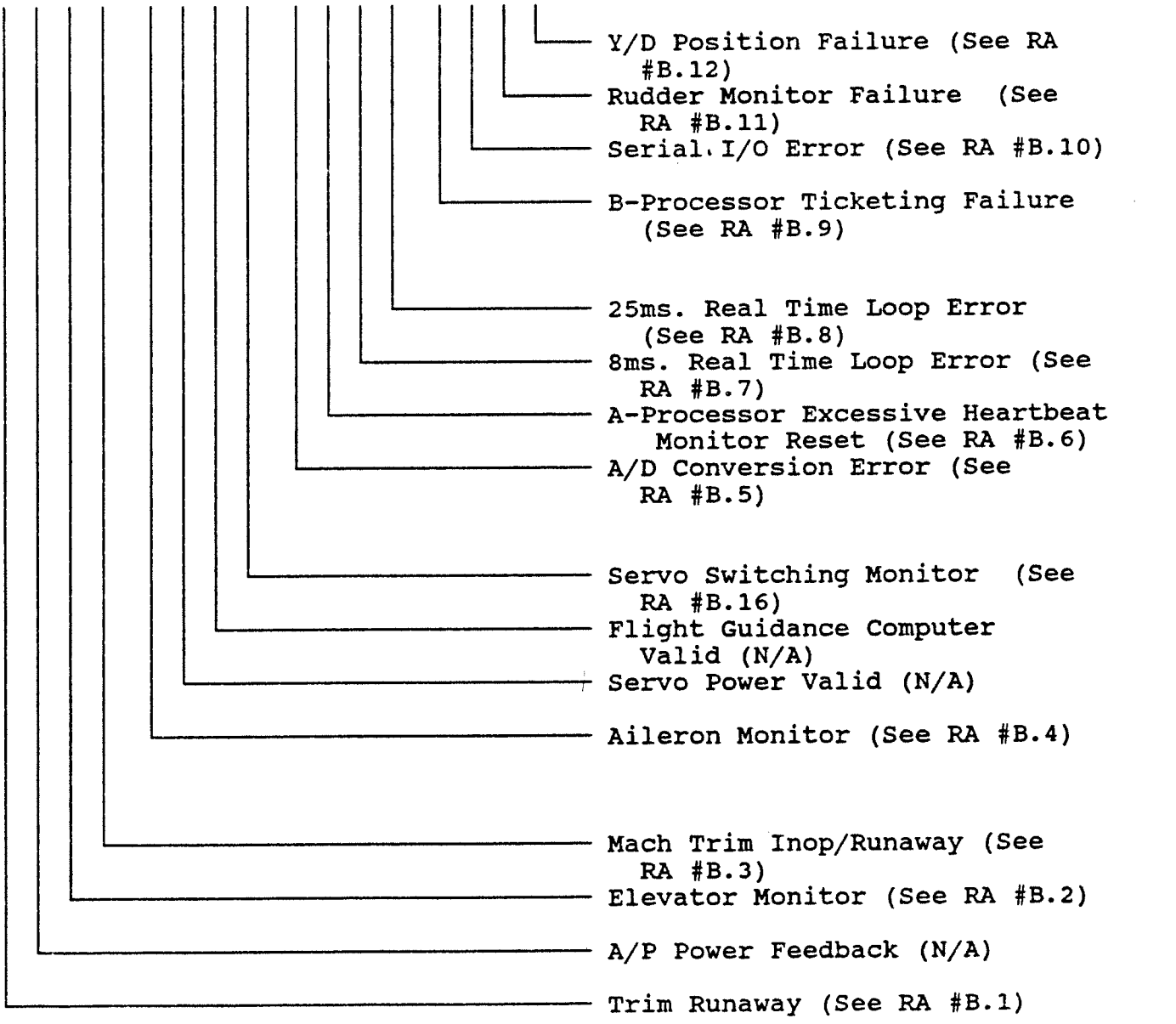
**LINE A, WORD 2**



## RECOMMENDED ACTION MAP

Performance Monitors Flags

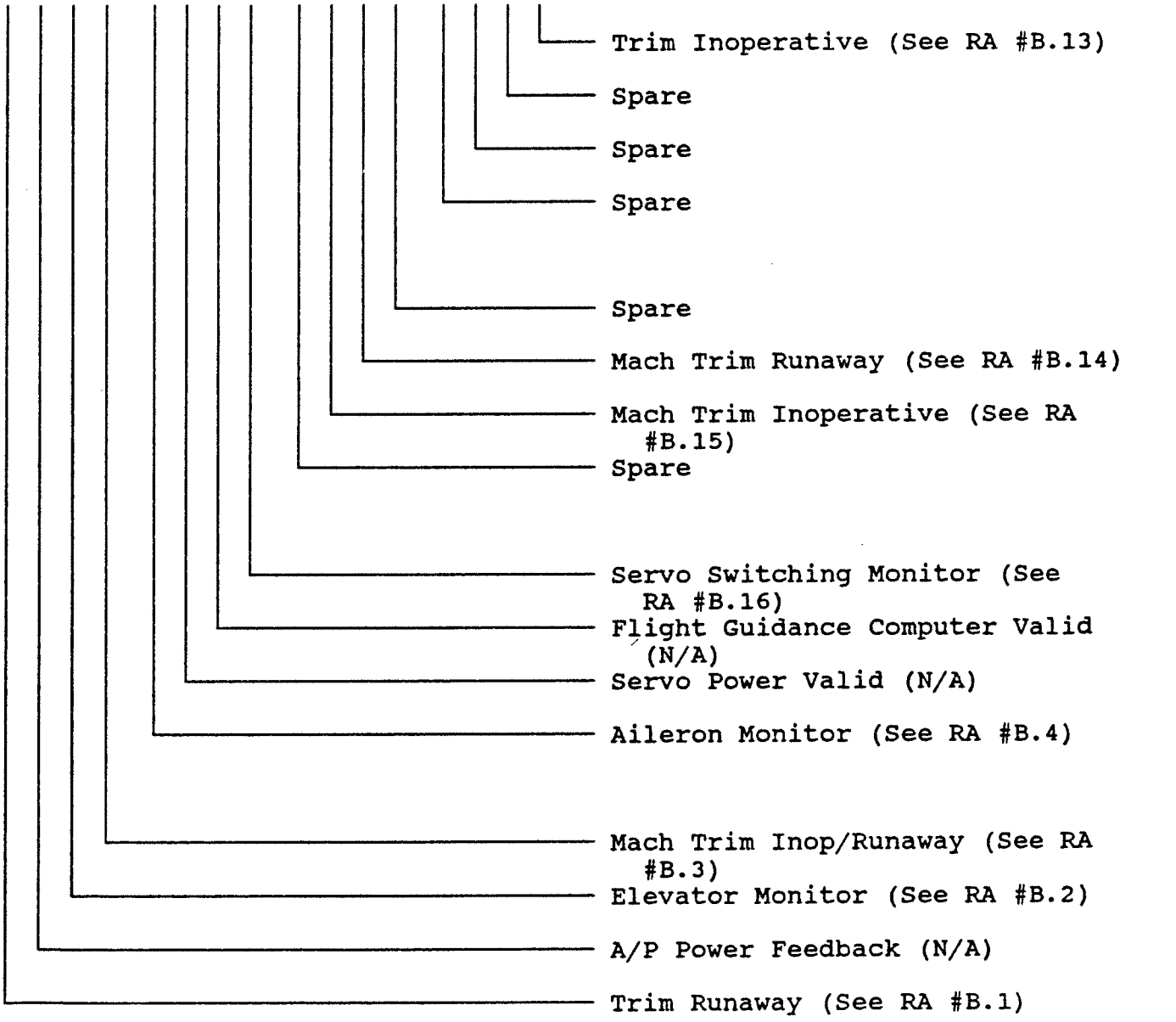
**LINE B, WORD 1**



## RECOMMENDED ACTION MAP

Performance Monitors Flags

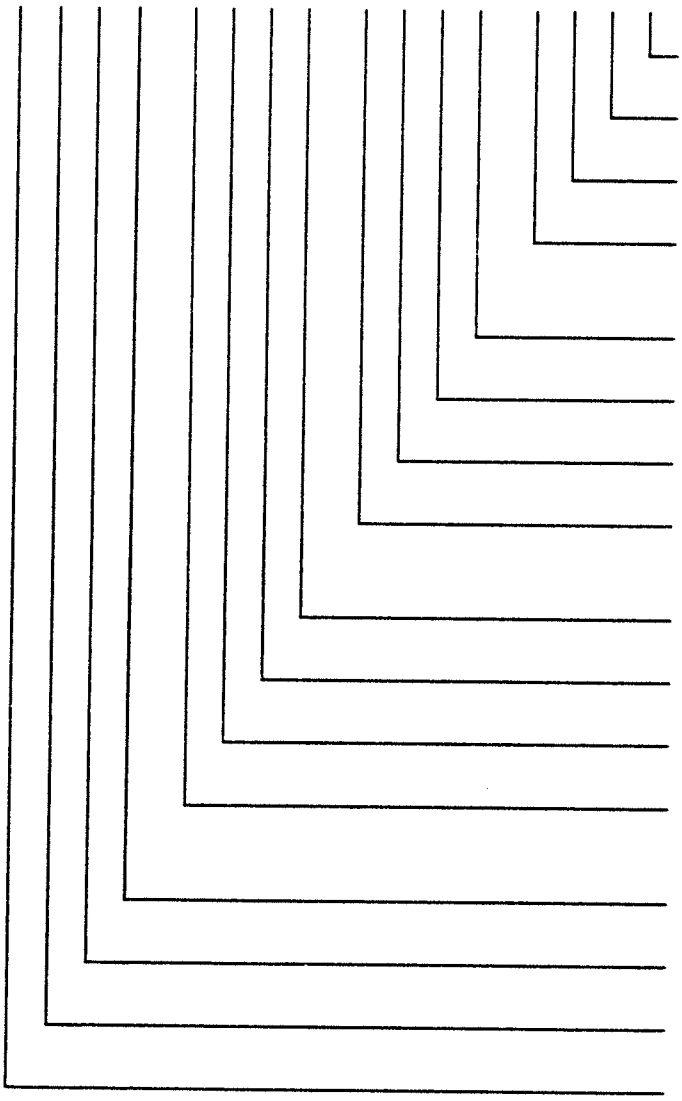
**LINE B, WORD 2**



## RECOMMENDED ACTION MAP

POWER-UP TEST FLAGS

**LINE C, WORD 1**

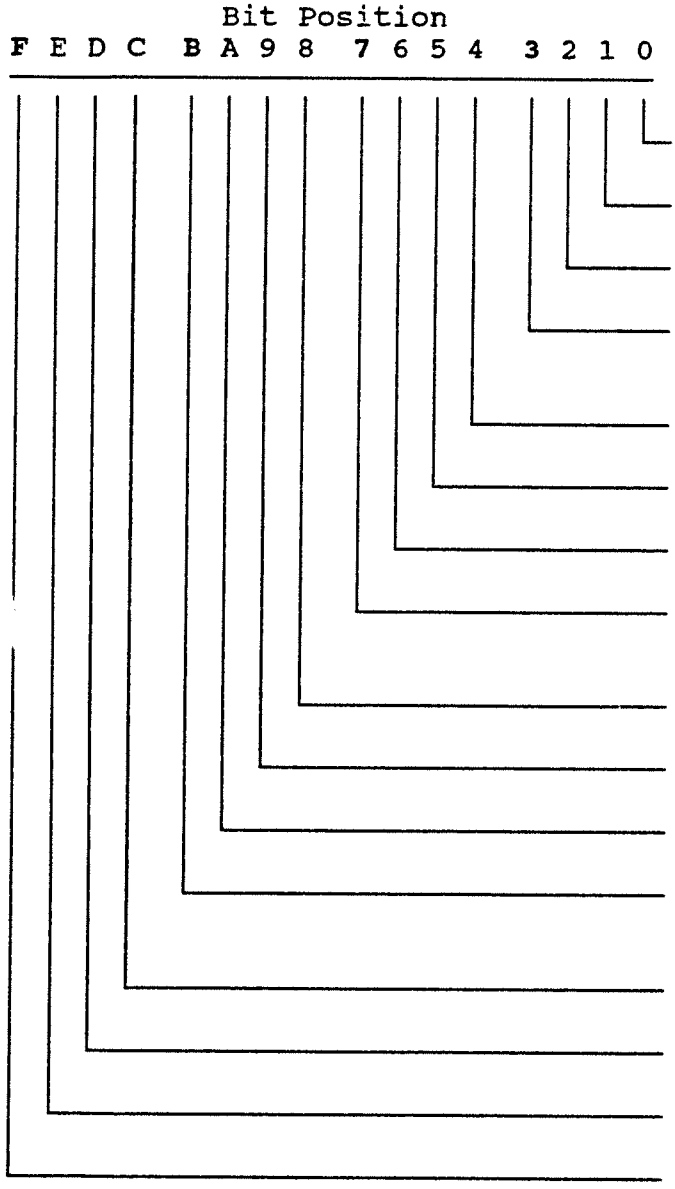



| Bit | Description (Recommended Action) |
|---|---|
| 0 | Elev Trim pull-up resistor fail (Replace this FZ) |
| 1 | Spare |
| 2 | Elev Trim servo engage relay fail (see RA #C.3) |
| 3 | Spare |
| 4 | Spare |
| 5 | Servo Power Off 'OR' gate fail (see RA #C.5) |
| 6 | Elev Trim pre-engage conditions fail (see RA #C.3) |
| 7 | Servos Off 'AND' gate fail (see RA #C.4) |
| 8 | Elev Trim pre-drive conditions fail (see RA #C.3) |
| 9 | Spare |
| A | Elev Trim engage test fail (see RA #C.3) |
| B | Spare |
| C | AP or YD servo power relay fail (see RA #C.2) |
| D | Spare |
| E | Spare |
| F | Elev Trim servo amp fail (see RA #C.1) |

## RECOMMENDED ACTION MAP

POWER-UP TEST FLAGS (cont)

**LINE C, WORD 2**

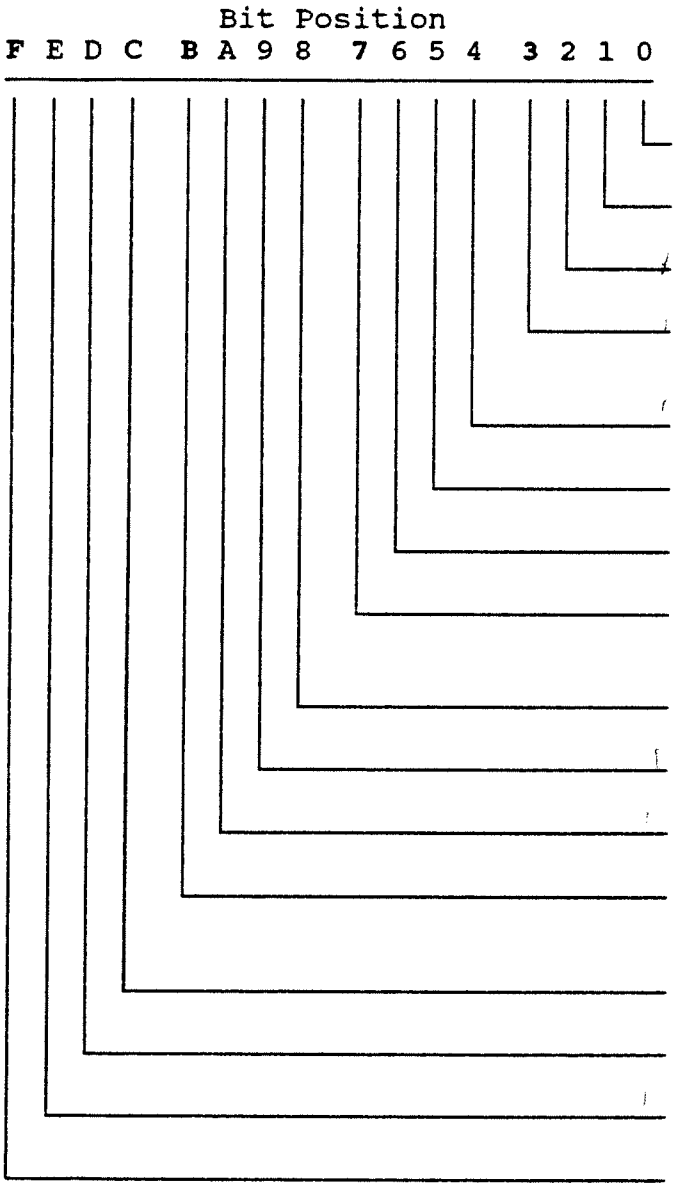



| Bit | Description (Recommended Action) |
|---|---|
| 0 | Elev Trim clutch diode fail (Replace this FZ) |
| 1 | Spare |
| 2 | Spare |
| 3 | Spare |
| 4 | A/D calibration fail (Replace this FZ) |
| 5 | FD/Annunciator fail (see RA #C.7) |
| 6 | Servo power inhibit failure (Replace this FZ) |
| 7 | Bus enable inhibit failure (Replace this FZ) |
| 8 | Serial I/O Failure (see RA #C.7) |
| 9 | Aircraft Identification Failure (see RA #C.6) |
| A | Power Supply Monitor reset failure (Replace this FZ) |
| B | Spare |
| C | RAM failure (Replace this FZ) |
| D | Memory checksum failure (Replace this FZ) |
| E | Latched power valid failure (Replace this FZ) |
| F | D/A Wraparound Failure (see RA #C.8) |

## RECOMMENDED ACTION MAP

POWER-UP TEST FLAGS (cont)

**LINE C, WORD 3**

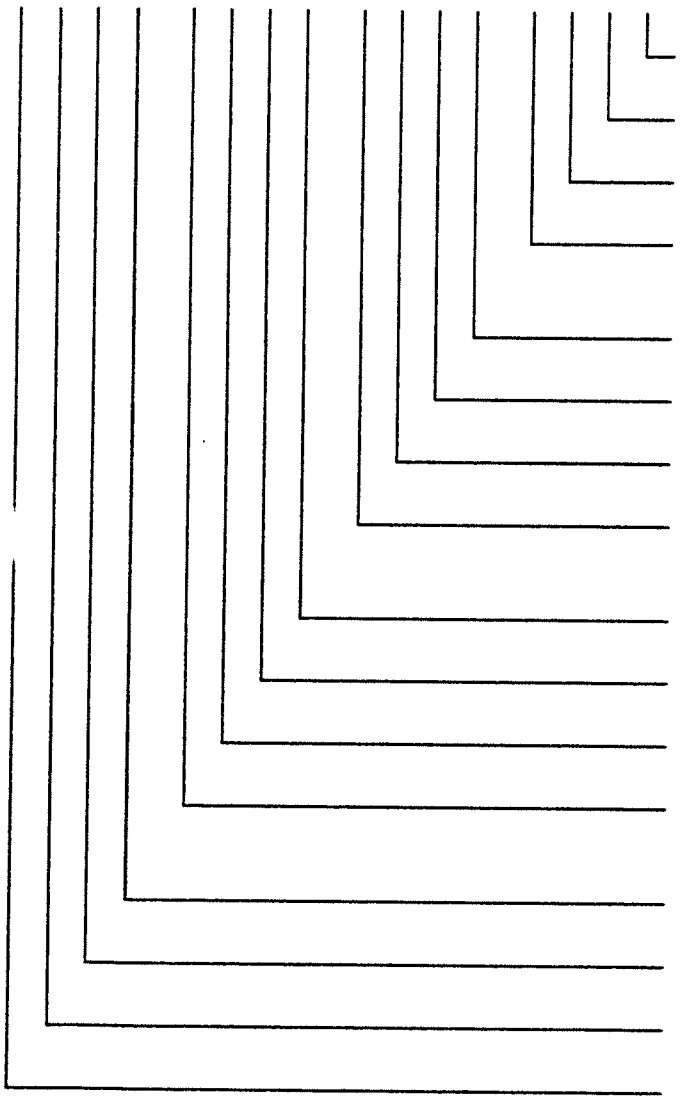



| Bit | Description (Recommended Action) |
|---|---|
| 0 | Spare |
| 1 | Spare |
| 2 | Spare |
| 3 | Spare |
| 4 | Spare |
| 5 | Spare |
| 6 | Spare |
| 7 | Preflight Test ticket fail (Replace this FZ) |
| 8 | Spare |
| 9 | HBM reset pretest conditions fail (N/A) |
| A | Power interrupt pretest conditions fail ( N/A) |
| B | HBM reset interlocks test fail (Replace this FZ) |
| C | Heartbeat Monitor (HBM) fail (long) (Replace this FZ) |
| D | Heartbeat Monitor (HBM) fail (short) (Replace this FZ) |
| E | Power interrupt interlocks test fail (Replace this FZ) |
| F | 200mS power down timer fail (Replace this FZ) |

## RECOMMENDED ACTION MAP

POWER-UP TEST FLAGS (cont)

**LINE C, WORD 4**

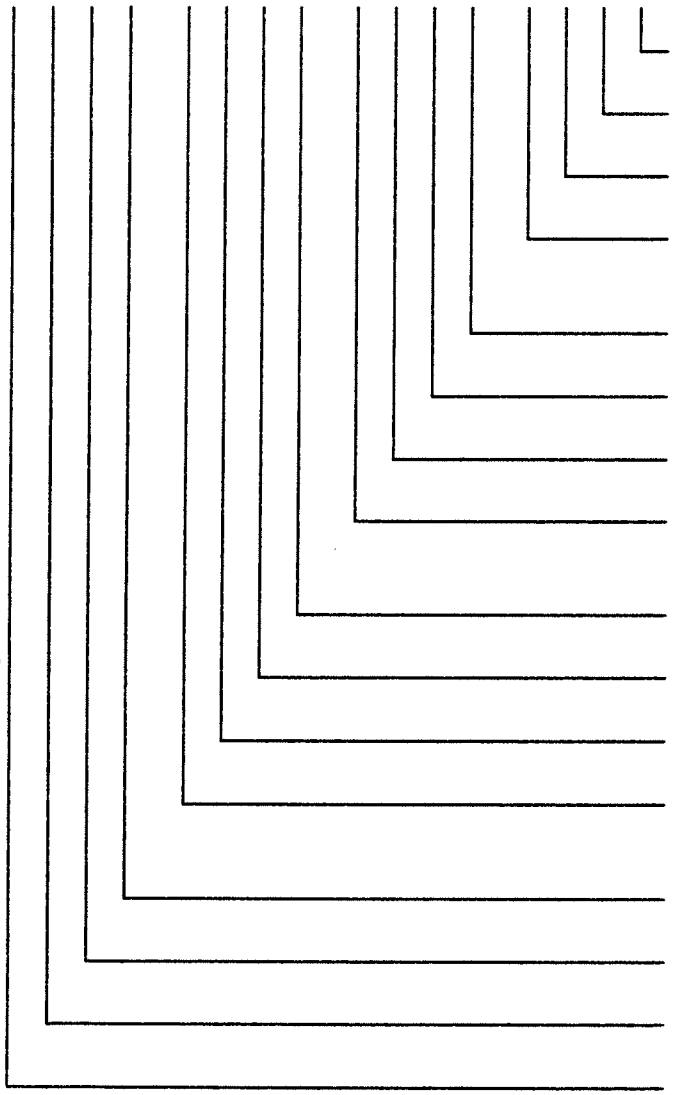



| Bit | Description (Recommended Action) |
|---|---|
| 0 | AP pull-up resistor fail (Replace this FZ) |
| 1 | YD pull-up resistor fail (Replace this FZ) |
| 2 | AP servo engage relay fail (see RA #C.10) |
| 3 | YD servo engage relay fail (see RA #C.9) |
| 4 | AP servo power relay fail (see RA #C.2) |
| 5 | YD servo power relay fail (see RA #C.2) |
| 6 | Servo power off 'OR' gate fail (see RA #C.5) |
| 7 | Servos Off 'AND' gate fail (see RA #C.4) |
| 8 | Spare |
| 9 | AP pre-engage conditions fail (see RA #C.10) |
| A | YD pre-engage conditions fail (see RA #C.9) |
| B | Spare |
| C | Spare |
| D | AP Engage test fail (see RA #C.10) |
| E | YD Engage test fail (see RA #C.9) |
| F | Servo power pre-enable conditions fail (see RA #C.2) |

## RECOMMENDED ACTION MAP

POWER-UP TEST FLAGS (cont)

**LINE C, WORD 5**

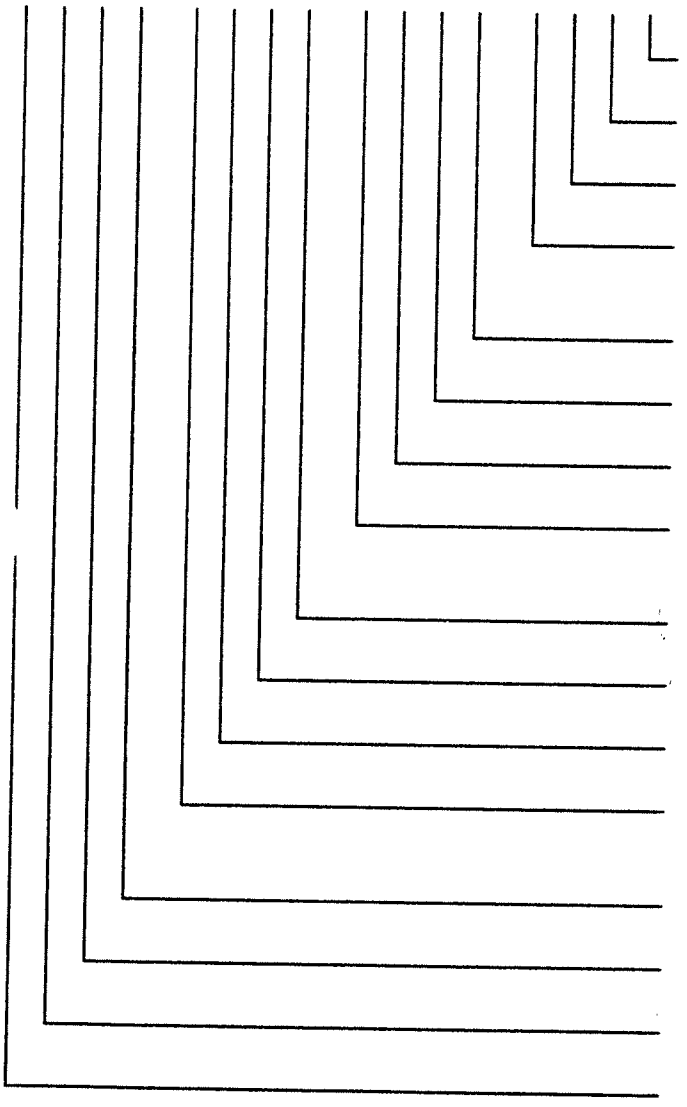



| Bit | Description (Recommended Action) |
|---|---|
| 0 | AP clutch diode fail (see RA #C.8) |
| 1 | YD brake diode fail (see RA #C.8) |
| 2 | Aircraft Identification Failure (see RA #C.6) |
| 3 | Spare |
| 4 | A/D calibration fail (Replace this FZ) |
| 5 | Processor Valid fail (Replace this FZ) |
| 6 | Servo power enable fail (Replace this FZ) |
| 7 | Status Transfer RAM fail (Replace this FZ) |
| 8 | Internal serial I/O Failure (Replace this FZ) |
| 9 | 5v Overvoltage Monitor fail (Replace this FZ) |
| A | 5v Undervoltage Monitor fail (Replace this FZ) |
| B | Spare |
| C | RAM failure (Replace this FZ) |
| D | Memory checksum failure (Replace this FZ) |
| E | Latched power valid failure (Replace this FZ) |
| F | D/A Wraparound Failure (Replace this FZ) |

## RECOMMENDED ACTION MAP

POWER-UP TEST FLAGS (cont)

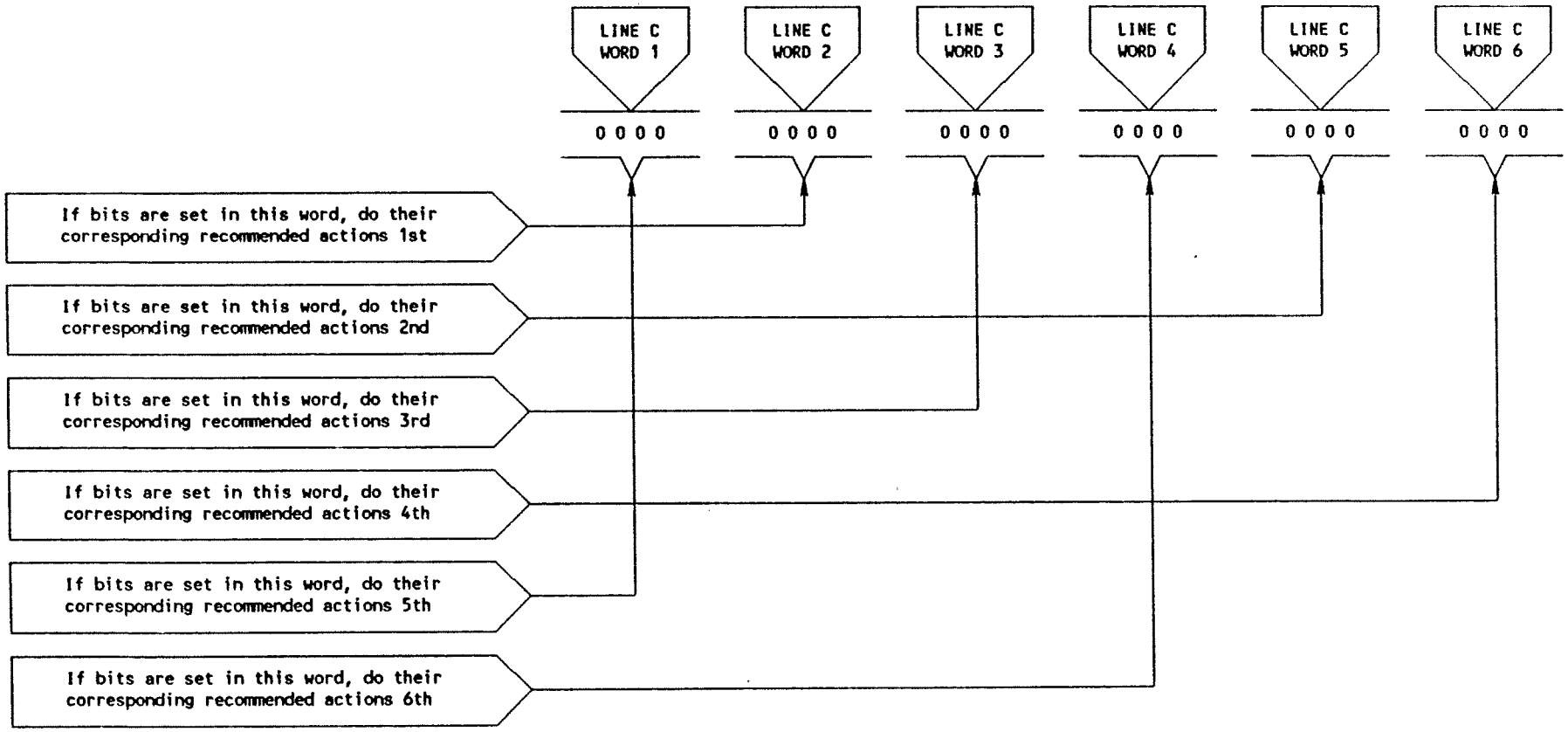
**LINE C, WORD 6**



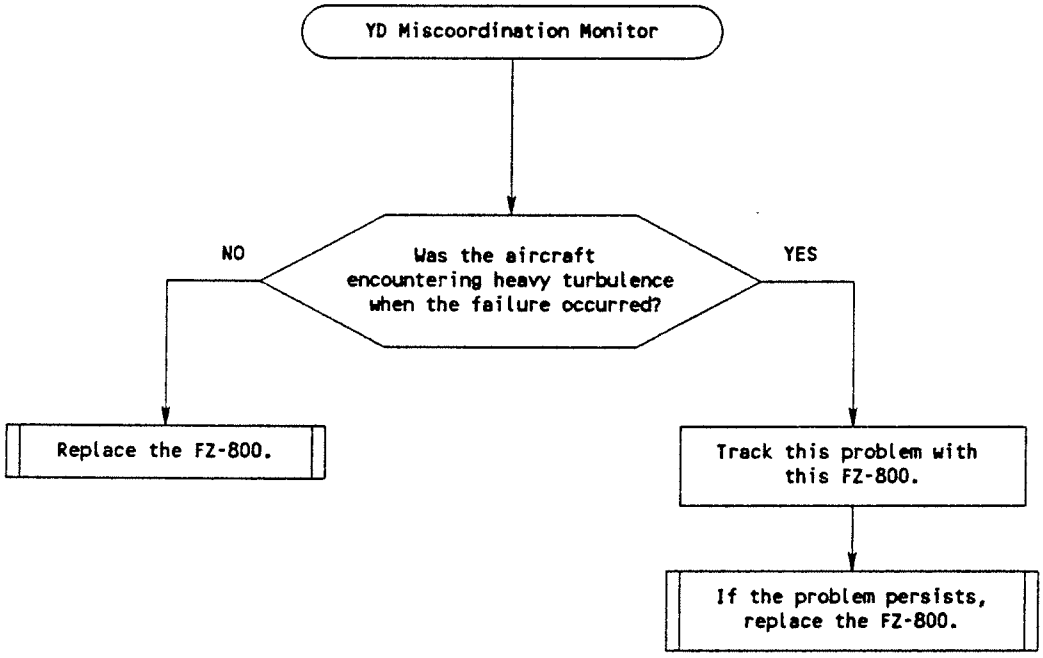

| Bit | Description (Recommended Action) |
|---|---|
| 0 | Ail servo amp fail (see RA #C.1) |
| 1 | Elev servo amp fail (see RA #C.1) |
| 2 | YD servo amp fail (see RA #C.1) |
| 3 | Spare |
| 4 | Spare |
| 5 | Spare |
| 6 | Spare |
| 7 | Preflight Test ticket fail (Replace this FZ) |
| 8 | HBM reset pretest conditions fail (N/A) |
| 9 | Power interrupt pretest conditions fail (N/A) |
| A | FD/Annunciator fail (see RA #C.9) |
| B | HBM reset interlocks test fail (Replace this FZ) |
| C | Heartbeat Monitor (HBM) fail (long) (Replace this FZ) |
| D | Heartbeat Monitor (HBM) fail (short) (Replace this FZ) |
| E | Power interrupt interlocks test fail (Replace this FZ) |
| F | 200mS power down timer fail (Replace this FZ) |

# Recommended Action Map

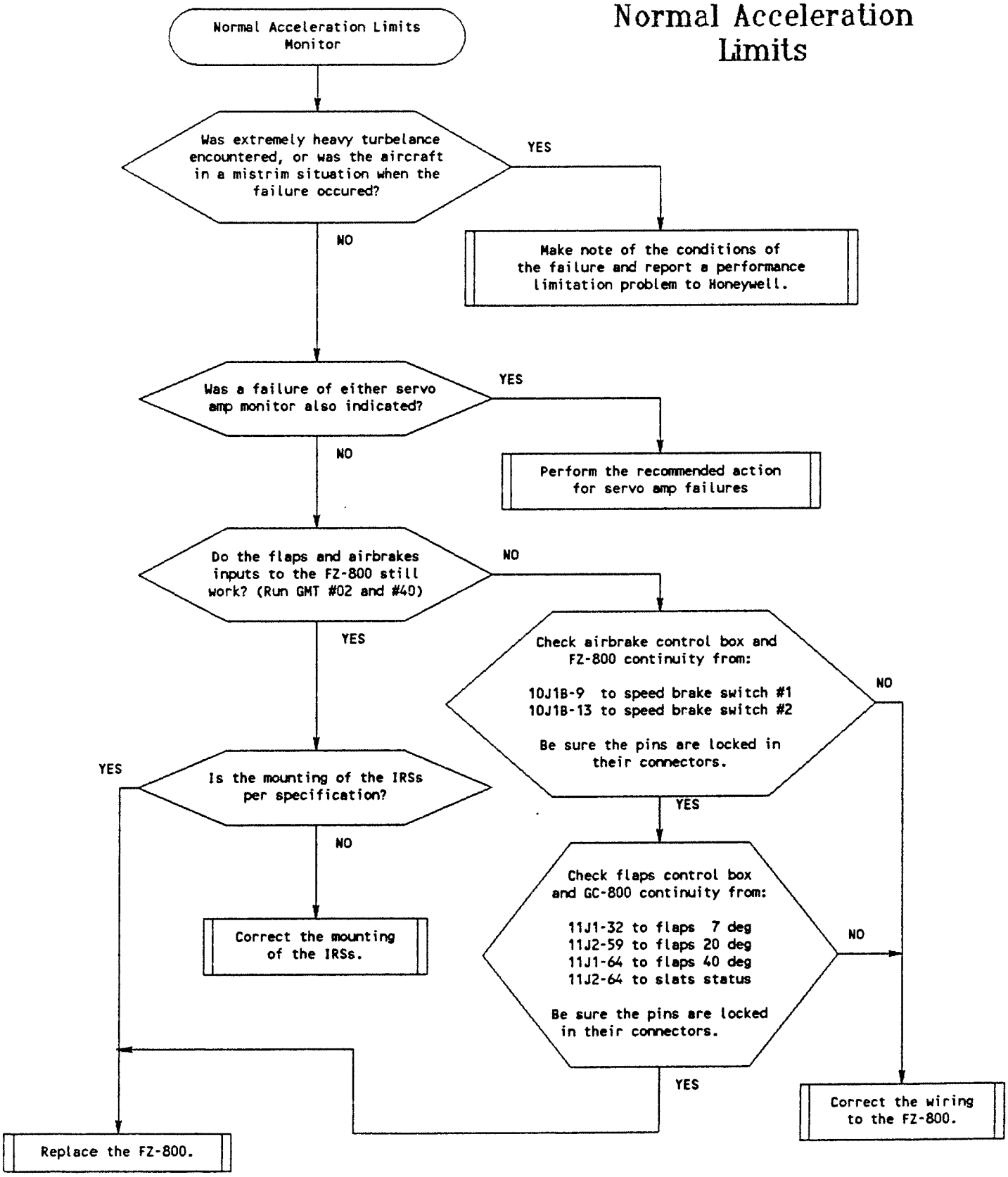
## Power-up Test Fault Hierarchy



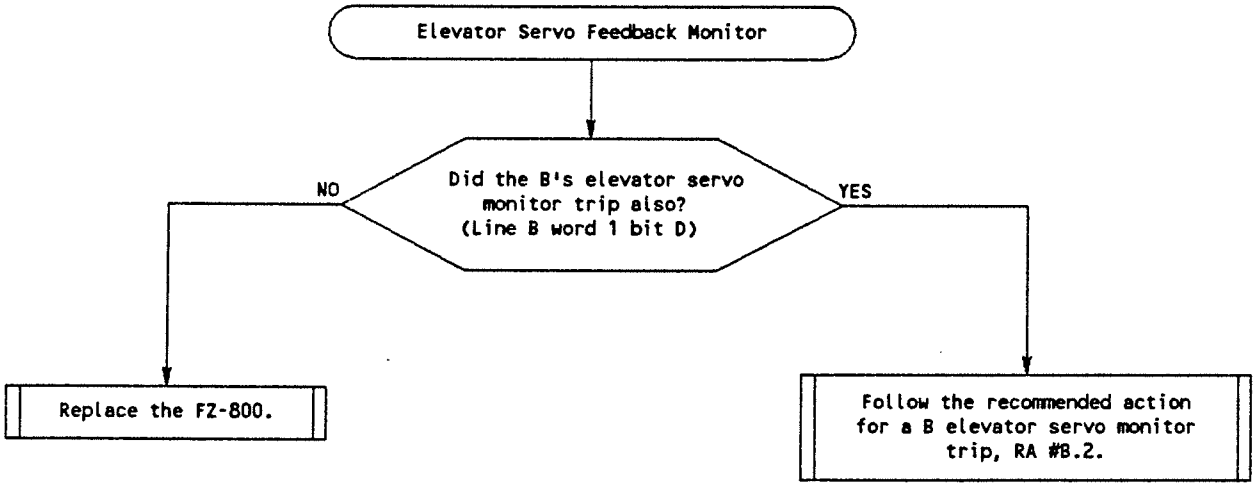
# Recommended Action #A.1
# YD Miscoordination Monitor



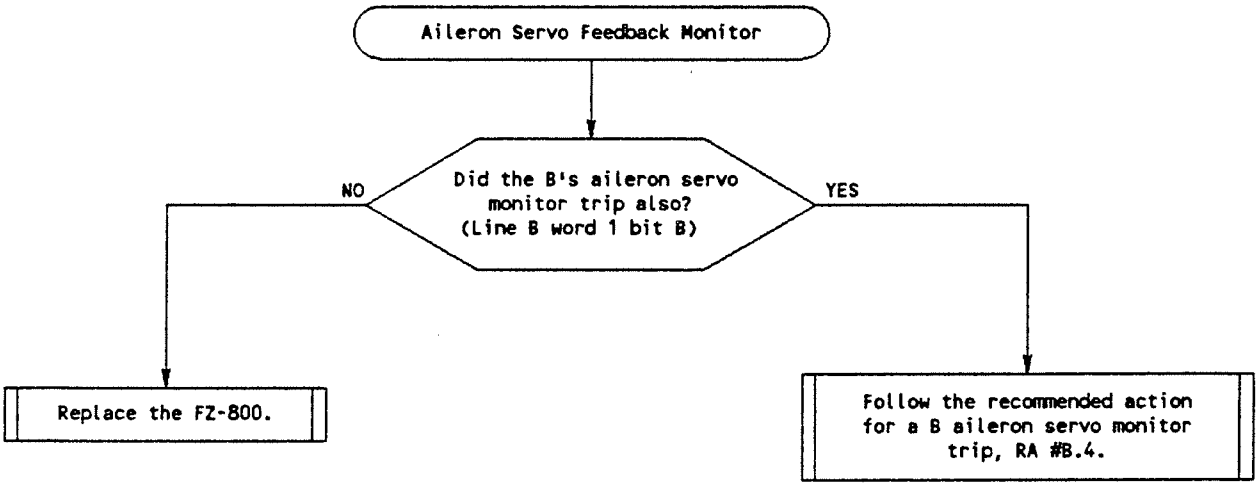
# Recommended Action #A.2
# Normal Acceleration Limits



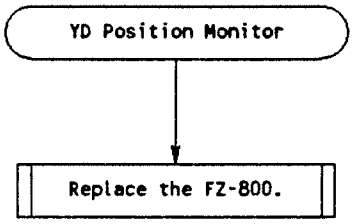
# Recommended Action #A.3
# Elevator Servo Feedback Monitor



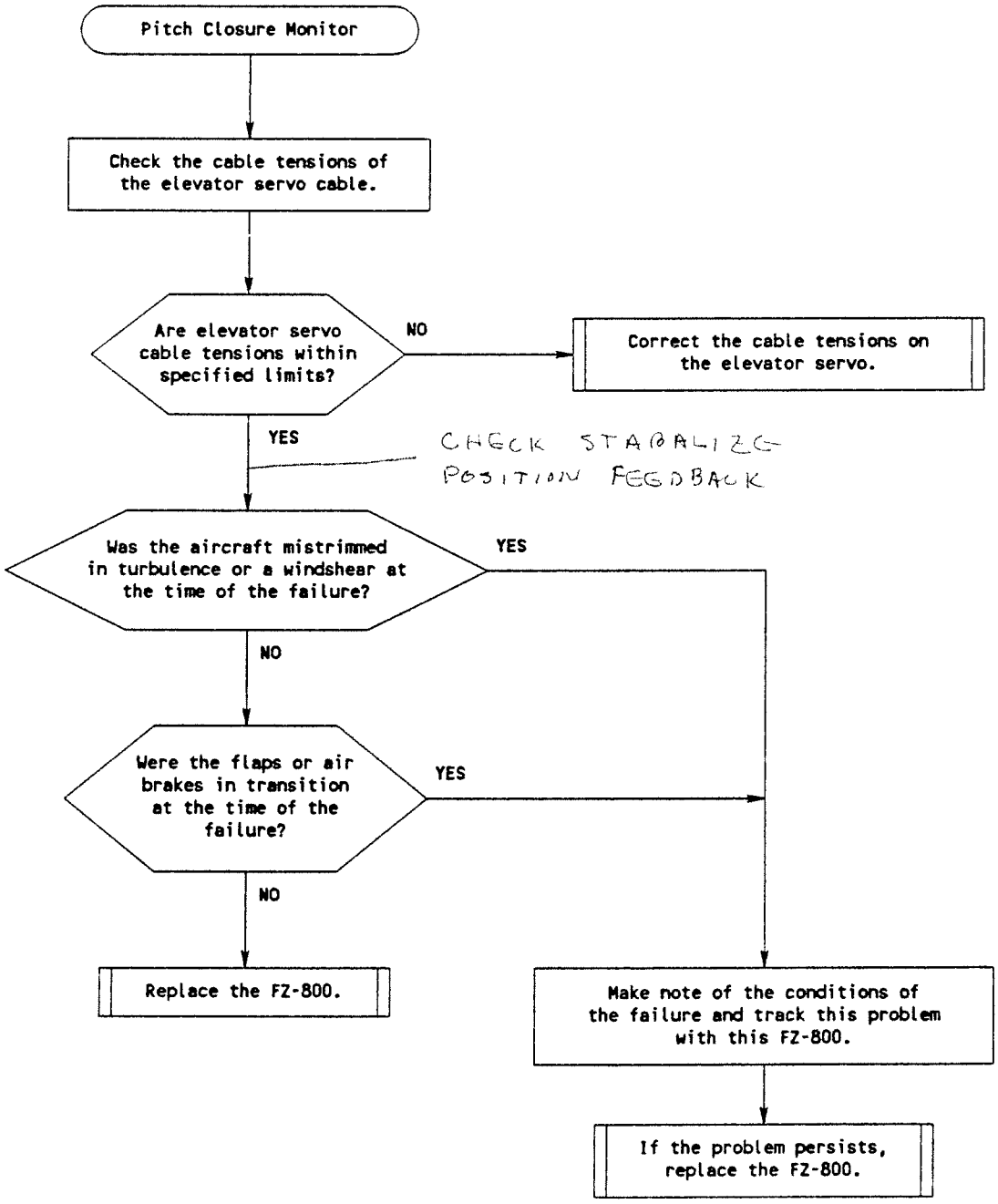
# Recommended Action #A.4
# Aileron Servo Feedback Monitor



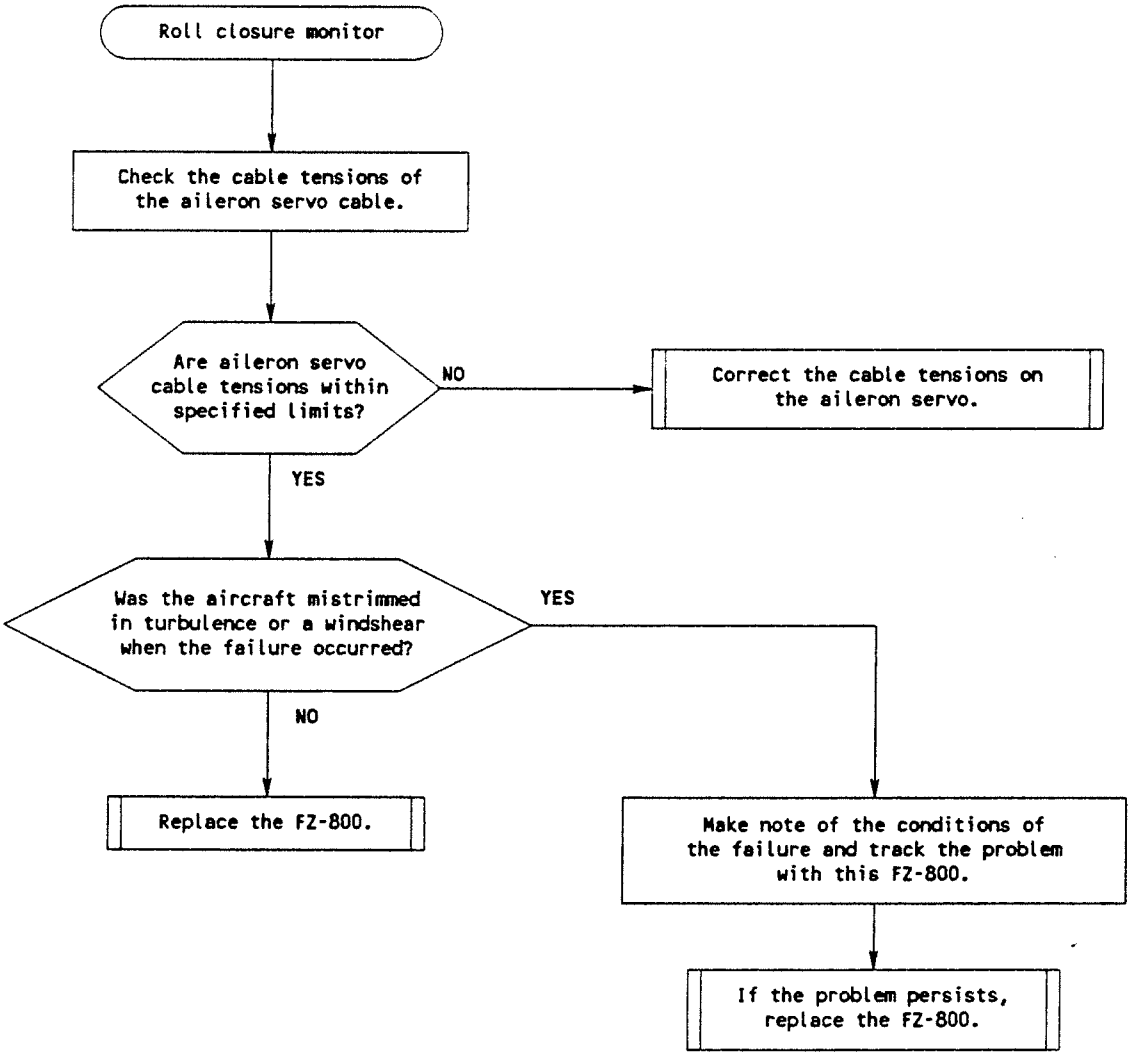
# Recommended Action #A.5
# YD Position



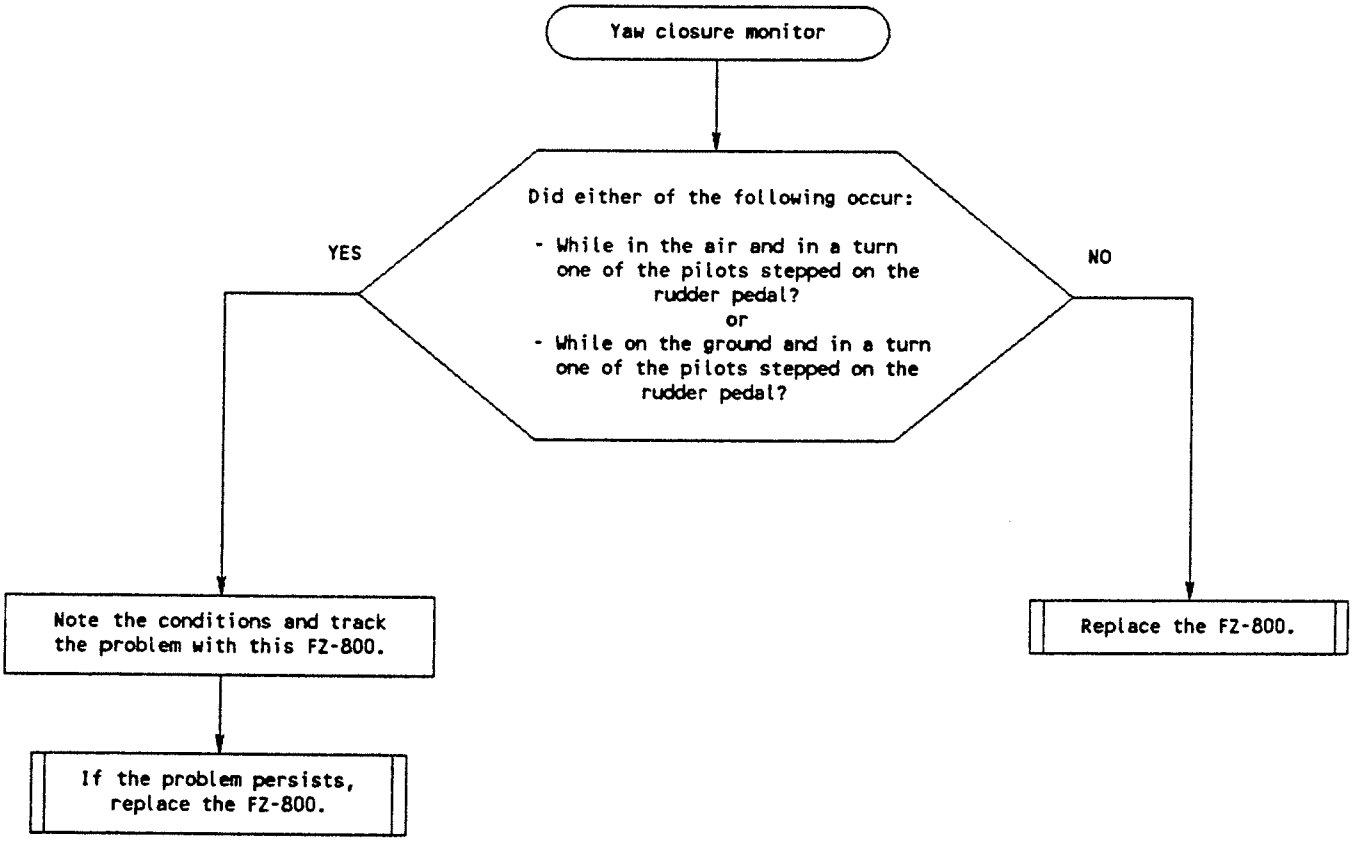
# Recommended Action #A.6
# Pitch Closure Monitor



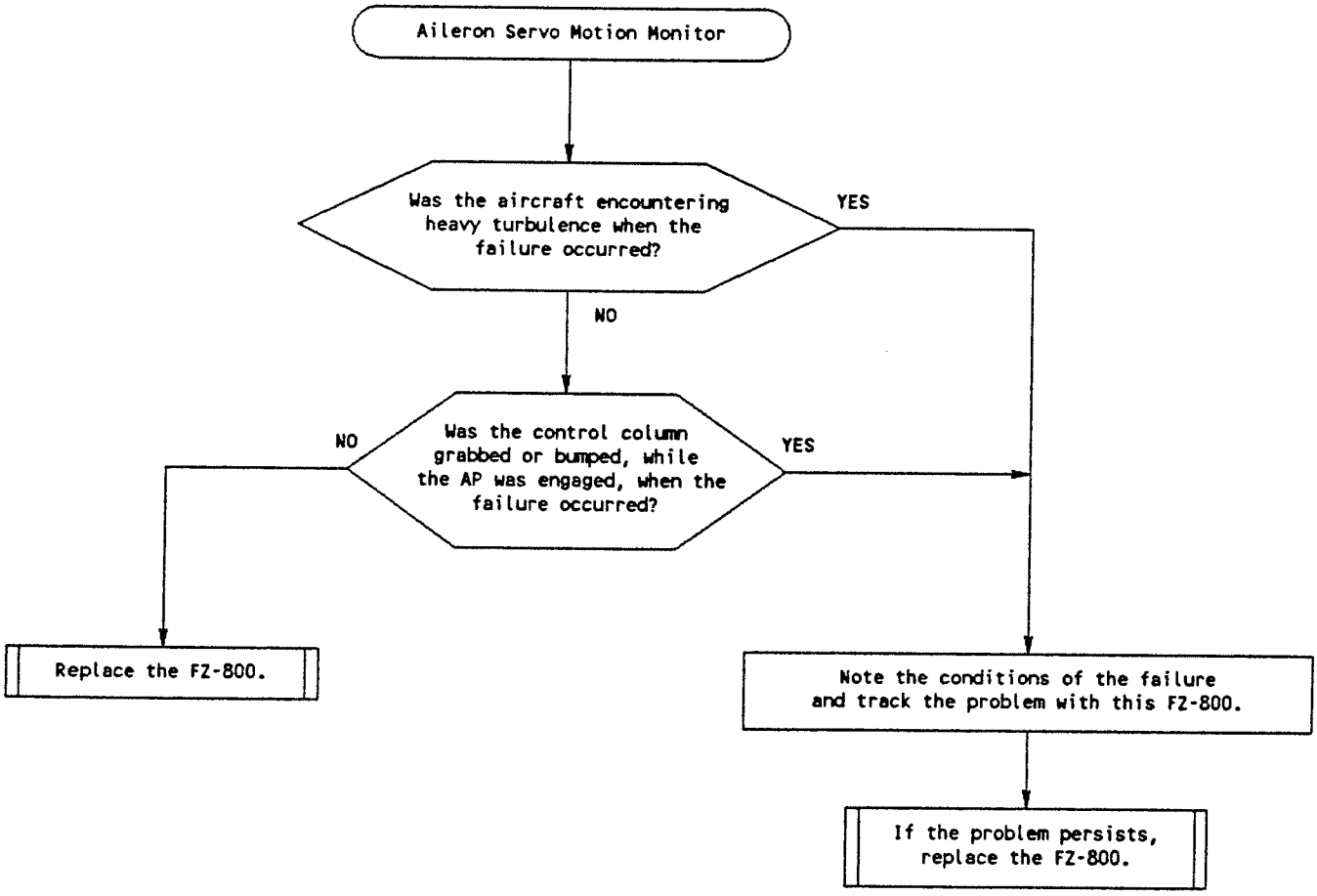
# Recommended Action #A.7
# Roll Closure Monitor



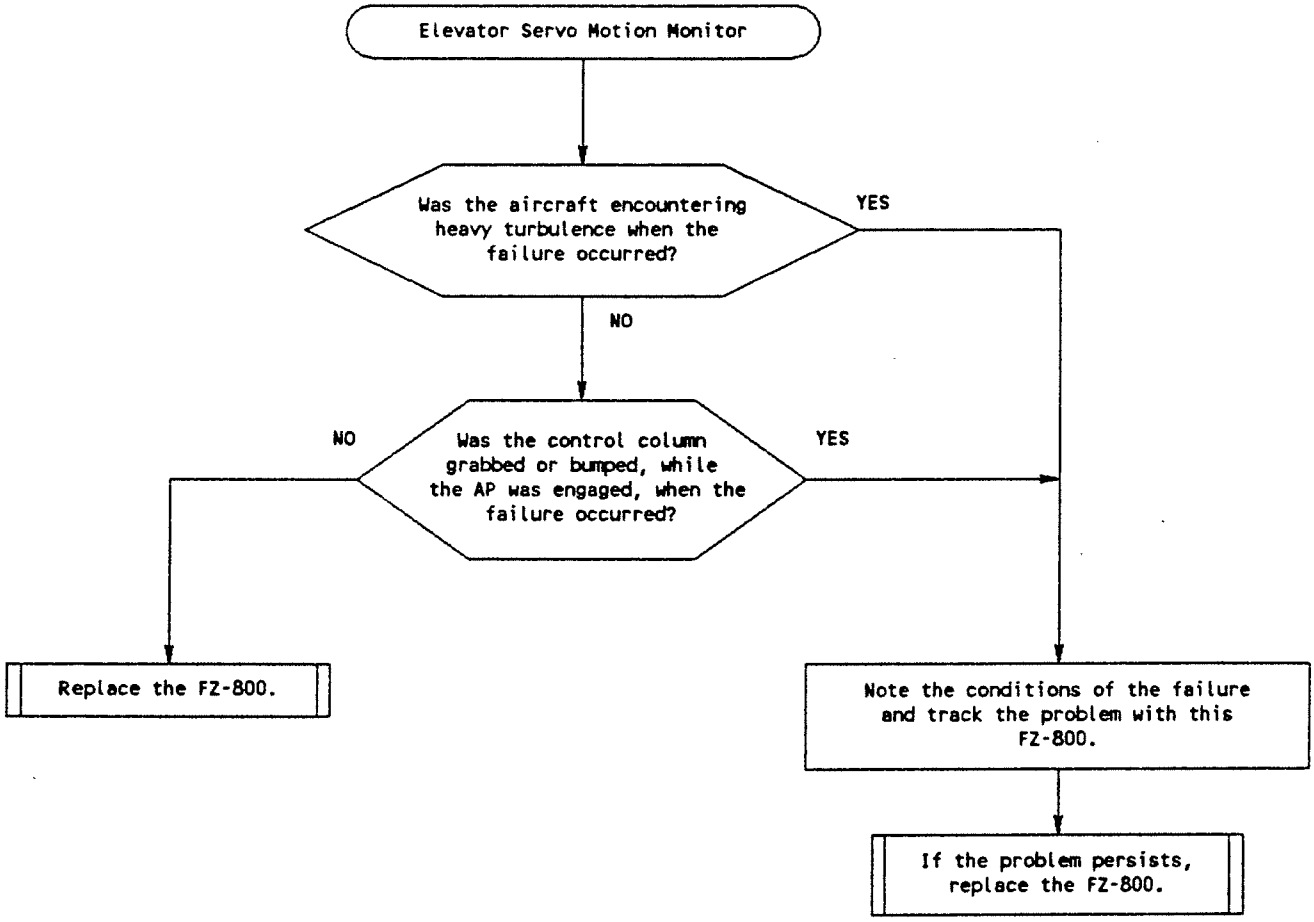
# Recommended Action #A.8
# Yaw Closure Monitor



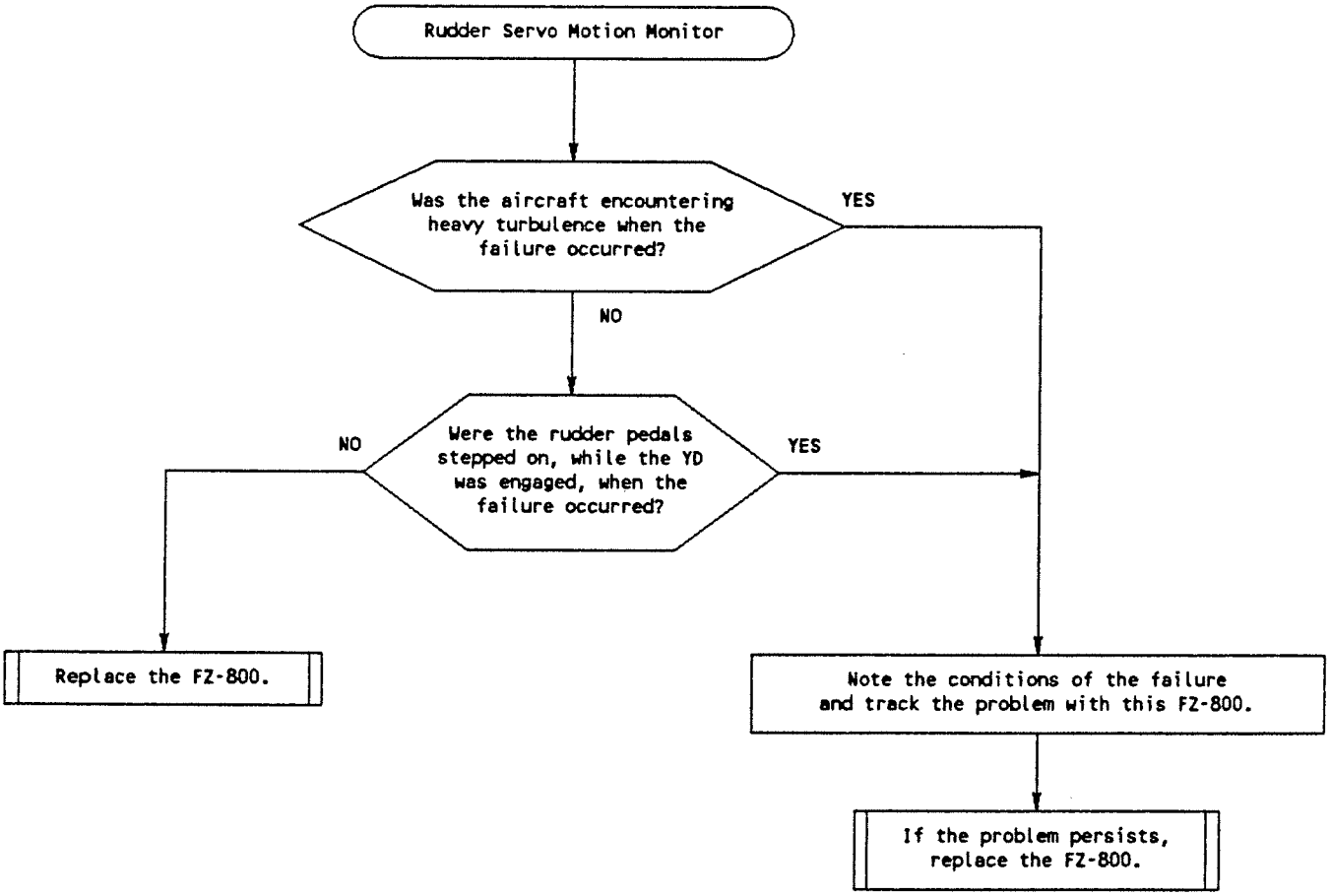
# Recommended Action #A.9
# Aileron Servo Motion Monitor



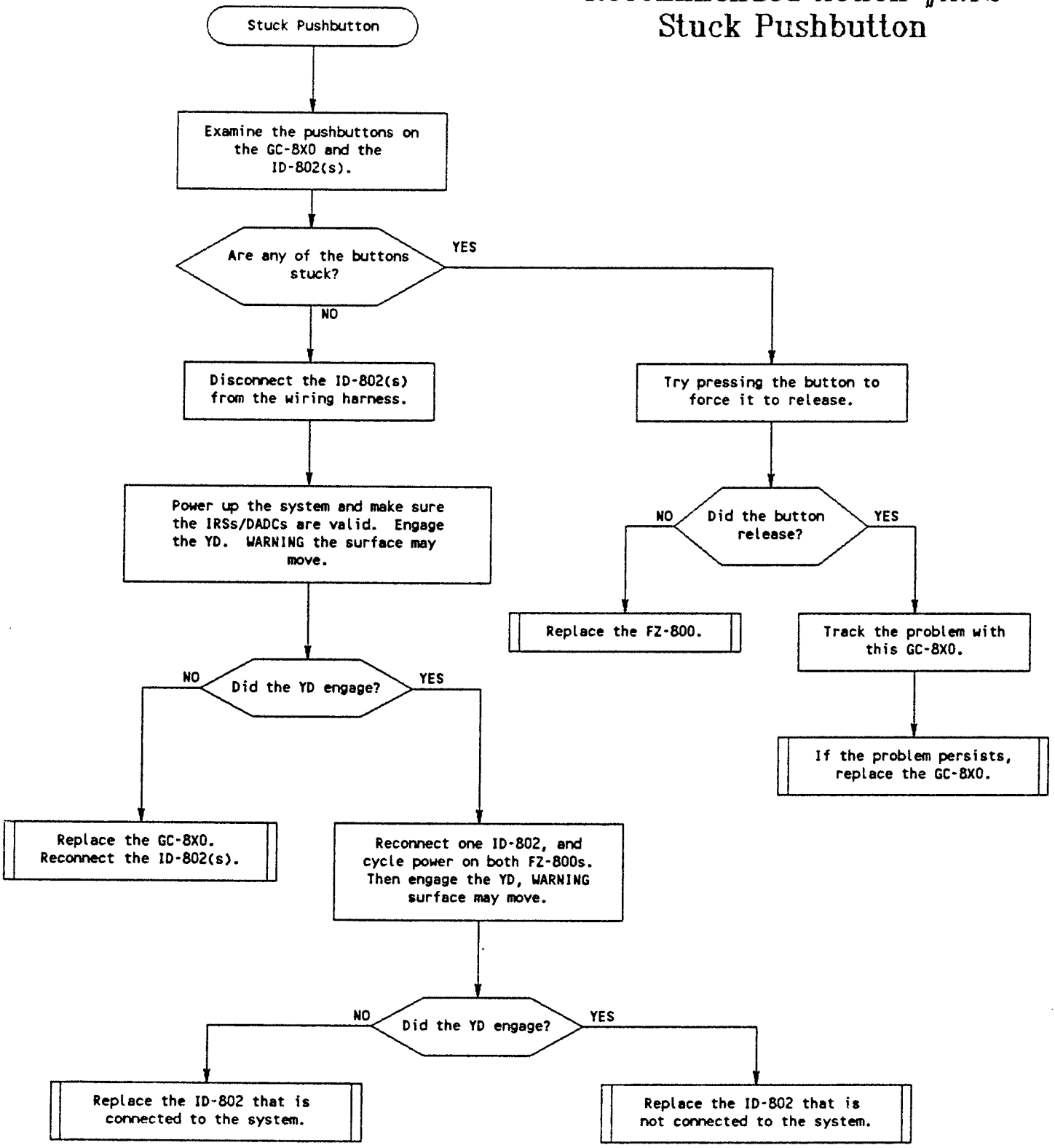
# Recommended Action #A.10
# Elevator Servo Motion Monitor



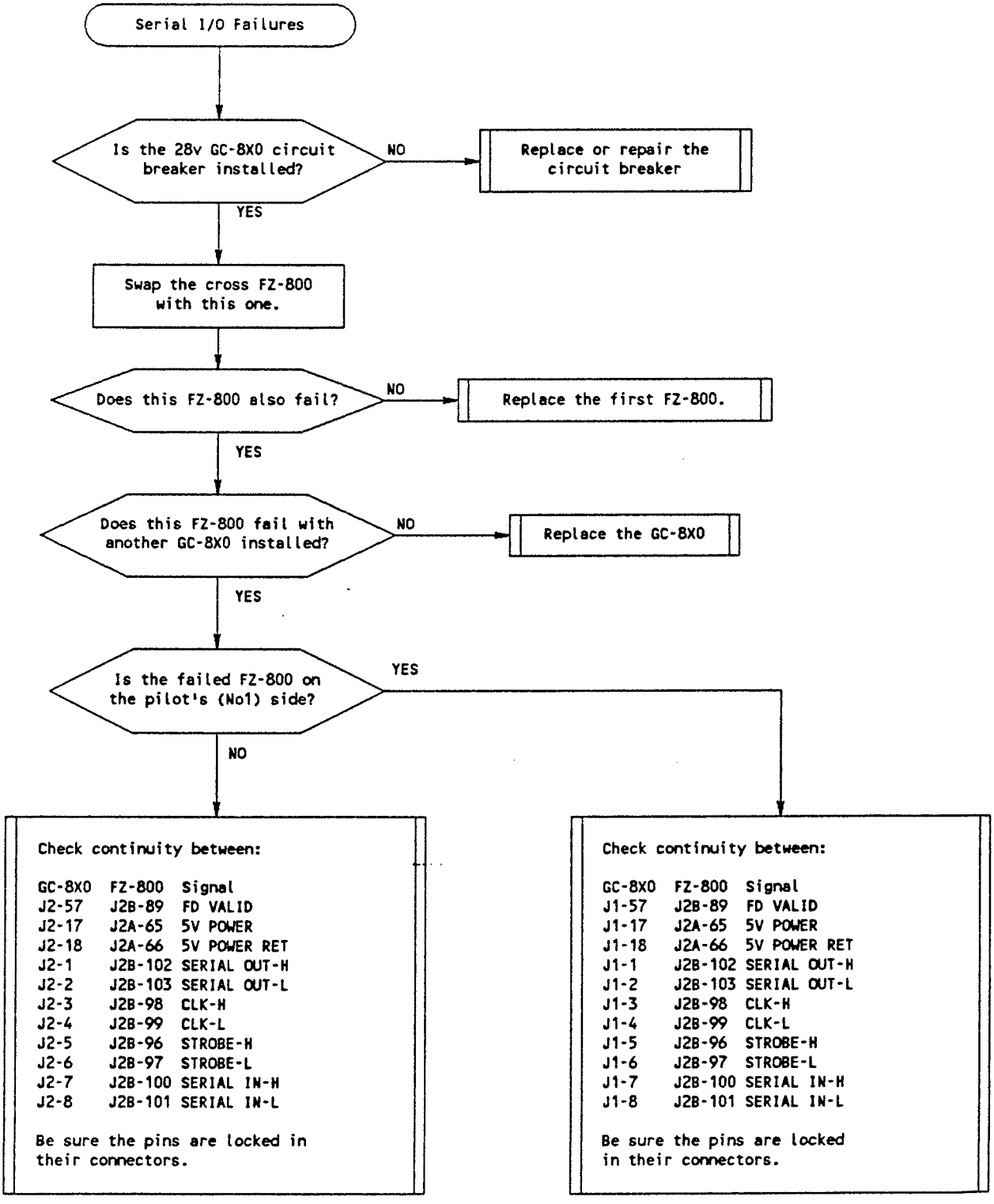
# Recommended Action #A.11
# Rudder Servo Motion Monitor



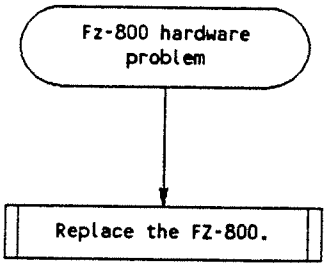
# Recommended Action #A.12
# Stuck Pushbutton



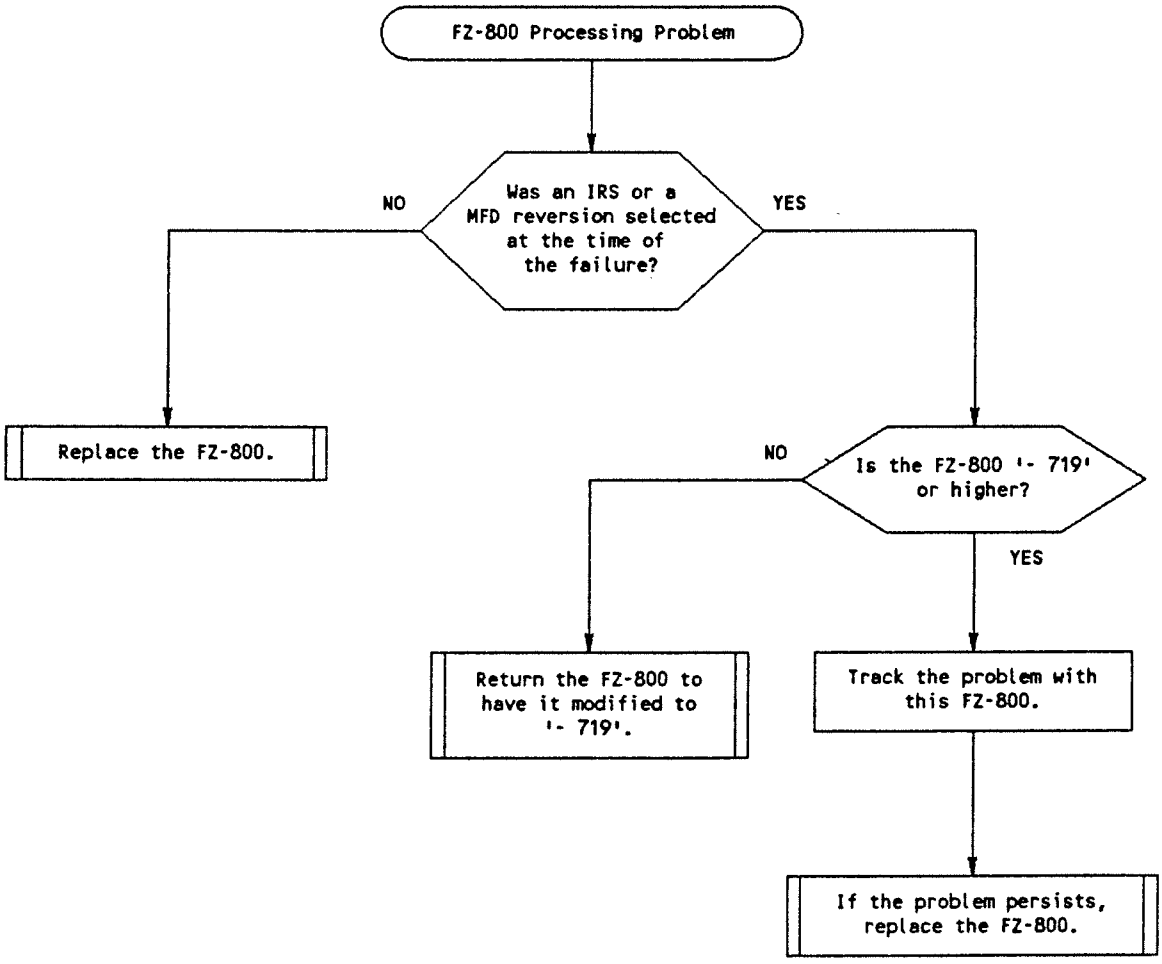
# Recommended Action #A.13
# Serial I/O Failure



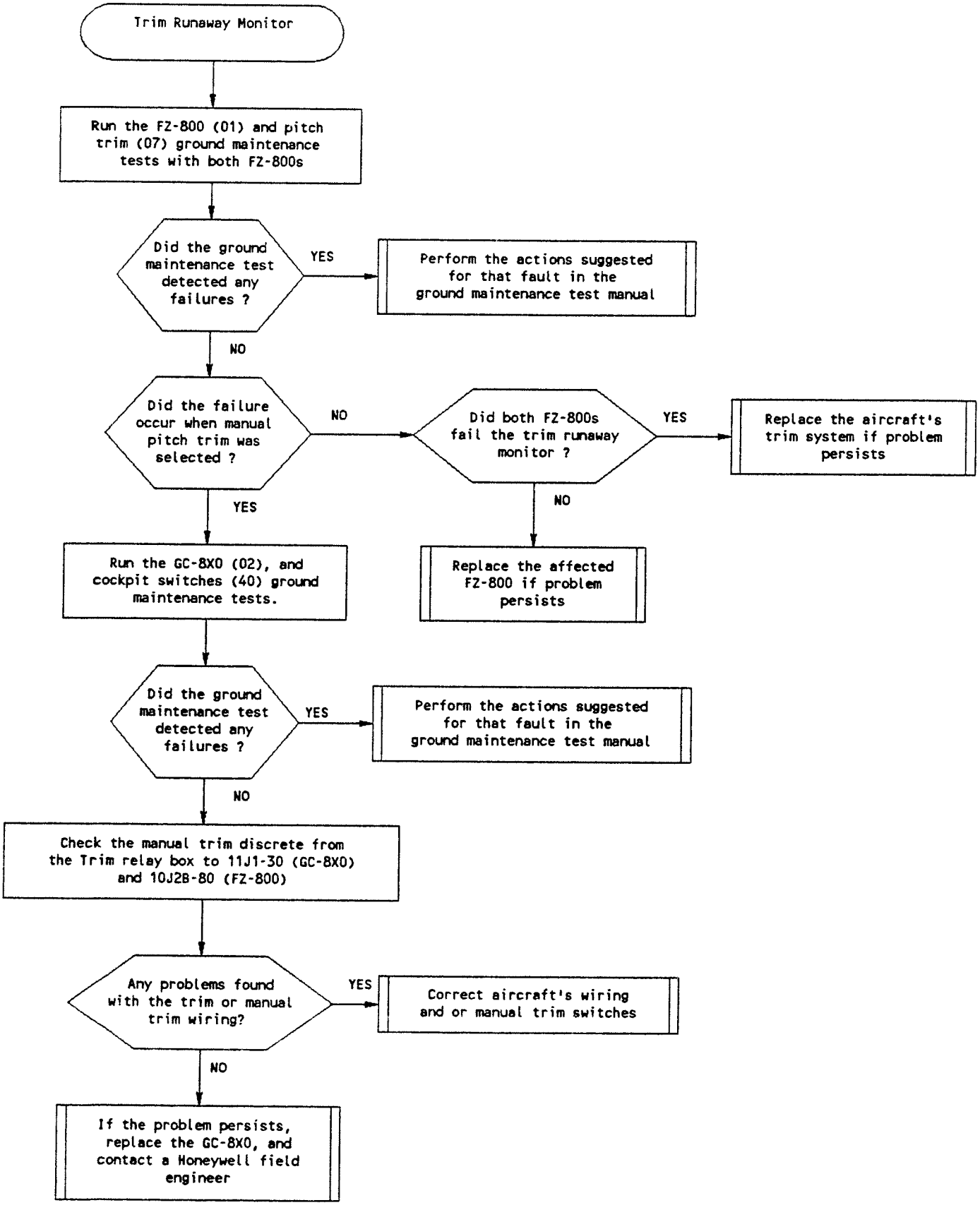
# Recommended Action #A.14
# FZ-800 Hardware Problem



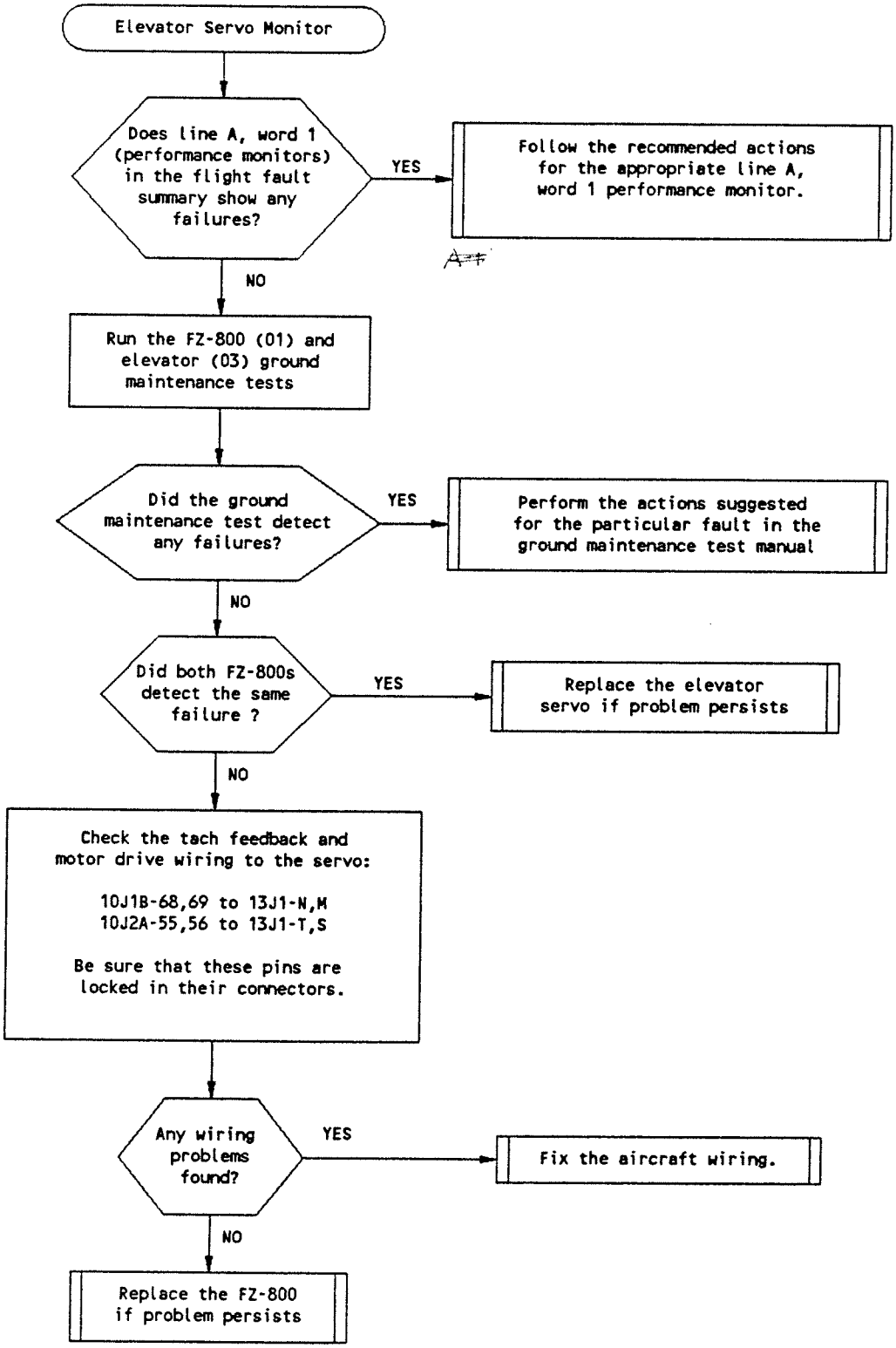
# Recommended Action #A.15
# FZ-800 Processing Problem



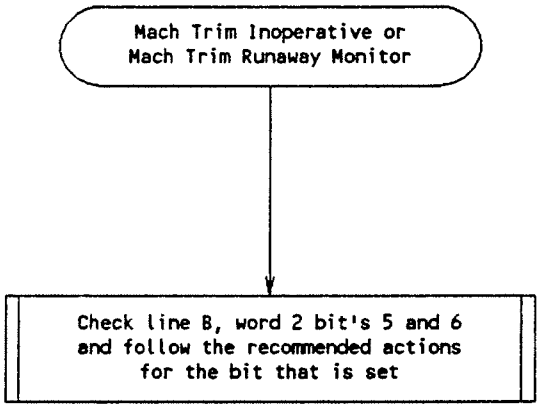
# Recommended Action # B.1
# Trim Runaway Monitor



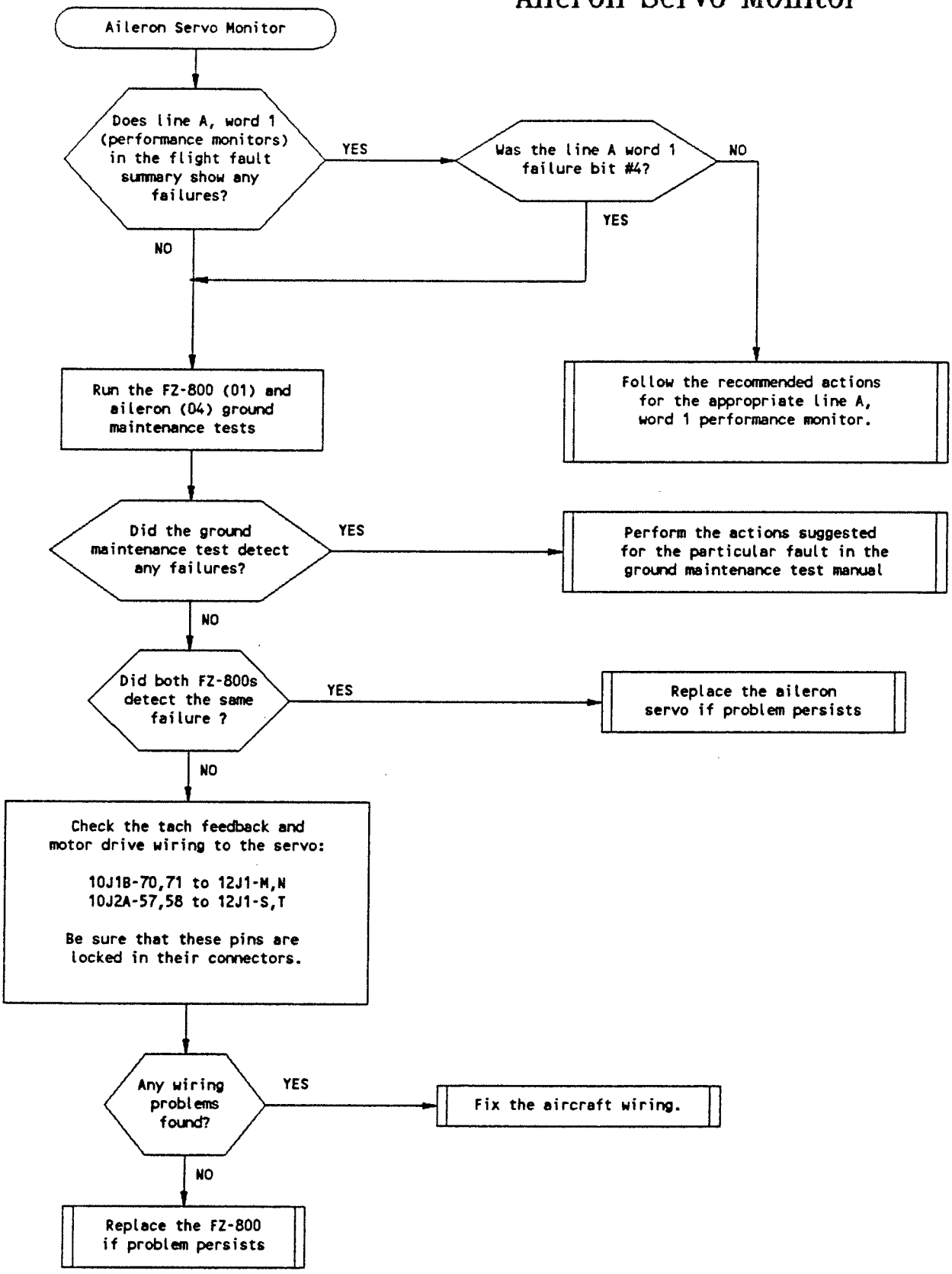
# Recommended action # B.2
# Elevator Servo Monitor



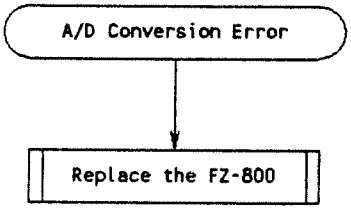
# Recommended Action # B.3
# Mach Trim Inoperative or
# Mach Trim Runaway Monitor



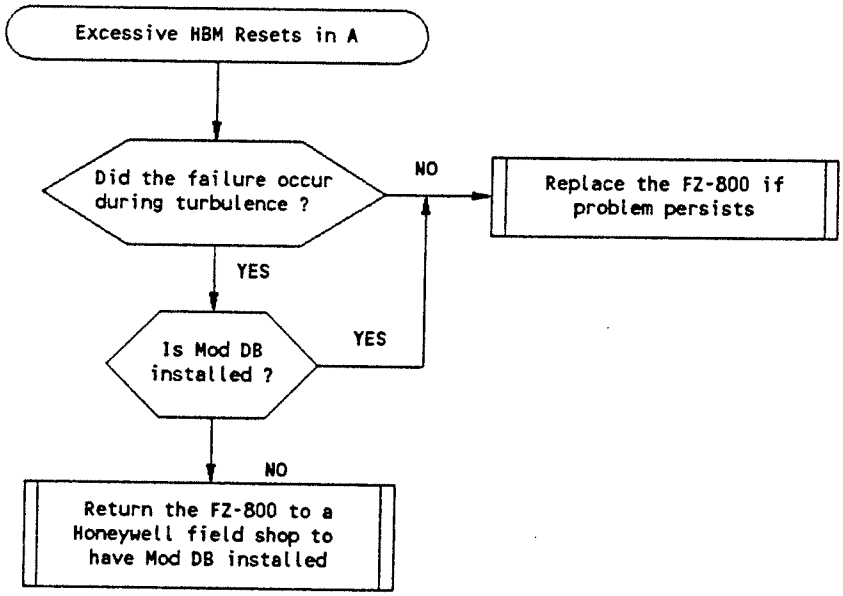
# Recommended action # B.4
# Aileron Servo Monitor



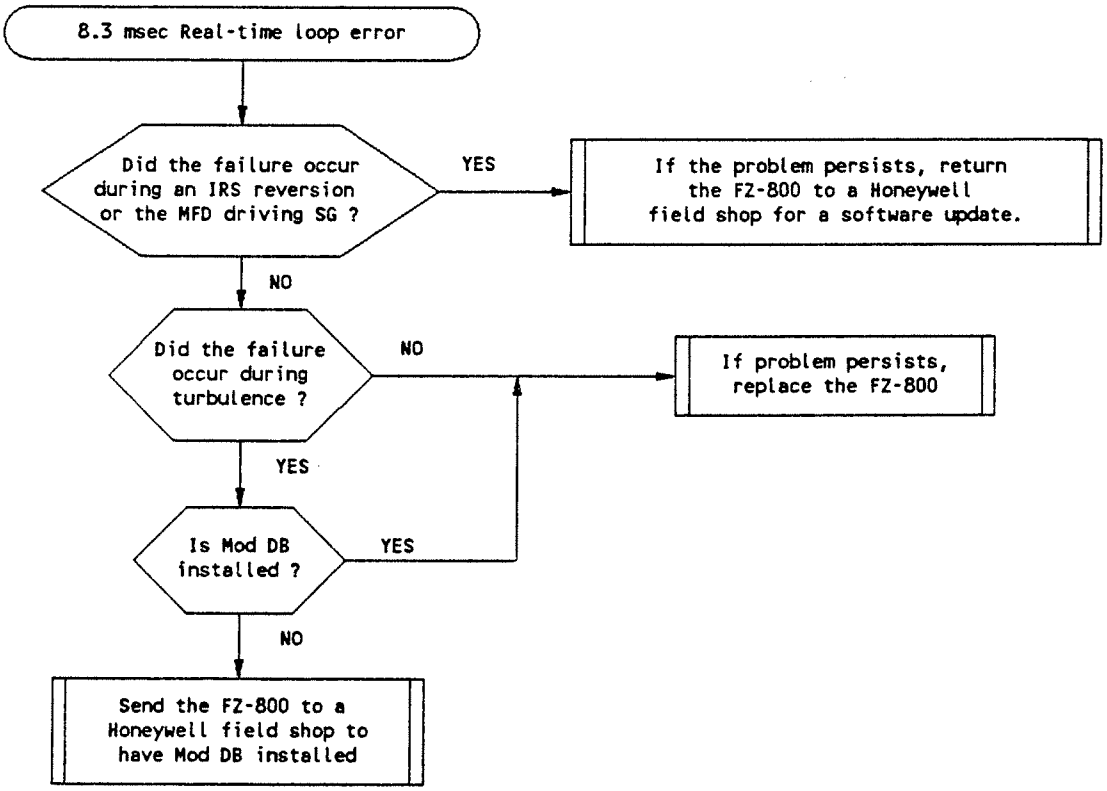
# Recommended Action # B.5
# A/D Conversion error



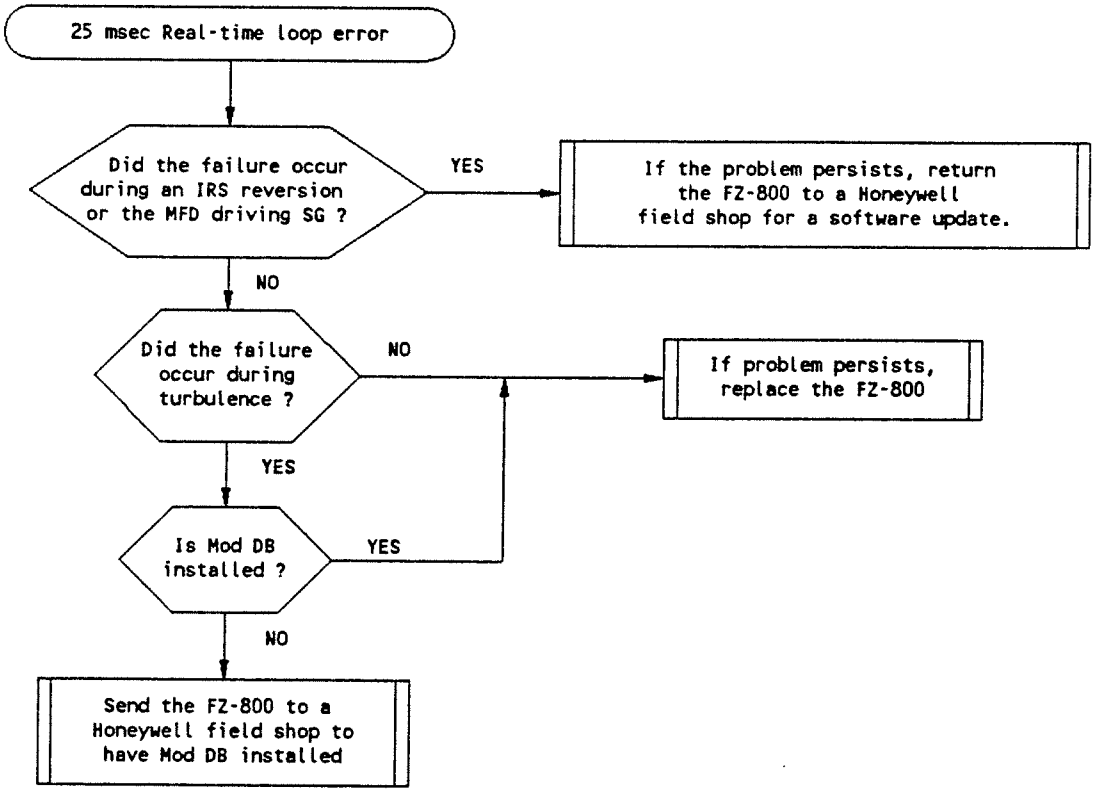
# Recommended Action # B.6
# Excessive Heartbeat monitor reset in the A processor



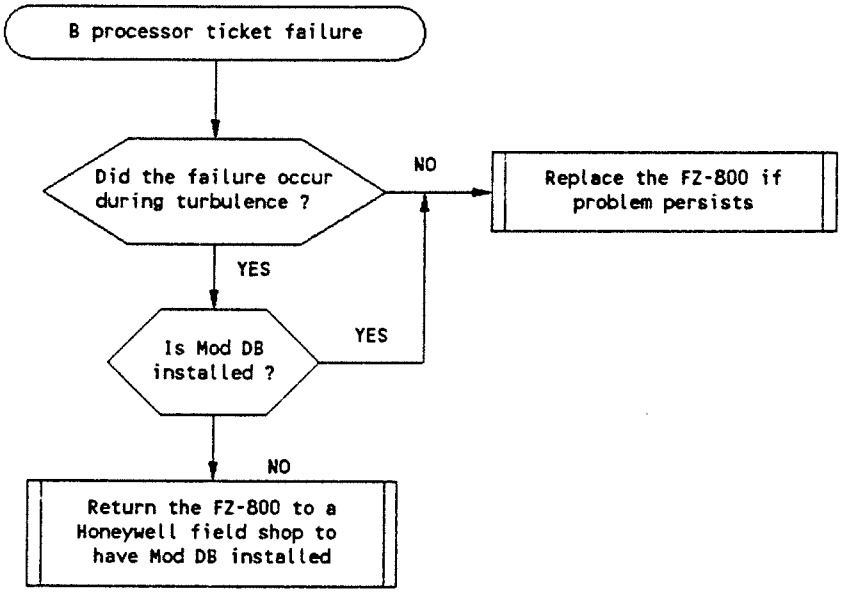
# Recommended Action # B.7
# 8.3 msec Real-time loop error



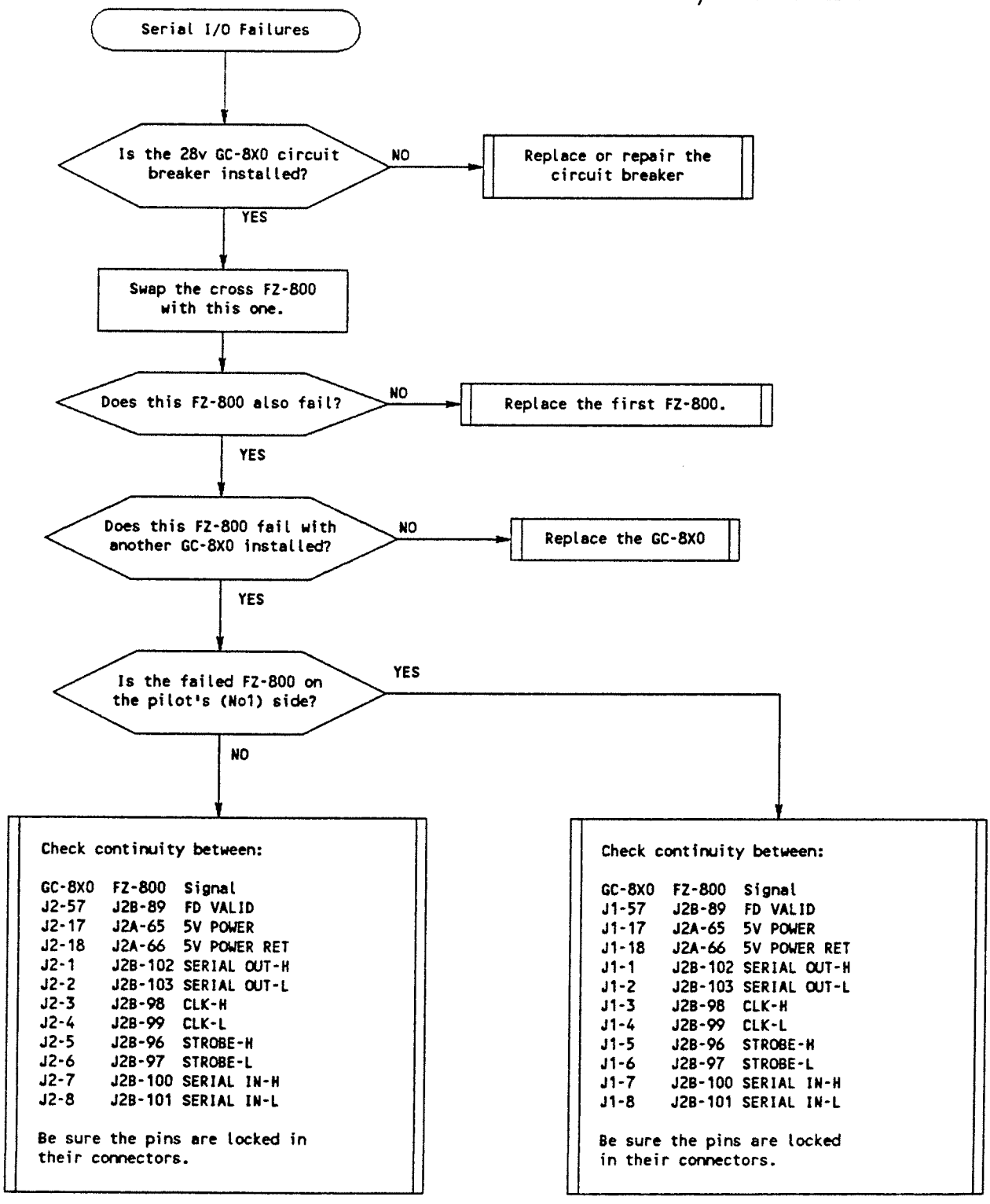
# Recommended Action # B.8
# 25 msec Real-time loop error



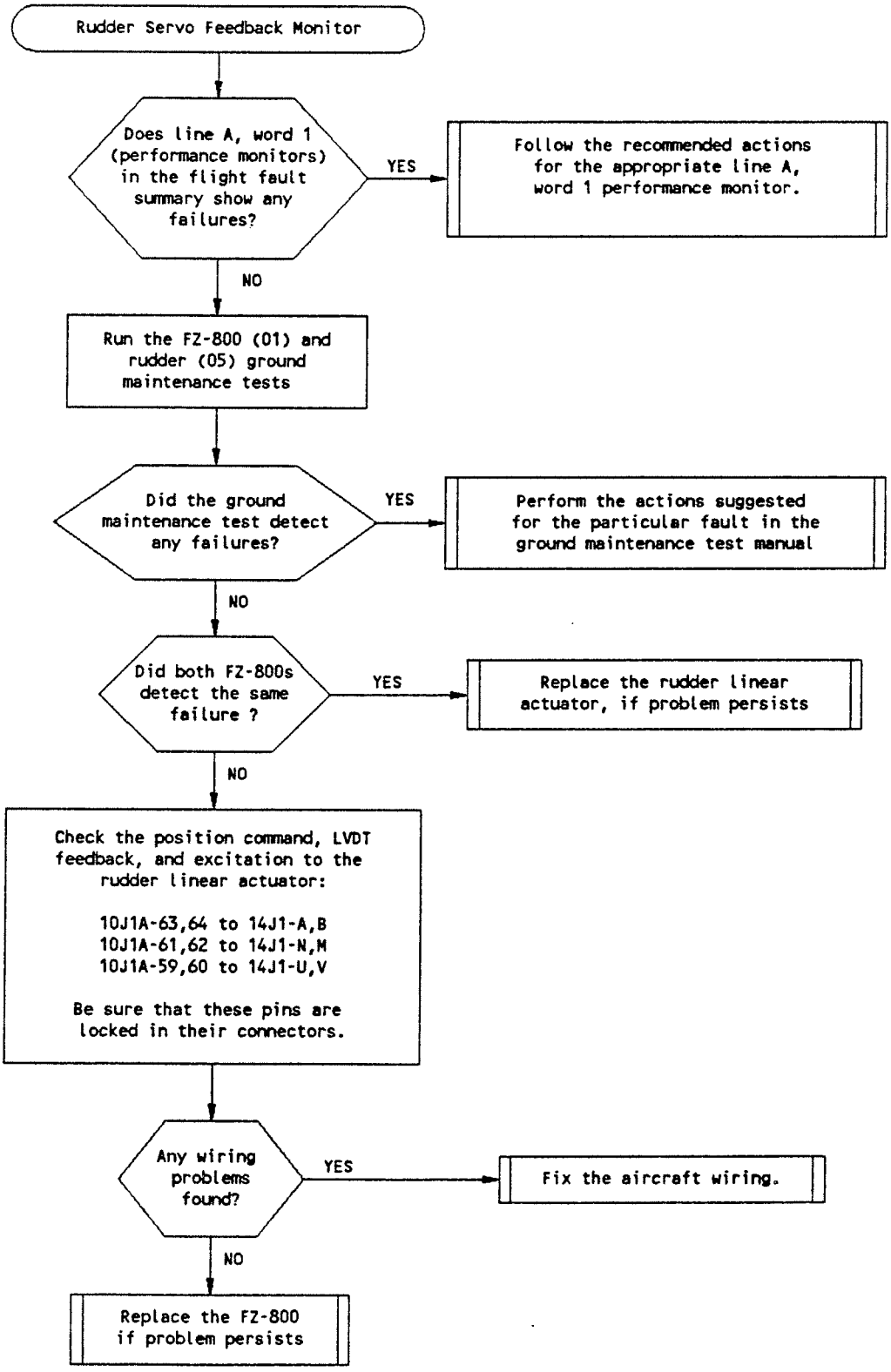
# Recommended Action # B.9
# B processor ticket failure



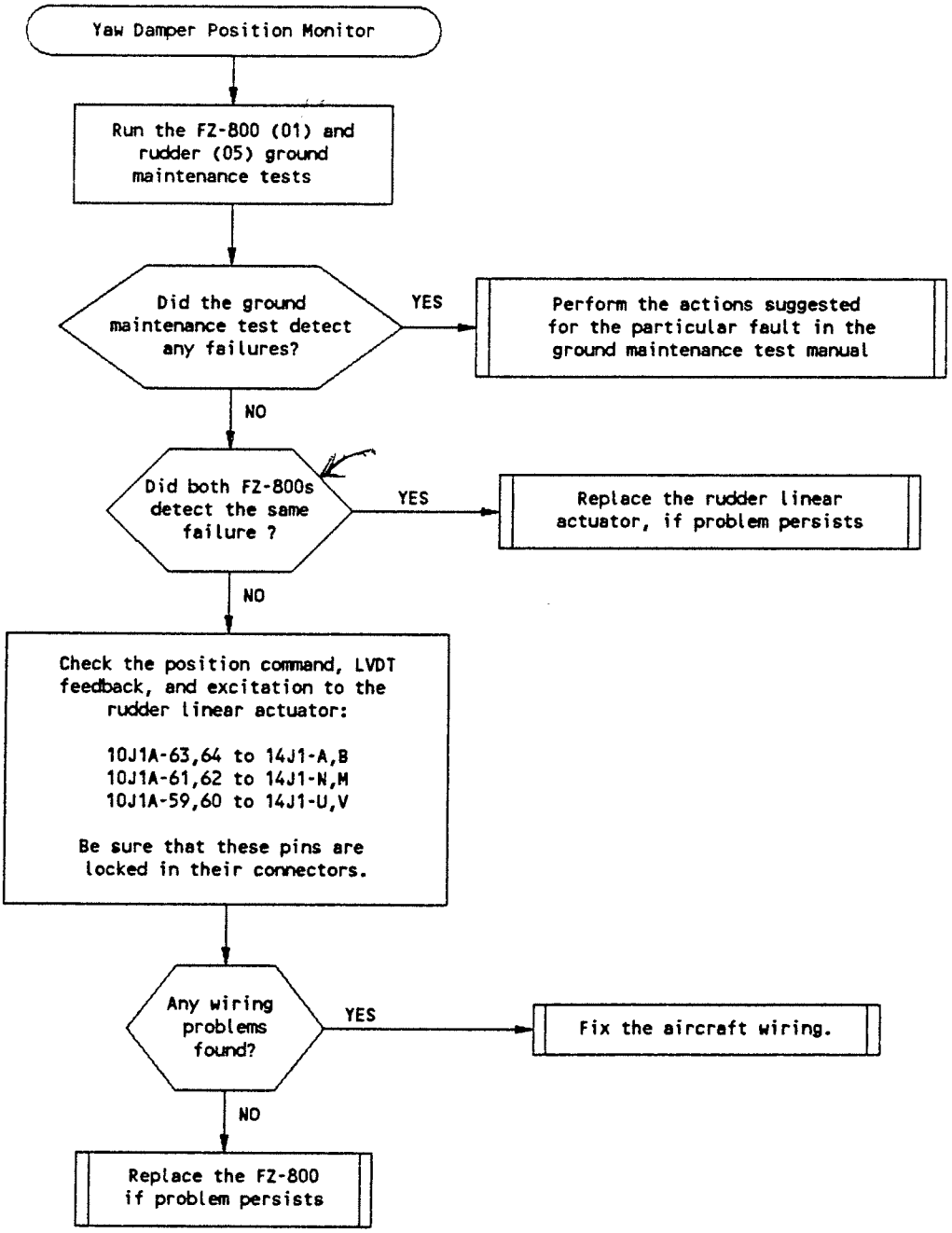
# Recommended Action #B.10
# Serial I/O Failure



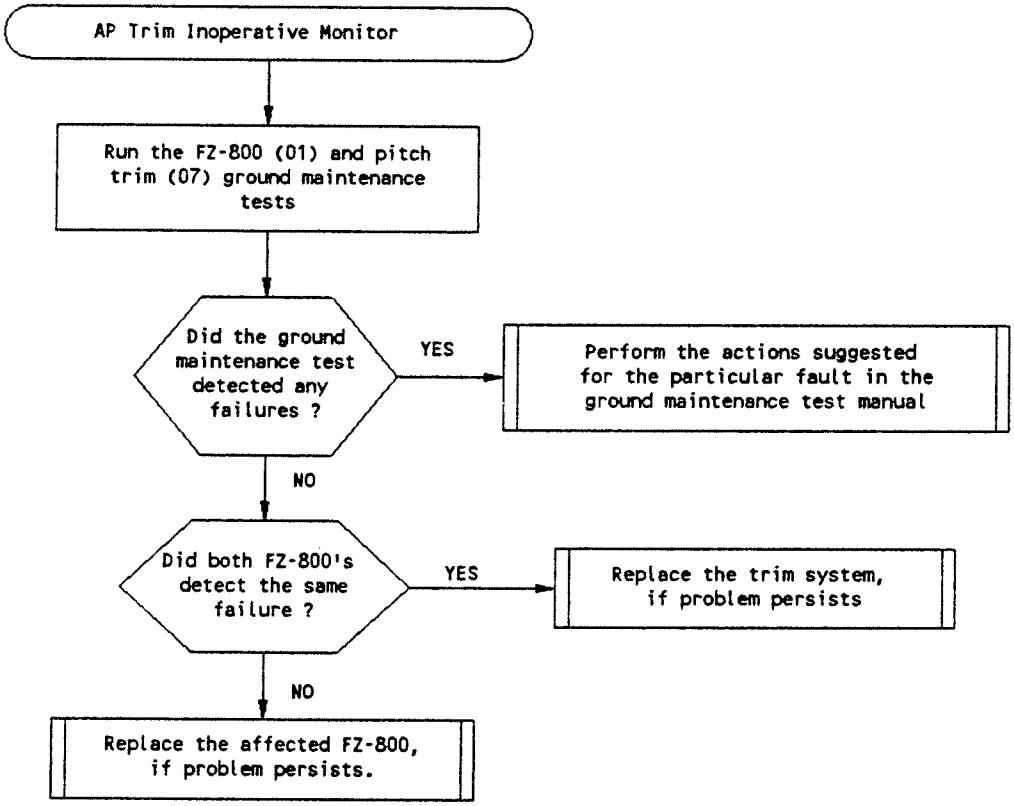
# Recommended action # B.11
# Rudder Servo Feedback Monitor



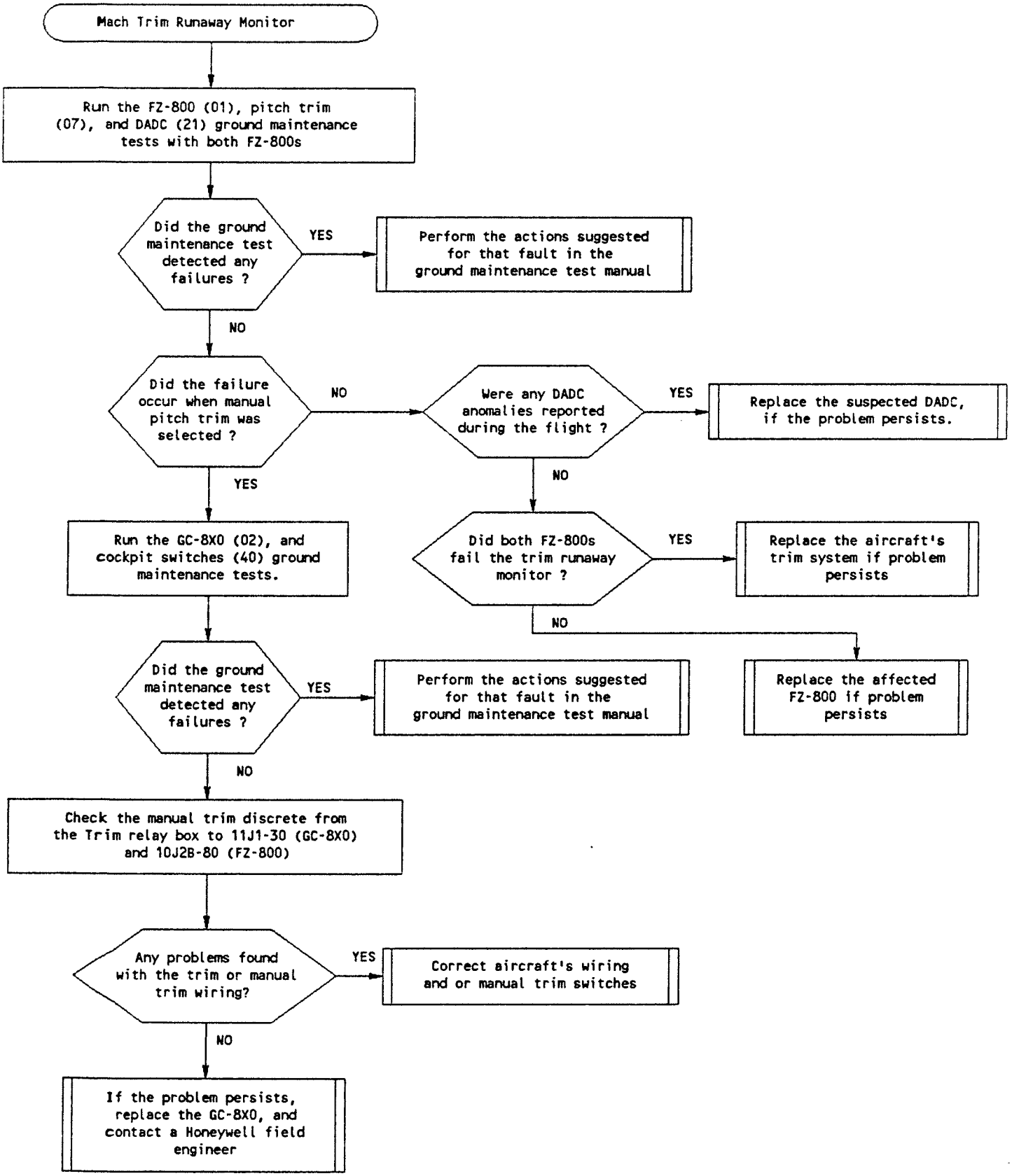
# Recommended action # B.12
# Yaw Damper Position Monitor



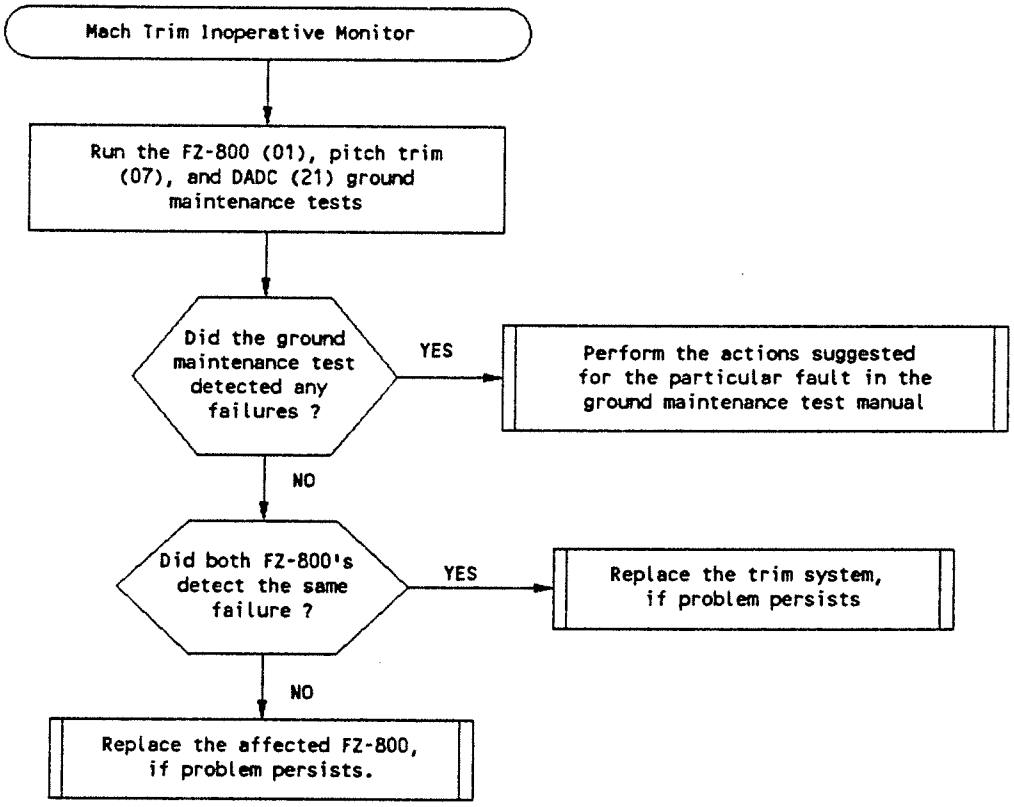
# Recommended Action # B.13
# AP Trim Inoperative Monitor



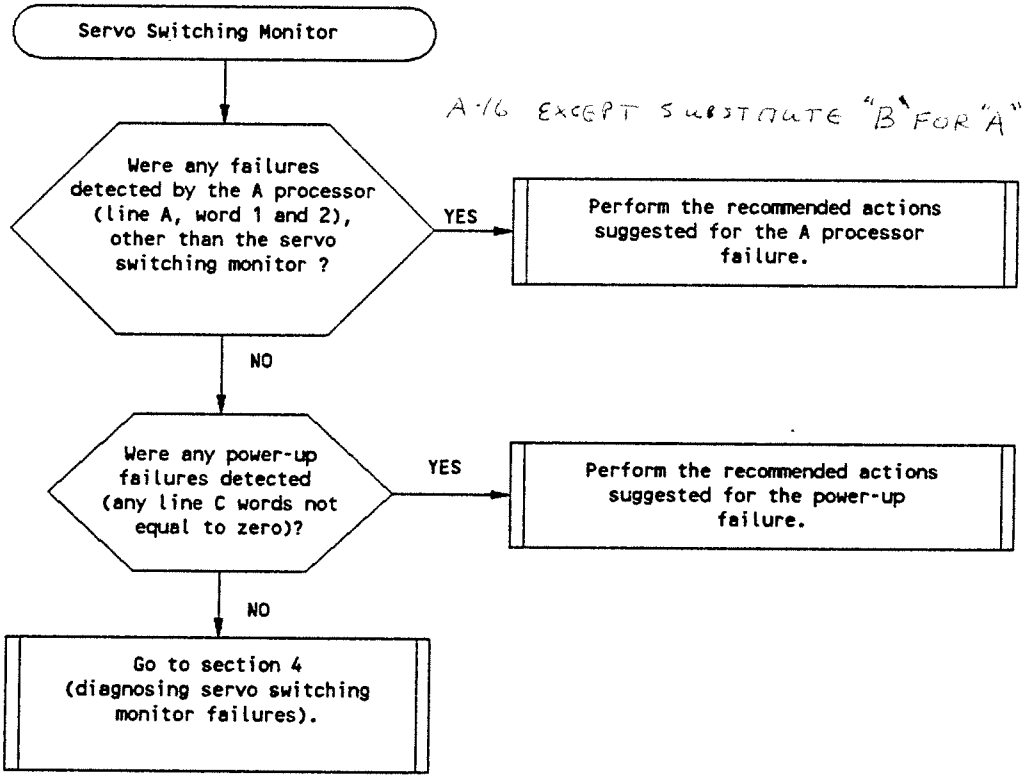
# Recommended Action # B.14
# Mach Trim Runaway Monitor



# Recommended Action # B.15
# Mach Trim Inoperative Monitor



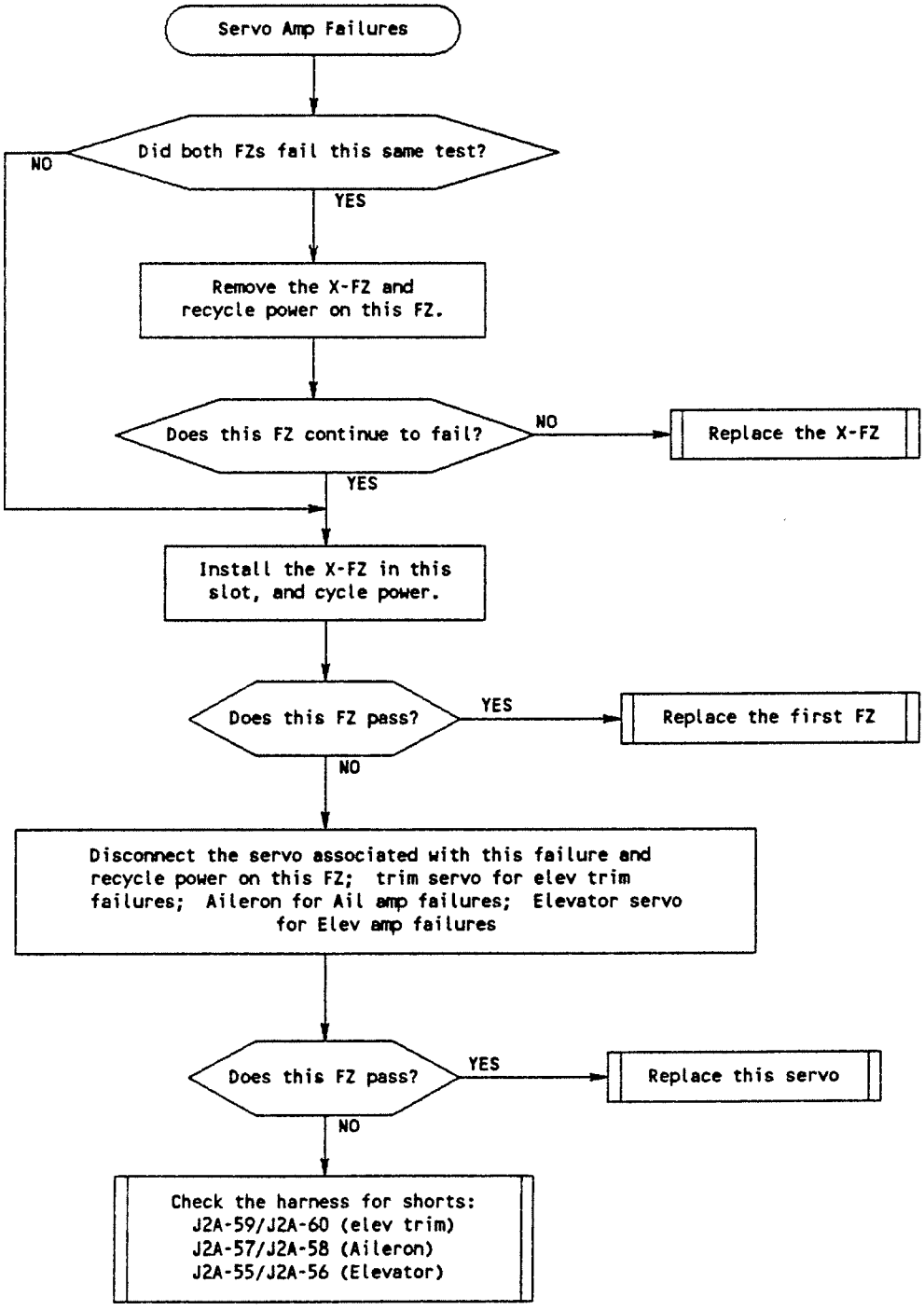
# Recommended Action # B.16
# B Processor Servo Switching Monitor



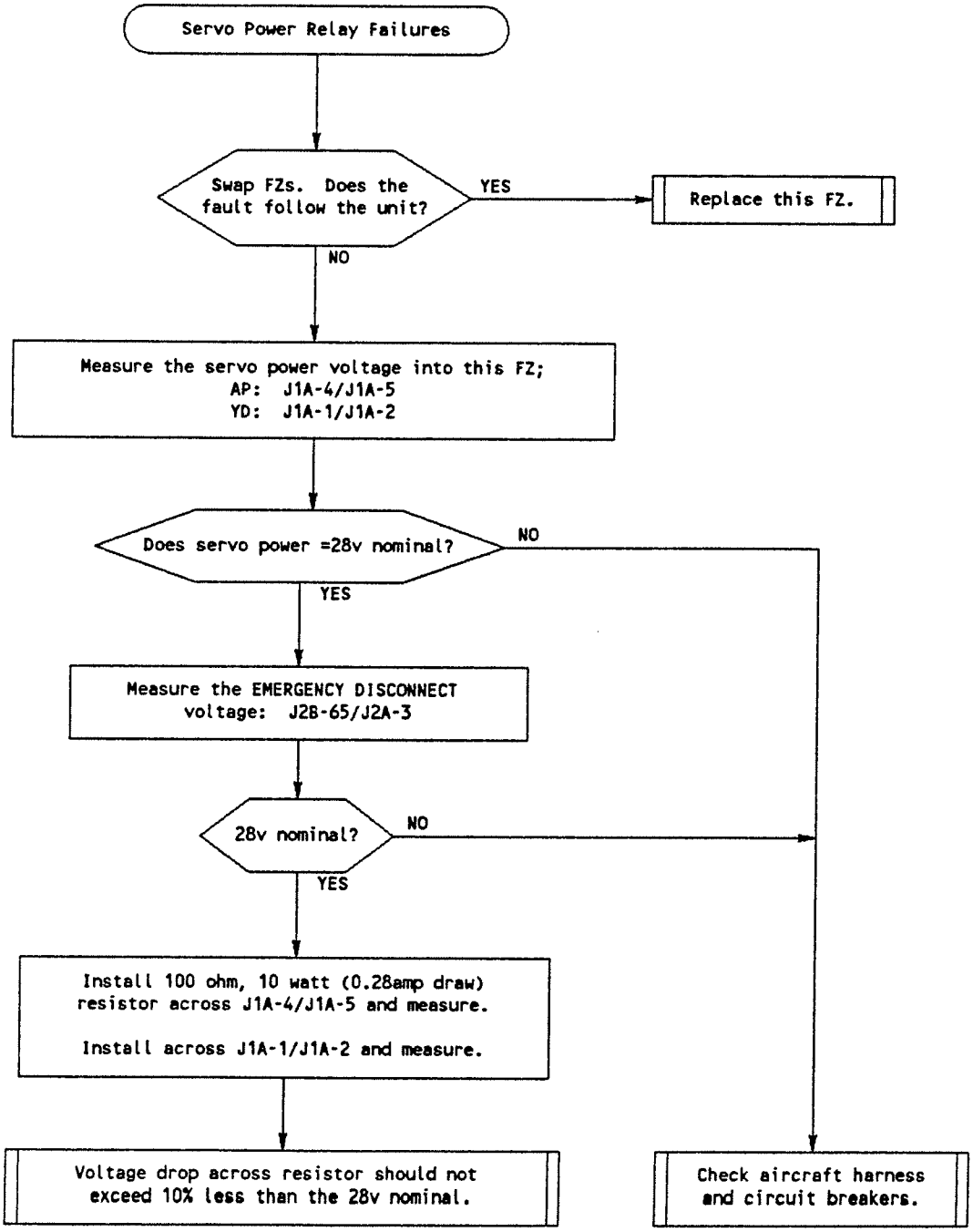

A-16 EXCEPT SUBSTITUTE "B" FOR "A"

CONTACT HONEYWELL REP.

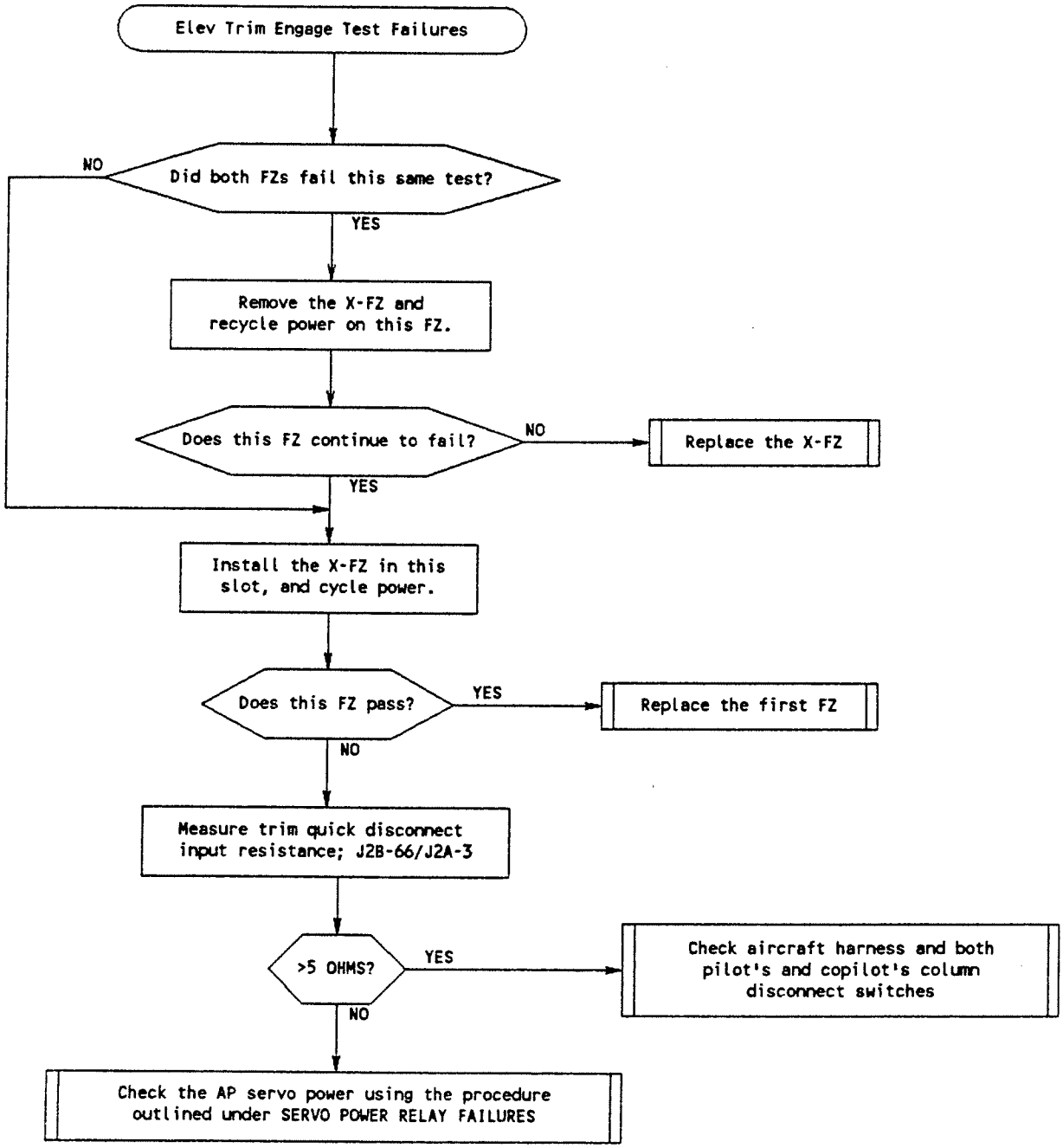
# Recommended Action #C.1
# Servo Amplifier Failures



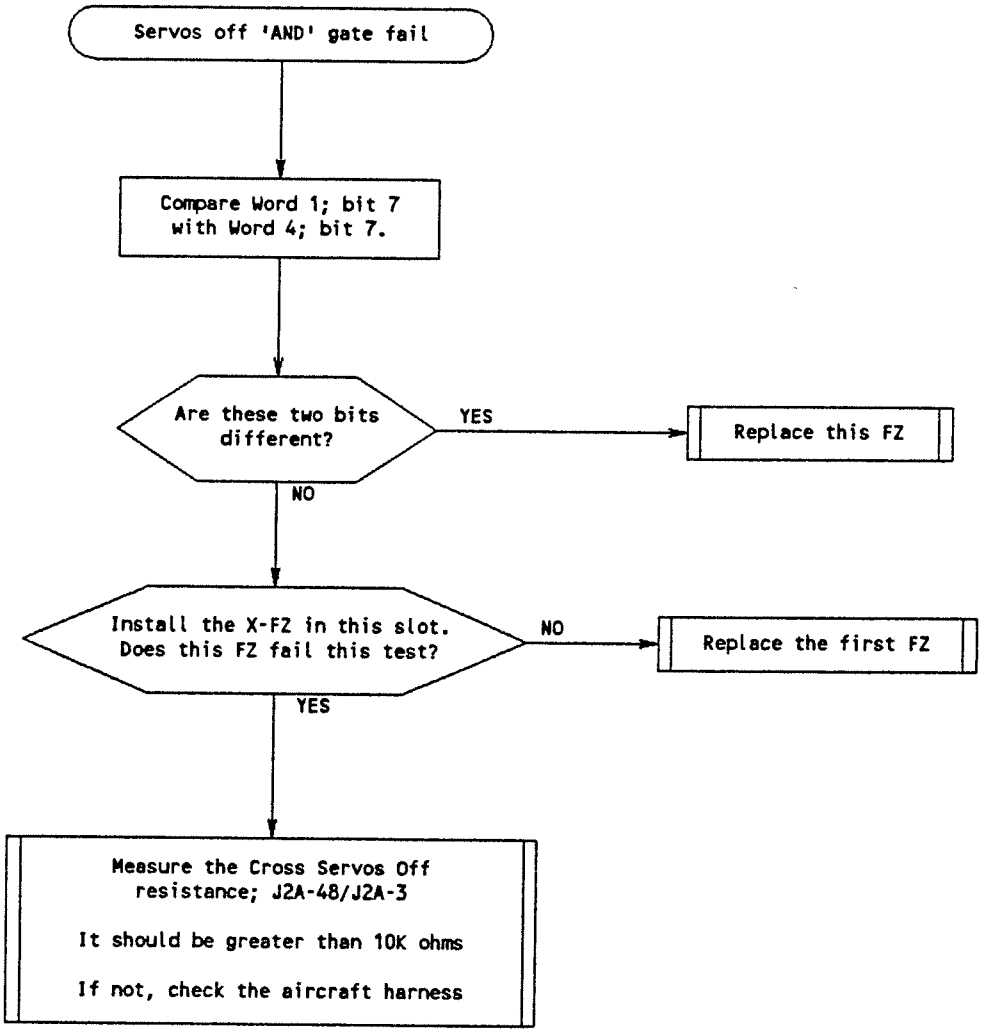
# Recommended Action #C.2
# Servo Power Relay Failures



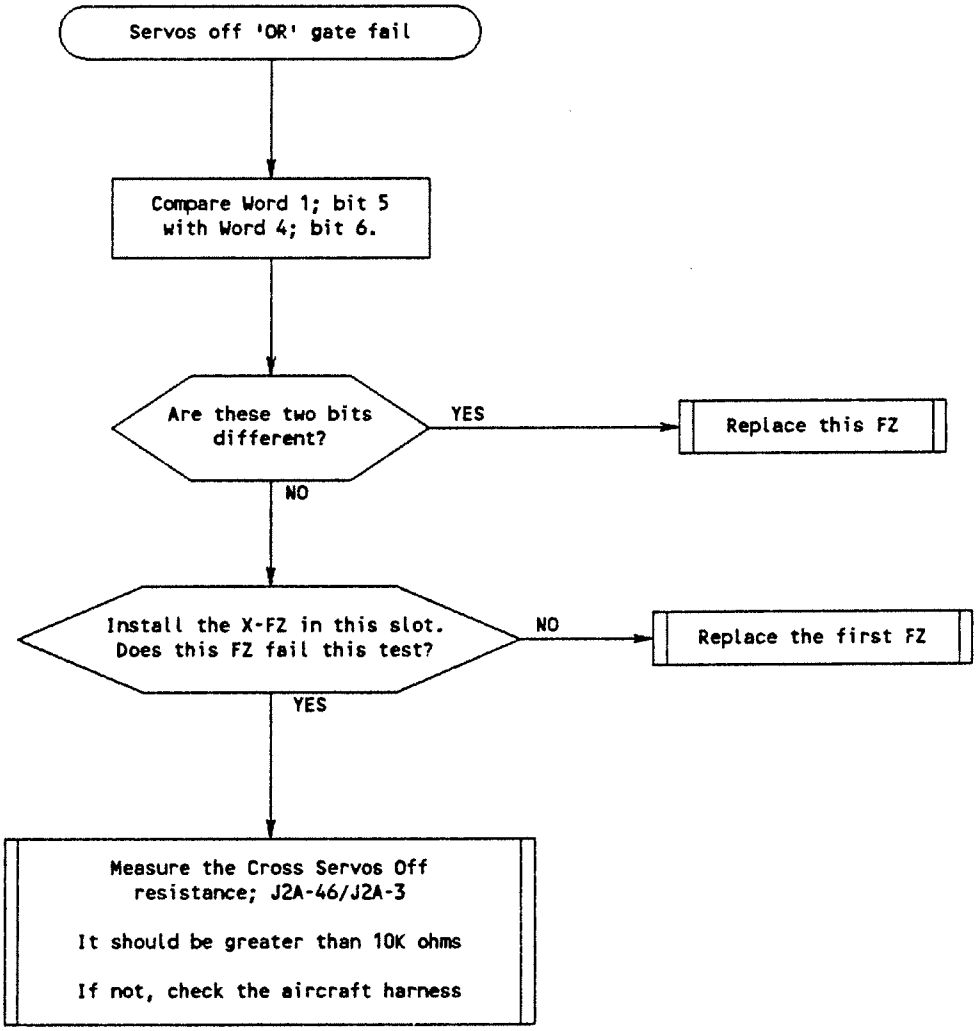
# Recommended Action #C.3
# Elev Trim Engage Test Failures



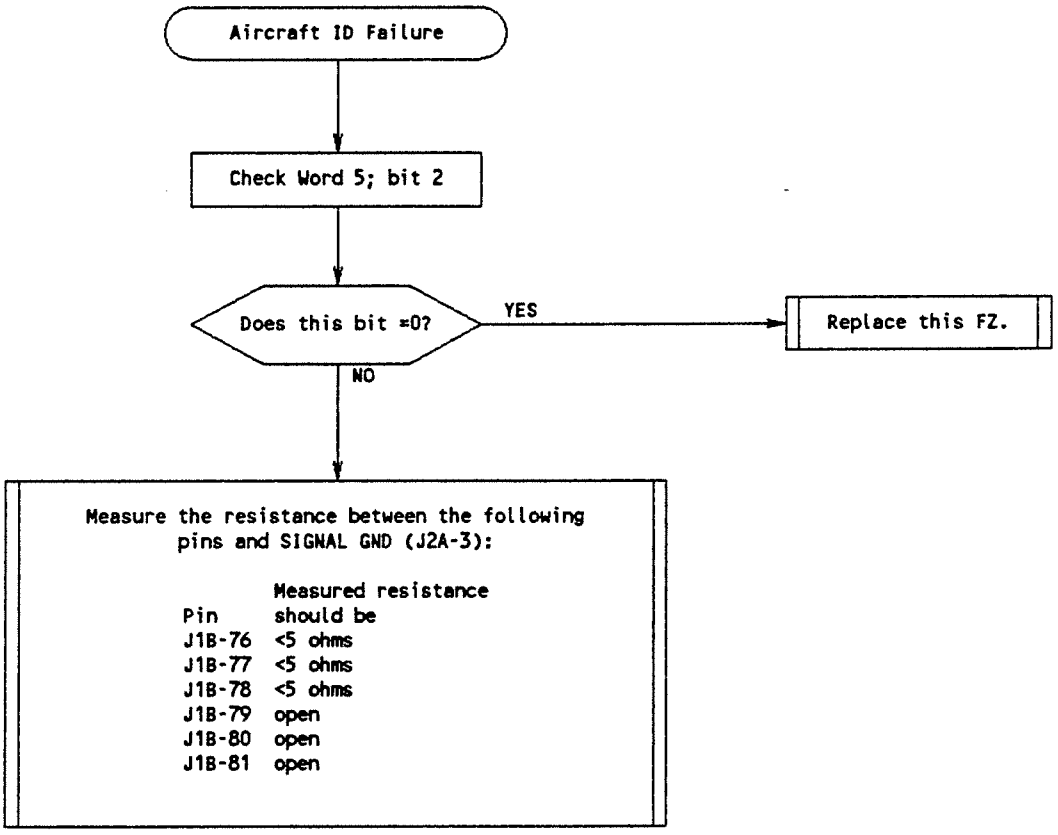
# Recommended Action #C.4
# Servos Off 'AND' Gate Failure



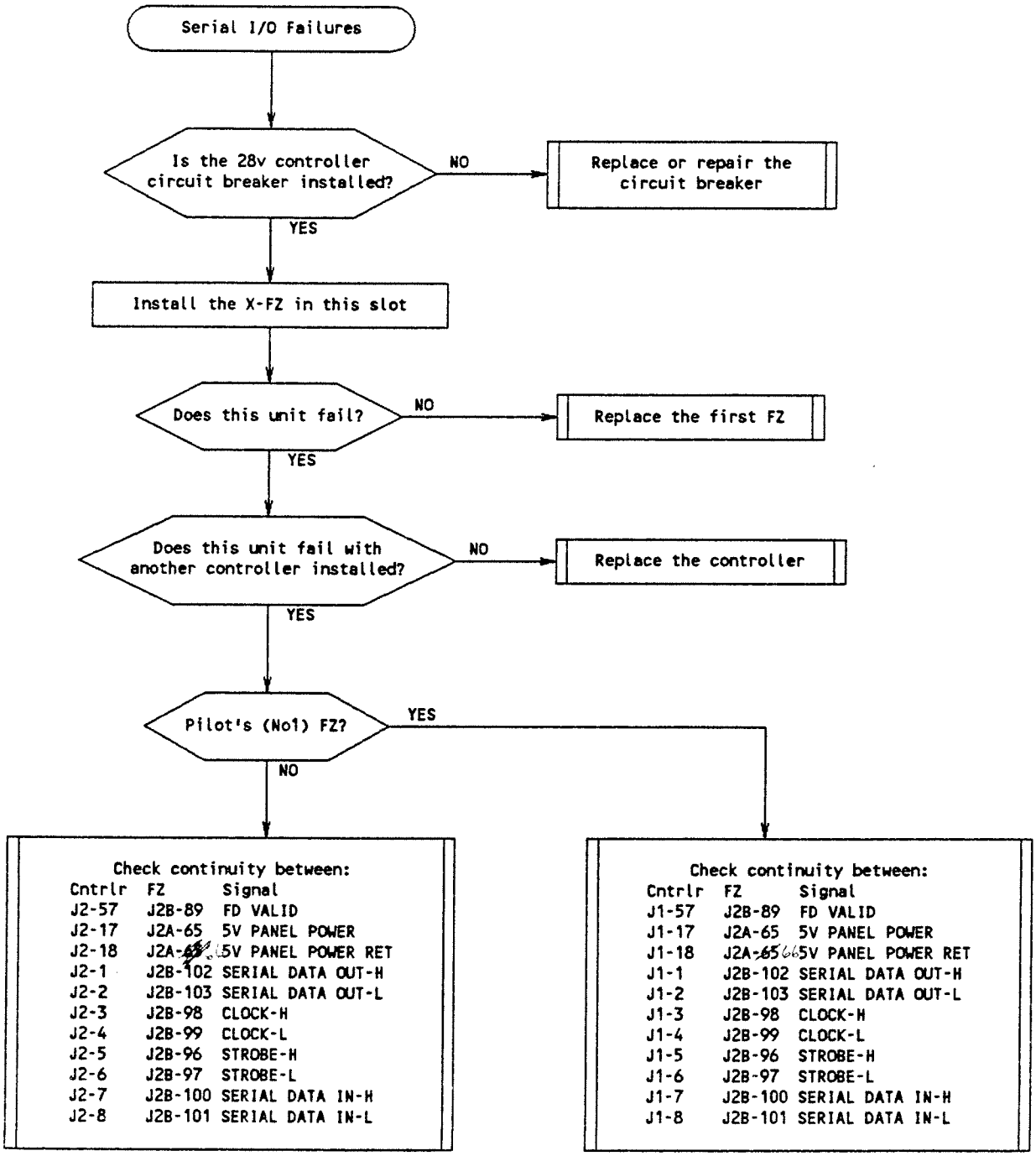
# Recommended Action #C.5
# Servos Off 'OR' Gate Failure



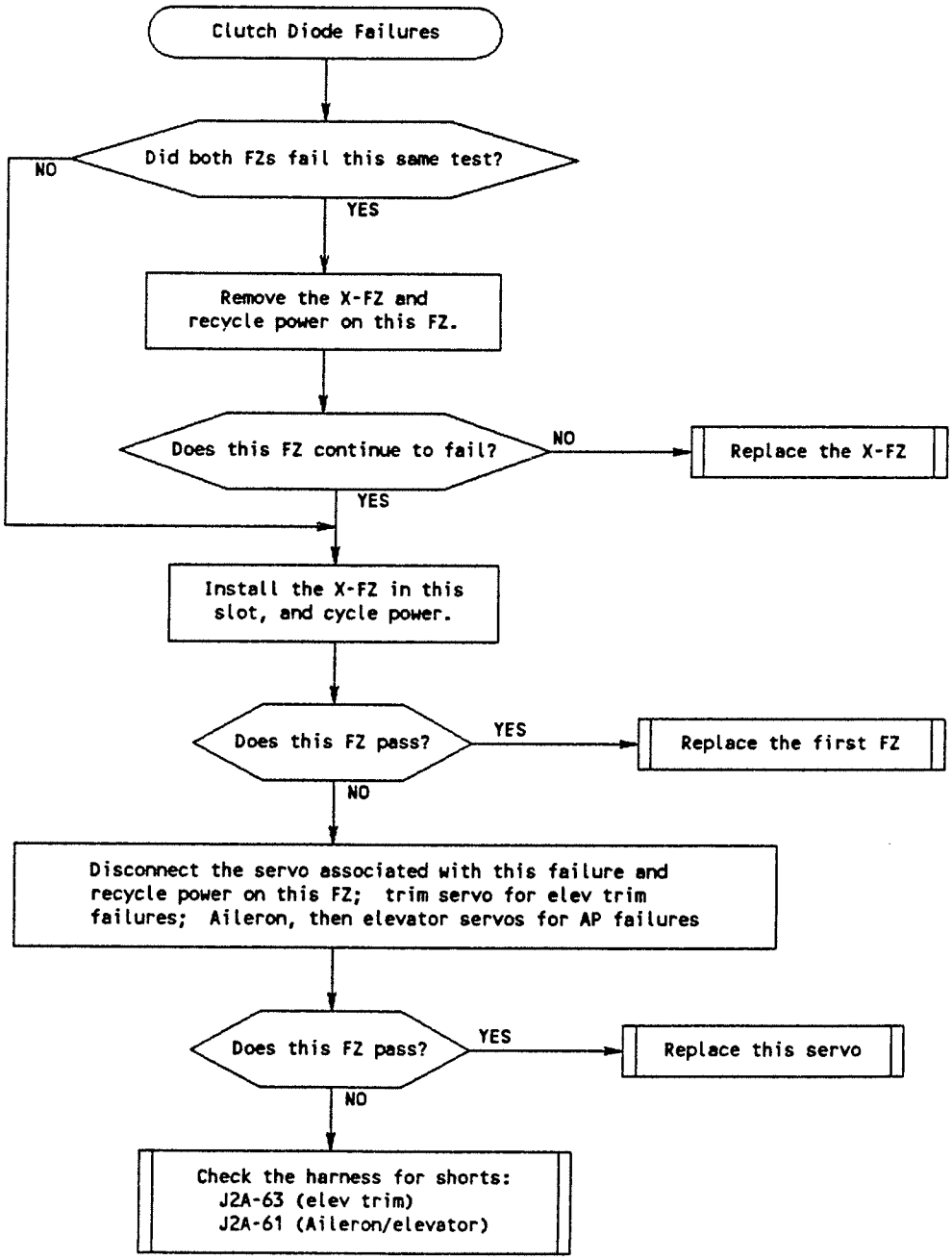
# Recommended Action #C.6
# Aircraft ID Failure



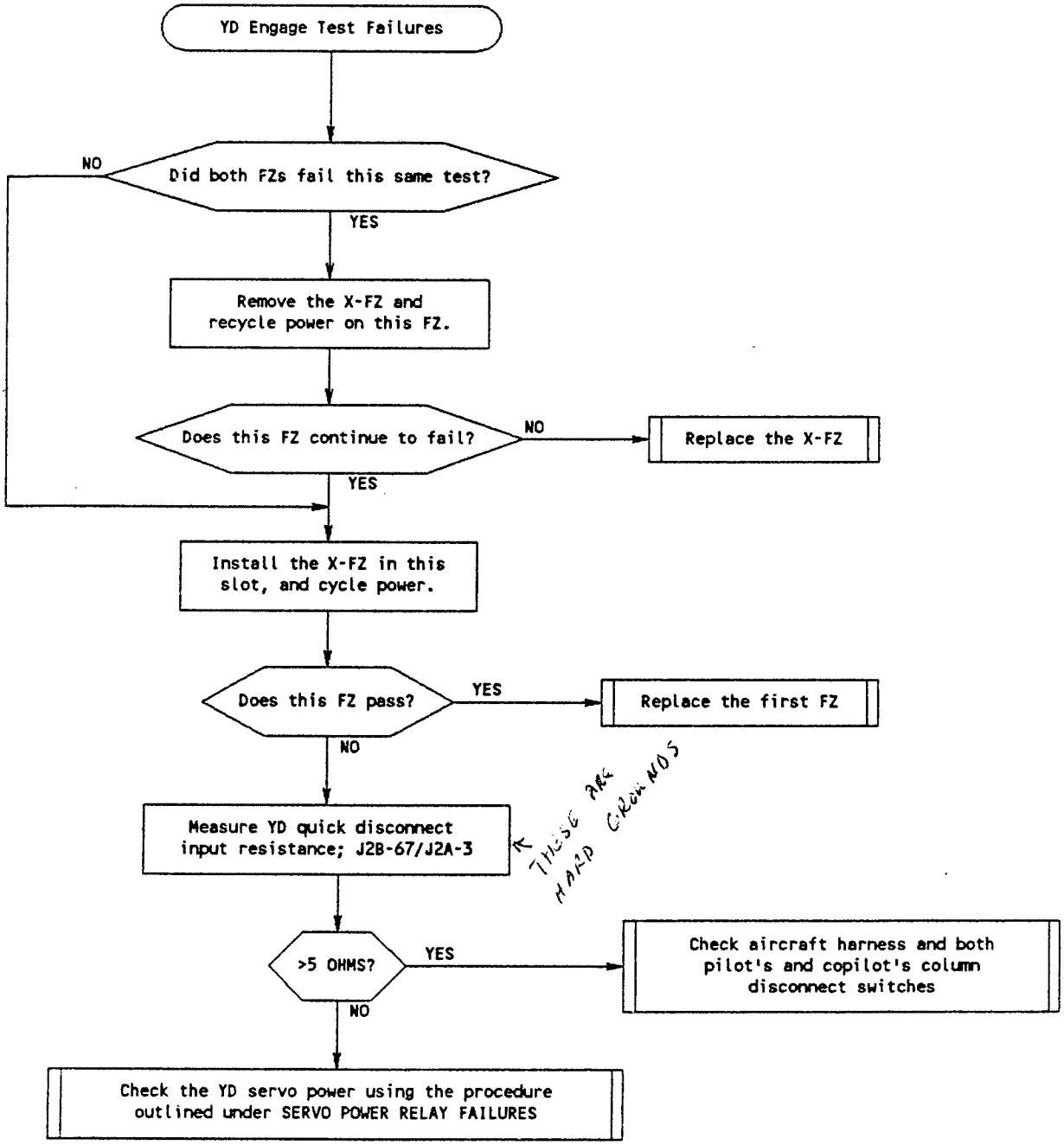
# Recommended Action #C.7
# Serial I/O Failures



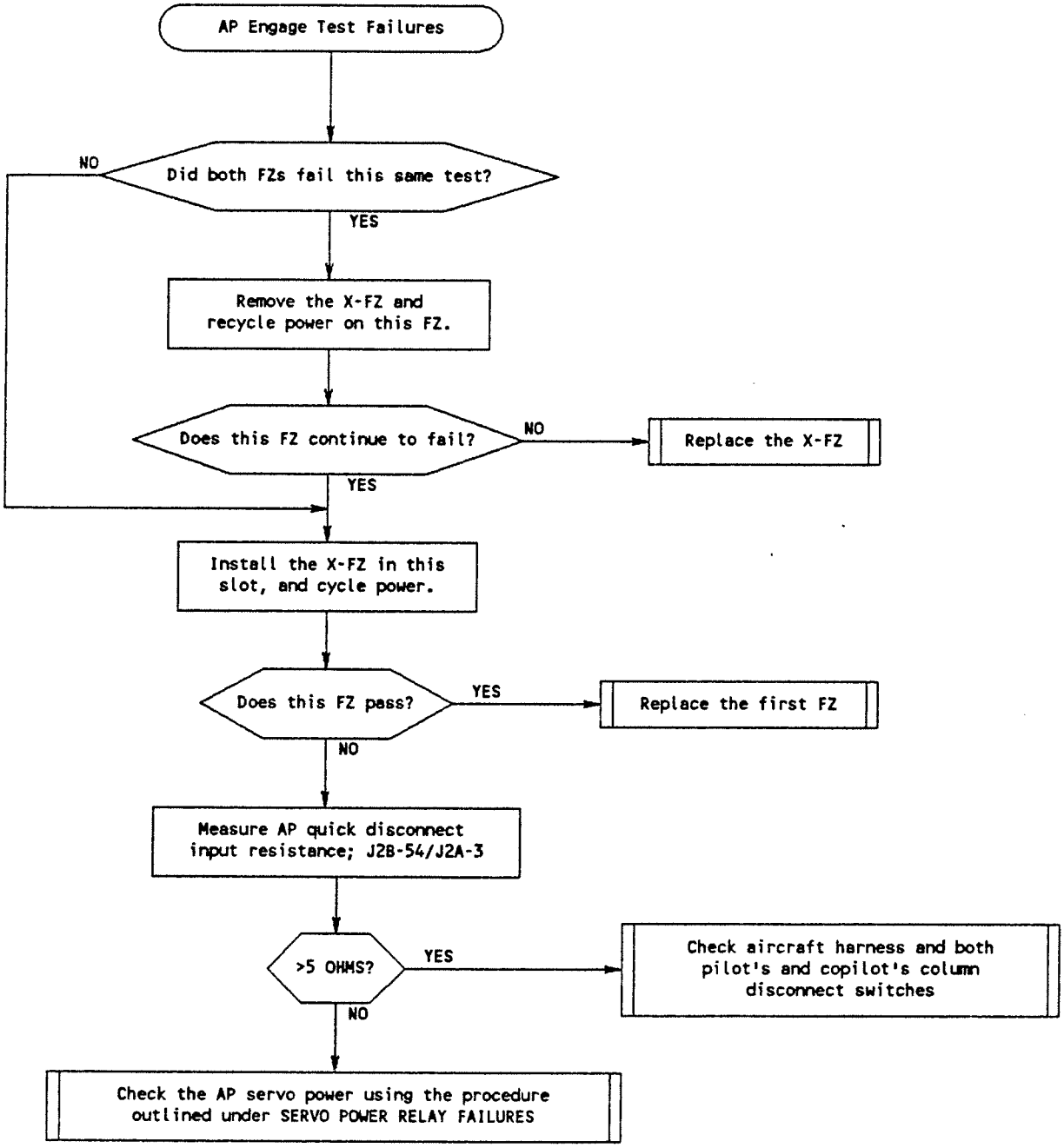
# Recommended Action #C.8
# Clutch Diode Failures



# Recommended Action #C.9
# YD Engage Test Failures



# Recommended Action #C.10
# AP Engage Test Failures



AT THIS POINT, CALL YOUR REP.

## 4.1 SERVO SWITCHING MONITOR

The servo switching monitor is designed to verify the engaged status of the servos. The monitor uses hardware (discrete) and software (status) data to validate the performance of both single and dual Flight Guidance Computer (FGC) configurations. The servo switching monitor can be subdivided into the following five major groups.

1. Hardware monitor
2. Pushbutton monitor
3. Sensor monitor
4. Performance monitors monitor
5. Engage status monitor

## 4.2 HARDWARE MONITOR

The hardware portion of the servo switching monitor verifies the performance of the servo relays. These relays are illustrated in Figure 1. There are two levels or paths of servo control. The first level is the normal servo engage/disengage path. The second is the abnormal disconnect path. All disengagements using the abnormal disconnect path will result in a failed autopilot.

The relays used in the normal engage/disengage path are called the servo engage relays. These provide the following discrete information:

| Ref Des | Mnemonic | Name | Active Signal Description (=1) |
|---|---|---|---|
| 1 | YDRELAY | YD BRAKE RELAY | This FGC YD brake relay is engaged |
| 2 | YDBRAKE | YD BRAKE | YD brake is active |
| 3 | APCLTCH | AP CLUTCH | Elevator and Aileron clutch is active |
| 4 | APRELAY | AP CLUTCH RELAY | This FGC AP clutch relay is engaged |
| 5 | ELTCLTCH | ELEV TRIM CLUTCH | Elevator trim clutch is active |
| 6 | ELTRELAY | ELEV TRIM RELAY | This FGC elevator trim relay is engaged |
| 7 | SERVOFF | SERVOS OFF | All servo engage relays in this FGC are off, thus this FGC is not controlling any servos |

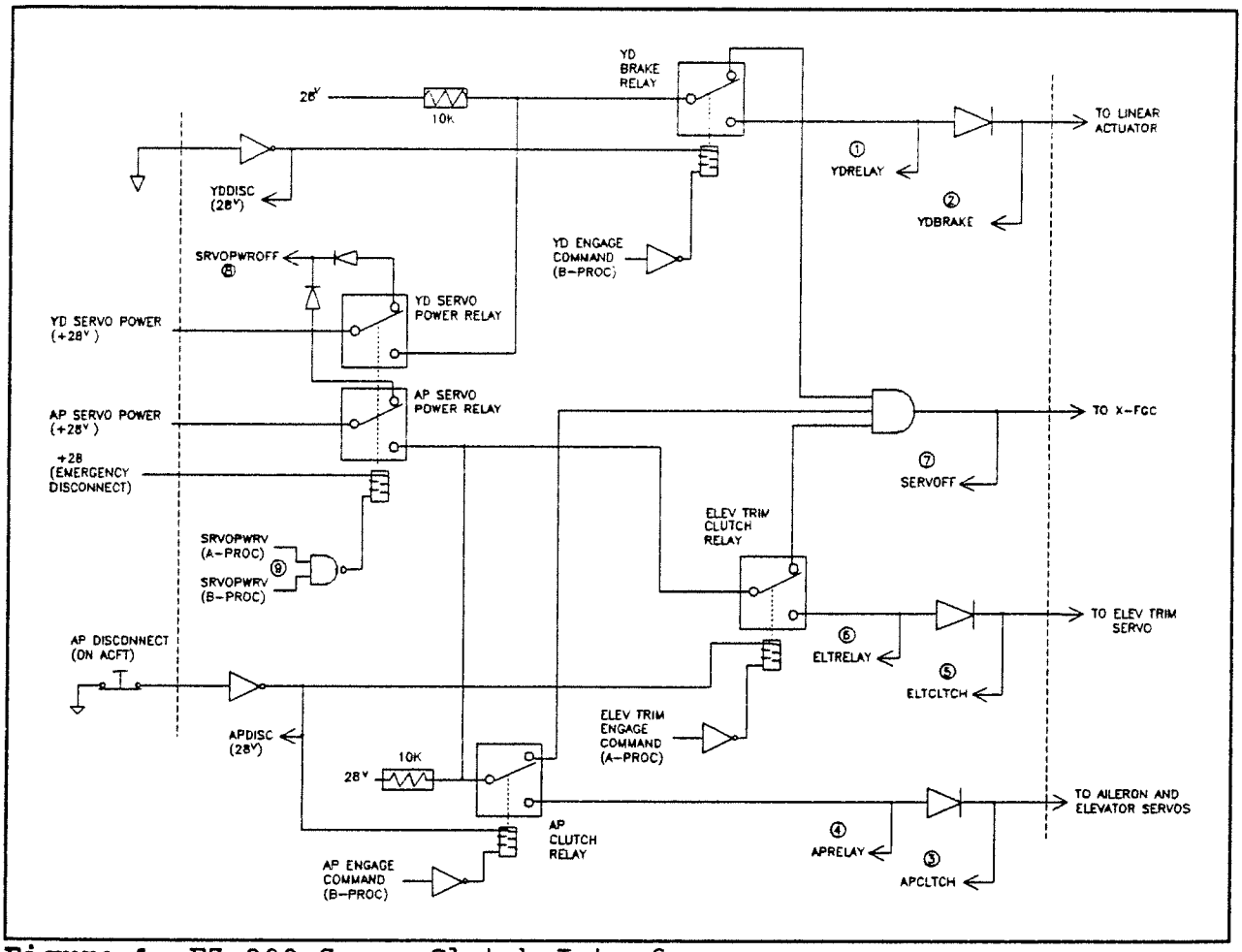



**Figure 1** FZ-800 Servo Clutch Interface

Each servo engage relay is controlled by only one processor; however, relay performance is monitored by both. The A-processor controls engagement/disengagement of the elevator trim relay, while the B-processor controls both the AP clutch and the YD brake relays.

Only one relay is used in the abnormal disconnect path. This relay, called the servo power relay, switches power to all the servo engage relays. When this relay opens, all servo engage relays are deprived of power and are consequently deactivated. The servo power relay is the primary disconnect path used whenever any failures are detected.

A simultaneous command is required from each processor[1] to engage the servo power relay. This inherently provides each processor with two important functions:

1. A secondary disengage path and
2. A means to independently disengage all servos.

For example, suppose the B-processor commands the aileron and elevator servos to disengage via the normal engage/disengage relays. Next, suppose one of these fails and remains stuck closed. Using the secondary path and commanding the servo power relay to open (SRVOPWRV) the B-processor can remove power from the clutch relays and thus power from the servos.

Monitoring of the servo engaged status by the cross-processor allows the cross-processor to disengage the system if a failure is detected. For example, suppose a YD servo disengagement is requested, but due to a failure, the B-processor does not see this request and continues to control the rudder. The A-processor, by commanding the servo power relay to open (SRVOPWRV), can disengage the system.

Only one discrete feedback is available to monitor the state of the servo power relay. This signal is described as follows:

| Ref Des | Mnemonic | Name | Active Signal Description (=1) |
|---|---|---|---|
| 8 | SRVPWROFF | Servo Power Off FB | The servo power relay is open, thus removing power from all clutches, and power to the servos is switched off. |

The above hardware signals provide a concise description of the engaged status of the system. A few examples of a steady state system are shown below:

| | |
|---|---|
| YDRELAY. . . 1 | This first table shows the expected state of the relays when only the YD is engaged in this FGC. |
| YDBRAKE. . . 1 | |
| APCLTCH. . . 0 | |
| APRELAY. . . 0 | Only the YD relay is on, while the AP and Elev trim relays are off. |
| ELTCLTCH . . 0 | |
| ELTRELAY . . 0 | |
| SERVOFF. . . 0 | Since this FGC is engaged, the Servos Off signal is low, as is the Servo Power Off feedback. |
| SRVPWROFF. . 0 | |

Table 4-1

[1] The servo power relay enable command from each processor is labelled SRVOPWRV; reference designation 9 in Figure 1.

| | |
|---|---|
| YDRELAY. . . 1 | This second table shows the state of the relays |
| YDBRAKE. . . 1 | when both the AP and YD are engaged by this FGC. |
| APCLTCH. . . 1 | |
| APRELAY. . . 1 | All relays and their corresponding brake/clutch |
| ELTCLTCH . . 1 | feedbacks are set. |
| ELTRELAY . . 1 | |
| SERVOFF. . . 0 | Since this FGC is controlling the servos, both the |
| SRVPWROFF. . 0 | Servos Off and Servo Power Off signals are low. |

Table 4-2

| | |
|---|---|
| | In this table, the YD and Mach Trim are engaged, |
| YDRELAY. . . 0 | but in the cross-FGC. This is why the YD and Trim |
| YDBRAKE. . . 1 | relays are off, but the servo feedbacks (Trim |
| APCLTCH. . . 0 | clutch, YD brake) are high. |
| APRELAY. . . 0 | |
| ELTCLTCH . . 1 | Note also that since this FGC is not engaged, the |
| ELTRELAY . . 0 | Servos Off signal is high, indicating that all |
| SERVOFF. . . 1 | servos are off on this side. |
| SRVPWROFF. . 0 | |

Table 4-3

Because the Servo Power Off feedback is not high, this FGC has not failed.

| | |
|---|---|
| YDRELAY. . . 0 | |
| YDBRAKE. . . 0 | This table represents a system where nothing is |
| APCLTCH. . . 0 | engaged. |
| APRELAY. . . 0 | |
| ELTCLTCH . . 0 | Again, since the Servo Power Off feedback is low, |
| ELTRELAY . . 0 | this FGC is still valid. |
| SERVOFF. . . 1 | |
| SRVPWROFF. . 0 | |

Table 4-4

| | |
|---|---|
| YDRELAY. . . 0 | This table shows the effect of a failure on the |
| YDBRAKE. . . 1 | system. Here, the AP and YD are engaged by the |
| APCLTCH. . . 1 | cross-FGC, however, this FGC has failed. |
| APRELAY. . . 0 | |
| ELTCLTCH . . 1 | We know that this FGC has failed because the |
| ELTRELAY . . 0 | Servo Power Off signal is high. |
| SERVOFF. . . 1 | |
| SRVPWROFF. . 1 | |

Table 4-5

The above are representative samples of the hardware portion of the engaged states of a dual channel system. These states are what the

servo switching monitor has been designed to verify. If this monitor does not match a pre-programmed valid state, a failure has been detected. Some failure examples are shown below:

| | |
|---|---|
| YDRELAY. . . 1<br>YDBRAKE. . . 0<br>APCLTCH. . . 0<br>APRELAY. . . 0<br>ELTCLTCH . . 0<br>ELTRELAY . . 0<br>SERVOFF. . . 0<br>SRVPWROFF. . 0 | The YD in this FGC was commanded to engage, but did not completely do so.<br><br>The YD Relay engaged, but the YD Brake signal did not go high. This could be due to an isolation diode failing open. SRVPWROFF will be set high once the servo switching monitor trips. |

Table 4-6

| | |
|---|---|
| YDRELAY. . . 1<br>YDBRAKE. . . 1<br>APCLTCH. . . 0<br>APRELAY. . . 0<br>ELTCLTCH . . 1<br>ELTRELAY . . 1<br>SERVOFF. . . 1<br>SRVPWROFF. . 0 | Both the YD and MT are engaged. Both relays have closed, and their corresponding Brake/Clutch lines have gone high.<br><br>A failure has occured in the Servos Off signal. It remained high. There could possibly be a failure in this circuit. SRVPWROFF will be set high once the servo switching monitor trips. |

Table 4-7

| | |
|---|---|
| YDRELAY. . . 0<br>YDBRAKE. . . 0<br>APCLTCH. . . 1<br>APRELAY. . . 1<br>ELTCLTCH . . 1<br>ELTRELAY . . 1<br>SERVOFF. . . 0<br>SRVPWROFF. . 0 | These failure conditions show that the AP and Trim are engaged. What is missing is the YD. It should also be engaged.<br><br>The failure could be caused by the YD relay itself, or with the engage command drivers to the relay. SRVPWROFF will be set high once the servo switching monitor trips. |

Table 4-8

## 4.3 PUSHBUTTON MONITOR

The following pushbutton inputs are monitored and recorded by the engage logic:

| Mnemonic | Active Signal Description (=1) |
|---|---|
| TCS | Touch control steering active |
| YDDISC | YD quick disconnect NOT pushed |
| APDISC | AP quick disconnect NOT pushed |
| STALWARN | Stall warning active |
| MTRIMACT | Manual pitch trim active or emergency trim activated |

### 4.3.1 TCS

When the TCS pushbutton is pressed, and the AP is engaged, control of the aileron, elevator and trim are disengaged until the pushbutton is released. The state of the servo clutch engage relays is verified against this condition as shown in the following table:

| | |
|---|---|
| YDRELAY. . . 1 | |
| YDBRAKE. . . 1 | In this example, the AP, YD and Trim are engaged. |
| APCLTCH. . . 1 | This FGC's TCS is not active. |
| APRELAY. . . 1 | |
| ELTCLTCH . . 1 | This is a normal engaged state. |
| ELTRELAY . . 1 | |
| SERVOFF. . . 0 | |
| SRVPWROFF. . 0 | |
| TCS. . . . . 0 | |

Table 4-9

| | |
|---|---|
| YDRELAY. . . 1 | In this example, TCS is active. As soon as the |
| YDBRAKE. . . 1 | FGC sees this pushbutton, it disengages the AP and |
| APCLTCH. . . 0 | Elev trim clutches. This leaves only the YD |
| APRELAY. . . 0 | engaged. |
| ELTCLTCH . . 0 | |
| ELTRELAY . . 0 | Since the Elev trim clutch relay is not engaged |
| SERVOFF. . . 0 | (ELTCLTCH=ELTRELAY=0) Mach trim cannot be |
| SRVPWROFF. . 0 | selected. See the following example. |
| TCS. . . . . 1 | |

Table 4-10

| | |
|---|---|
| YDRELAY. . . 1 | |
| YDBRAKE. . . 1 | This last example again shows that TCS is active. |
| APCLTCH. . . 0 | However, both the YD brake and elev trim relays |
| APRELAY. . . 0 | are active. |
| ELTCLTCH . . 1 | |
| ELTRELAY . . 1 | This shows the state where YD and Mach trim remain |
| SERVOFF. . . 0 | engaged during a TCS maneuver. |
| SRVPWROFF. . 0 | |
| TCS. . . . . 1 | |

Table 4-11

4.3.2 APDISC/YDDISC

The AP and YD quick disconnect pushbuttons are used by the operator to disengage the corresponding servos. Each input, when the pushbutton is not pushed, will appear as a ground to the FGC. To the FGC, this is it's normal state, and thus is assigned a "1". In other words, the FGC assumes the logic:

If APDISC=1, the AP quick disconnect is <u>not</u> pushed.

The same is true for YDDISC[2]. Ths following tables show the normal state of the relays relative to the active states of the quick disconnect pushbuttons.

| | |
|---|---|
| YDRELAY. . . 1 | |
| YDBRAKE. . . 1 | |
| APCLTCH. . . 1 | |
| APRELAY. . . 1 | The AP, YD and Trim relays are all engaged. The |
| ELTCLTCH . . 1 | quick disconnects are not pushed (=1). |
| ELTRELAY . . 1 | |
| SERVOFF. . . 0 | |
| SRVPWROFF. . 0 | |
| APDISC . . . 1 | |
| YDDISC . . . 1 | |

Table 4-12

[2] While an option for a YD quick disconnect pushbutton is provided by the FGC, the pushbutton does not exist on the aircraft. This input is hard-wired to signal ground at the rear connector of the FGC. Therefore, this input should always appear set to '1'. An input status of '0' implies a loose connection (or even miswire) in the harness assembly.

| | |
|---|---|
| YDRELAY. . . 1 | |
| YDBRAKE. . . 1 | The AP quick disconnect pushbutton is being pushed causing the AP relays to open. Since YD and Mach trim are selected, these relays remain engaged. Since the AP quick disconnect is being pushed, APDISC =0 (or active) and the AP relay is disengaged. |
| APCLTCH. . . 0 | |
| APRELAY. . . 0 | |
| ELTCLTCH . . 1 | |
| ELTRELAY . . 1 | |
| SERVOFF. . . 0 | |
| SRVPWROFF. . 0 | |
| APDISC . . . 0 | |
| YDDISC . . . 1 | |

Table 4-13

4.3.3 STALWARN

The two stall warning input discretes are filtered and voted by the engage logic. If either input appears active, the FGC will disengage the AP. The servo switching monitor examines these discrete inputs only during AP engagement. If the AP remains engaged while either stall warning is active, an abnormal disconnect is performed.

4.3.4 MTRIMACT

This trim disengage signal has two different meanings. The first represents manual trim activated; the second represents emergency trim activated. Unfortunately, the state data that distinguishes the two is not stored.

When the manual trim is activated while the AP is engaged, the FGC will perform a normal disengagement of the AP. With only Mach Trim (MT) or MT/YD engaged, manual trim will cause the FGC to temporarily relinquish control of the trim. When the manual trim is no longer active, the Mach trim is re-engaged.

When the emergency trim is activated, both the AP and Mach trim are disengaged.

The servo switching monitor is designed to verify that the MTRIMACT input is not active whenever either the AP or the MT is engaged. It is limited to only verifing the manual trim active process. The emergency trim processing is not directly monitored. Some examples are shown below:

| | |
|---|---|
| YDRELAY. . . 1<br>YDBRAKE. . . 1<br>APCLTCH. . . 1<br>APRELAY. . . 1<br>ELTCLTCH . . 1<br>ELTRELAY . . 1<br>SERVOFF. . . 0<br>SRVPWROFF. . 0<br>MTRIMACT . . 0 | The AP, YD and Trim relays are all engaged. Trim disengage is not active (MTRIMACT=0). |

Table 4-14

| | |
|---|---|
| YDRELAY. . . 1<br>YDBRAKE. . . 1<br>APCLTCH. . . 0<br>APRELAY. . . 0<br>ELTCLTCH . . 0<br>ELTRELAY . . 0<br>SERVOFF. . . 0<br>SRVPWROFF. . 0<br>MTRIMACT . . 1 | Manual Mach trim has been activated (MTRIMACT=1) causing two events; (1) disengagement of the AP, and (2) temporary disengagement of the Trim relays. |

Table 4-15

## 4.4 SENSOR MONITOR

The servo switching monitor makes sure that the FGC properly disengages if the IRS valid (VAHRS) and/or the DADC valid (VDADC) goes invalid. If these sensor voted valids (1=valid or not failed) go invalid, this monitor verifies the engaged status of the FGC. The following engaged status is allowed for each given sensor failure:

- o IRS fail (VAHRS=0)- Mach trim only
- o DADC fail (VDADC=0)- Nothing unless in APPT[3], where AP, YD or Mach trim are allowed.

The following tables show the valid relationship of the monitored states.

[3] APPT indicates that the final phase of an approach mode is active.

| | |
|---|---|
| YDRELAY. . . 1 | |
| YDBRAKE. . . 1 | This table shows that the YD is engaged in this FGC. |
| APCLTCH. . . 0 | |
| APRELAY. . . 0 | |
| ELTCLTCH . . 0 | Both sensors are valid. |
| ELTRELAY . . 0 | |
| SERVOFF. . . 0 | No other servos are engaged. |
| SRVPWROFF. . 0 | |
| VAHRS. . . . 1 | This FGC is not in an approach mode. |
| VDADC. . . . 1 | |
| APPT . . . . 0 | |

Table 4-16

| | |
|---|---|
| YDRELAY. . . 1 | |
| YDBRAKE. . . 1 | This table shows that the YD is engaged in this FGC. |
| APCLTCH. . . 0 | |
| APRELAY. . . 0 | |
| ELTCLTCH . . 0 | All other servos are disengaged. |
| ELTRELAY . . 0 | |
| SERVOFF. . . 0 | The AHRS sensor is valid, however, the DADC is invalid. |
| SRVPWROFF. . 0 | |
| VAHRS. . . . 1 | |
| VDADC. . . . 0 | This FGC is in an active approach mode. |
| APPT . . . . 1 | |

Table 4-17

## 4.5 PERFORMANCE MONITORS MONITOR

Each processor employs a 'handshake' between the real-time performance monitors and the servo switching monitor. This internal status flag verifies that the monitors are operating when required and are bypassed when expected. The flags monitored are defined below:

| Mnemonic | Name | Active Signal Description (=1) |
|---|---|---|
| APPERFBY | AP Monitors Bypass | When this flag is set, it indicates that the AP performance monitors are being bypassed (A&B processors). |
| YDPERFBY | YD Monitors Bypass | When this flag is set, it indicates that the YD performance monitors are being bypassed (A&B processors). |

| | | |
|---|---|---|
| MTMONBY | Mach Trim Monitors Bypass | When this flag is set, it indicates that the M-Trim performance monitors are being bypassed (B-processor only). |
| ELTMONBY | Elev Trim Monitors Bypass | When this flag is set, it indicates that the elevator trim performance monitors are being bypassed (B-processor only). |
| TRIMINOP | Trim Inoperative | The AP trim monitors detected an inoperative condition with the trim servos |
| APSRVMON | AP Failure Detected | A failure affecting either the elevator or aileron servos has been detected. |

All the above performance monitor bypass flags are set whenever this FGC is not engaged. For example, engaging the AP and YD will cause APPERFBY, YDPERFBY and ELTMONBY flags to reset to zero. MTMONBY will remain set. Disengaging the AP only, with the YD remaining engaged, will cause both APPERFBY and ELTMONBY flags to both be set. Engaging the M-Trim without the AP will cause the MTMONBY flag to be cleared.

The status of the two servo monitors, TRIMINOP and APSRVMON, tells the servo switching monitor that this FGC is only partially operational. For example, if the fault flag APSRVMON is set, it indicates that a failure was detected by either the aileron or elevator servo monitors. This will cause loss of all AP functions but will not affect YD. This limited operation is verified by the servo switching monitor.

## 4.6 ENGAGE STATUS MONITOR

The engage status portion of the servo switching monitor verifies that all internal status flags are set to their proper states. These flags may be grouped into two major parts, channel status and engaged status flags.

### 4.6.1 A-Processor Channel Status Flags

| Mnemonic | Name | Active Signal Description (=1) |
|---|---|---|
| HIGHPRI | High Priority Status | This FGC will be the first to try to engage the servos when the system is commanded to do so. |
| XSTATUSV | Cross-Status Valid | The cross-FGC is capable of engaging the system. |
| ENGPWRV | Engage Valid | This FGC is engaged or may be engaged at any time. |

### 4.6.2 B-Processor Channel Status Flags

| Mnemonic | Name | Active Signal Description (=1) |
|---|---|---|
| ENGPWRV | Engage Valid | This FGC is engaged or may be engage at any time. |
| XSTATUSV | Cross-Status Valid | The cross-FGC is capable of engaging the system. |
| ACTIVCHN | Active Channel Status | Essentially the B-processor High Priority status. |

#### 4.6.2.1 HIGHPRI

In a dual channel installation, only one FGC will assume High Priority. This FGC will be the box that controls the servos, all aircraft modes, and all message annunciations.

#### 4.6.2.2 ENGPWRV

This flag implies the potential for engagement of this FGC. When this flag is set, this FGC either (1) has the capability of engaging at any time, or (2) this FGC is already engaged.

#### 4.6.2.3 XSTATUSV

This flag represents the status of the cross-FGC. If it is set, the cross-FGC is valid and is capable of controlling the servos.

#### 4.6.2.4 ACTIVCHN

Active channel status is the priority flag used by the B-processor. It indicates that this FGC is valid, and this FGC will control the servos when commanded.

The relationship between each one of these four flags is shown below:

| | |
|---|---|
| HIGHPRI . . 1<br>ENGPWRV . . 1<br>XSTATUSV. . 1<br>ACTIVCHN. . 1 | This first table shows that both FGCs are valid. This FGC is High priority, and will engage (if not already engaged) when commanded. |

Table 4-18

| | |
|---|---|
| HIGHPRI . . 0<br>ENGPWRV . . 1<br>XSTATUSV. . 1<br>ACTIVCHN. . 0 | This table also shows that both FGCs are valid and neither FGC is engaged (ENGPWRV=1). This FGC is not High priority, and will not assume so until the cross-FGC relinquishes it. |

Table 4-19

| | |
|---|---|
| HIGHPRI . . 0<br>ENGPWRV . . 0<br>XSTATUSV. . 1<br>ACTIVCHN. . 0 | This table does not show very definitive information. Two states are possible: (1) either the cross-FGC is valid and is either engaged and this FGC is valid, or (2) the cross-FGC is not engaged, and this FGC is failed. The other servo switching monitor data will nail-down this actual cause. |

Table 4-20

| | |
|---|---|
| HIGHPRI . . 1<br>ENGPWRV . . 0<br>XSTATUSV. . 0<br>ACTIVCHN. . 0 | This table shows that this FGC is High priority, but is capable of only FD functions (ENGPWRV=0). The cross-FGC is invalid, either because it has failed or is not installed. |

Table 4-21

| | |
|---|---|
| HIGHPRI . . 1<br>ENGPWRV . . 1<br>XSTATUSV. . 0<br>ACTIVCHN. . 1 | In this table, this FGC is either engaged, or capable of being engaged, while the cross-FGC has either failed, or is not installed. |

Table 4-22

### 4.6.3 Engage Status Flags

The following flags provide the engaged status of the FGC. These flags may be divided into two groups, those that denote the desired status of the system, and those that provide the actual status of this FGC.

4.6.3.1 A-Processor Desired Status Flags

| Mnemonic | Name | Active Signal Description (=1) |
|---|---|---|
| MTSELECT | Mach Trim Selected | The Mach trim is selected to be engaged (if possible). |

4.6.3.1.1 MTSELECT
Control of Mach trim is selected. When conditions are valid (e.g. AP not engaged), Mach trim will be engaged by the High priority FGC.

4.6.3.2 B-Processor Desired Status Flags

| Mnemonic | Name | Active Signal Description (=1) |
|---|---|---|
| YDSELECT | YD Selected | The YD has been selected to be engaged. (Note; if this FGC has active channel status set, it will try to engage the YD.) |
| APSELECT | AP Selected | The AP has been selected to be engaged |

4.6.3.2.1 YDSELECT
The YD is requested, and should be or is engaged by one of the FGCs. If this FGC cannot be engaged, YDSELECT will be cleared.

4.6.3.2.2 APSELECT
The AP is requested, and should be or is engaged by one of the FGCs. If this FGC cannot be engaged, APSELECT will be cleared.

4.6.3.3 Actual Status Flags

These flags reflect the actual engaged status of this FGC. These flags will not change until the FGC transitions to its desired state. For example, this FGC will not set YDSELENG status until after this side engages the YD.

A-Processor Present Status Flags:

| Mnemonic | Name | Active Signal Description (=1) |
|---|---|---|
| YDSELENG | YD SELECTED-ENGAGED | YD is selected and engaged by this FGC |
| APSELENG | AP SELECTED-ENGAGED | AP is selected and engaged by this FGC. |
| YDSELSTB | YD SELECTED-STANDBY | YD is selected but not engaged by this FGC. (this FGC is low priority). |

| | | |
|---|---|---|
| APSELSTB | AP SELECTED-STANDBY | AP is selected but not engaged by this FGC (this FGC is low priority). |
| YDOFFSTB | YD OFF-STANDBY | YD is not selected and this FGC is not high priority. |
| APOFFSTB | AP OFF-STANDBY | AP is not selected and this FGC is not high priority. |
| YDOFFINV | YD OFF-INVALID | YD is not selected and is invalid (cannot be engaged by this FGC). |
| APOFFINV | AP OFF-INVALID | AP is not selected and is invalid (cannot be engaged by this FGC) |

B-Processor Present Status Flags:

| Mnemonic | Name | Active Signal Description (=1) |
|---|---|---|
| MTSELENG | Mach Trim SELECTED-ENGAGED | Mach trim is selected and engaged by this FGC |
| MTSELSTB | Mach Trim SELECTED-STANDBY | Mach trim is selected and engaged by the cross-FGC |
| MTOFFSTB | Mach Trim OFF-STANDBY | Mach trim is not selected and this FGC is not high priority |
| MTOFFINV | Mach Trim OFF-INVALID | Mach trim is not selected and is invalid (cannot be engaged by this FGC) |

4.6.3.3.1 SELENG status
Selected/engaged (SELENG) status becomes active when the AP, YD or MT has been selected and when this FGC has actually engaged.

4.6.3.3.2 SELSTB status
Selected/standby (SELSTB) status becomes active when the appropriate function has been selected, and the cross-FGC is actually engaged. This FGC can pick-up engagement when required.

4.6.3.3.3 OFFSTB status
Off/standby (OFFSTB) status becomes active when the appropriate function is not selected and this FGC is not High Priority (HIGHPRI).

4.6.3.3.4 OFFINV status
Off/invalid (OFFINV) status becomes active after a fault is detected

by this FGC making it incapable of controlling the servos.

### 4.6.4 Hardware Versus Engaged Status Flags

This section relates these engaged status flags to their corresponding hardware configurations.

Example 1

System configuration:

- Dual
- FGC1 YD/Mach Trim engaged
- FGC2 is valid.

FGC1's hardware configuration is shown in Table 4-23. Both the YD relay and brake are high, as well as the elev trim relay and clutch.

| | |
|---|---|
| YDRELAY. . . | 1 |
| YDBRAKE. . . | 1 |
| APCLTCH. . . | 0 |
| APRELAY. . . | 0 |
| ELTCLTCH . . | 1 |
| ELTRELAY . . | 1 |
| SERVOFF. . . | 0 |
| SRVPWROFF. . | 0 |

Table 4-23 YD/MT Engaged - FGC1

| | |
|---|---|
| YDRELAY. . . | 0 |
| YDBRAKE. . . | 1 |
| APCLTCH. . . | 0 |
| APRELAY. . . | 0 |
| ELTCLTCH . . | 1 |
| ELTRELAY . . | 0 |
| SERVOFF. . . | 1 |
| SRVPWROFF. . | 0 |

Table 4-24 YD/MT Engaged - FGC2

FGC2's hardware configuration is shown in Table 4-24. Since no relays are engaged by this side, only the brake and clutch lines are high. The servos off signal is also high for the same reason.

FGC1's engage and channel status flags are shown in Table 4-25. Here, we can see that FGC1 is both high priority and active channel, making it the controlling FGC.

This table also shows that FGC2 is valid (XSTATUSV=1) thus, we can assume that, if FGC1 should fail, FGC2 will assume priority and keep the system engaged.

Because FGC1 has verified that it is engaged, the YDSELENG and MTSELENG flags are set. Because FGC1 is high priority, none of its standby flags are set. Since it has not failed, none of the invalid flags are set.

| | |
|---|---|
| HIGHPRI | 1 |
| ENGPWRV | 1 |
| XSTATUSV | 1 |
| ACTIVCHN | 1 |
| YDSELENG | 1 |
| APSELENG | 0 |
| YDSELSTB | 0 |
| APSELSTB | 0 |
| YDOFFSTB | 0 |
| APOFFSTB | 0 |
| YDOFFINV | 0 |
| APOFFINV | 0 |
| MTSELENG | 1 |
| MTSELSTB | 0 |
| MTOFFSTB | 0 |
| MTOFFINV | 0 |

Table 4-25 Status Flags - FGC1

| | |
|---|---|
| HIGHPRI | 0 |
| ENGPWRV | 0 |
| XSTATUSV | 1 |
| ACTIVCHN | 0 |
| YDSELENG | 0 |
| APSELENG | 0 |
| YDSELSTB | 1 |
| APSELSTB | 0 |
| YDOFFSTB | 0 |
| APOFFSTB | 1 |
| YDOFFINV | 0 |
| APOFFINV | 0 |
| MTSELENG | 0 |
| MTSELSTB | 1 |
| MTOFFSTB | 0 |
| MTOFFINV | 0 |

Table 4-26 Status Flags - FGC2

FGC2's engage and channel status flags are shown in Table 4-26. Here, we can see that FGC2 is not in-control because neither its high priority or active channel status flags are set.

Because FGC2 cannot engage its servos until FGC1 disengages, ENGPWRV is zero.

FGC2's engage/status flags show that both YD and Mach Trim are selected. Since this side is low priority, or standby, this side will re-engage YD and Mach Trim should FGC1 disengage unexpectedly.

Because the AP is not engaged, the APOFFSTB flag is set.

Example 2

System configuration:

- Dual
- FGC1 failed

o FGC2 has re-engaged AP, YD and Mach Trim

The hardware configuration of the servo switching monitor for the failed box, FGC1, is shown in Table 4-27. This data shows that FGC1 has failed (SRVPWROFF=1) and disengaged (SERVOFF=1).

Because the YDBRAKE, APCLTCH, and ELTCLTCH are all high, we can tell that the system is still engaged.

| | |
|---|---|
| YDRELAY. . . | 0 |
| YDBRAKE. . . | 1 |
| APCLTCH. . . | 1 |
| APRELAY. . . | 0 |
| ELTCLTCH . . | 1 |
| ELTRELAY . . | 0 |
| SERVOFF. . . | 1 |
| SRVPWROFF. . | 1 |

Table 4-27 FGC1's Failed Status with AP/YD/MT engaged

| | |
|---|---|
| YDRELAY. . . | 1 |
| YDBRAKE. . . | 1 |
| APCLTCH. . . | 1 |
| APRELAY. . . | 1 |
| ELTCLTCH . . | 1 |
| ELTRELAY . . | 1 |
| SERVOFF. . . | 0 |
| SRVPWROFF. . | 0 |

Table 4-28 AP/YD/MT engaged - FGC2 Status

Table 4-28 shows the hardware flags associated with FGC2.

FGC2 has re-engaged the system. All its relays are engaged and operational.

The status flags stored by FGC1 are shown in Table 4-29.

Even though FGC1 is low priority, it cannot set any of its standby flags (AP, YD or MT SELSTB) because it has failed. Because of its failed condition, AP, YD and Mach Trim are all off-invalid. Because it can no longer engage the system, ENGPWRV=0.

Note; FGC1 can still properly latch the valid status of FGC2 (XSTATUSV=1).

| | |
|---|---|
| HIGHPRI . . | 0 |
| ENGPWRV . . | 0 |
| XSTATUSV. . | 1 |
| ACTIVCHN. . | 0 |
| YDSELENG. . | 0 |
| APSELENG. . | 0 |
| YDSELSTB. . | 0 |
| APSELSTB. . | 0 |
| YDOFFSTB. . | 0 |
| APOFFSTB. . | 0 |
| YDOFFINV. . | 1 |
| APOFFINV. . | 1 |
| MTSELENG. . | 0 |
| MTSELSTB. . | 0 |
| MTOFFSTB. . | 0 |
| MTOFFINV. . | 1 |

Table 4-29 FGC1's Status Flags during Failure Condition

| | |
|---|---|
| HIGHPRI | 1 |
| ENGPWRV | 1 |
| XSTATUSV | 0 |
| ACTIVCHN | 1 |
| YDSELENG | 1 |
| APSELENG | 1 |
| YDSELSTB | 0 |
| APSELSTB | 0 |
| YDOFFSTB | 0 |
| APOFFSTB | 0 |
| YDOFFINV | 0 |
| APOFFINV | 0 |
| MTSELENG | 1 |
| MTSELSTB | 0 |
| MTOFFSTB | 0 |
| MTOFFINV | 0 |

Table 4-30 Status Flags - FGC2

Table 4-30 contains the status flags latched by FGC2.

Here, we see that FGC2 has assumed high priority (HIGHPRI=ACTIVCHN=1). Since FGC2 has re-engaged the system (all relays closed, see Table 4-28) it has set each of its selected-engaged status flags. In addition, FGC2 has latched FGC1's invalid condition (XSTATUSV=0).

## 4.7 PUTTING IT ALL TOGETHER

Thus far, we've covered the meaning of each flag examined by the servo switching monitor. Before we can review the procedure for interpreting this data, you must be aware of its limitations.

### 4.7.1 Servo Switching Monitor Architecture

Because of its architecture, there are inherent limitations within the servo switching monitor. These limitations become apparent after a brief review of the execution sequence.

#### 4.7.1.1 Execution and sequencing

The signals described in Appendix 1 are updated every 25mS in the A-processor and every 50mS in the B-processor. These updated signals are then compared, at the corresponding rate, against entries in a constants table. These entries (see Appendix 2) define every combination of permissible engaged states within the system.

If a match is found, the system has been verified to be in a valid state, and the servo switching monitor is satisfied.

If no matches are found after every entry is compared, the system is assumed to be in a transient state. The servo switching monitor will continue to update and compare the engaged status of the system, without tripping, until a match is found, but for only a limited time-

out period. For example, with the system disengaged, assume the AP is selected (APSELECT=1). The system must first command YD engagement, then wait for the YD to actually engage (YDRELAY=YDBRAKE=1) before commanding AP engagement. After AP engagement is verified (APRELAY=APCLTCH=1), elev trim is commanded to engage. The monitor will not be satisfied until the elev trim relay actually closes (ELTRELAY=ELTCLTCH=1). This process can take up to 500mS.

If no matches are found within specific time-out periods (800mS in the A-processor, 1sec in the B-processor) this monitor will trip, and fail the FGC.

Just prior to failing the FGC, the processor will (1) store the last set of updated signals into the Flight Fault Summary (FFS), then (2) open the servo power relay (ref des 8 in Figure 1).

These last two steps lead to shortcomings with the data reported by the monitor. Since only the last set of updated signals is stored, only one piece of a larger puzzle is available for evaluation. Since this fault has been ongoing for the entire time-out period, the dynamic nature of the error is unknown.

### 4.7.2 Data Analysis

We have not examined the actual bit sequence associated with displayed Flight Fault Summary data. This data is contained in four 16 bit words, forcing you to analyze up to 64 different flags (see Appendix 1).

The first step in analyzing this data is to reduce it to a more manageable level.

Since this monitor runs independently in each processor, one processor will typically trip before the other. The processor whose monitor tripped first will latch the data that most accurately describes the failure.

To determine which processor tripped first, look at the status of the Servo Power Off signal (SRVPWROFF). This flag, bit 14 in word 3 line A, and bit 14 in word 3 line B, will equal zero in the processor that first failed.

Once you've isolated the processor, use this processor's data to determine the state of the system when the fault occurred (e.g. was the AP/YD engaged?, was only the YD/Mach trim engaged?). The easiest way to determine this state is to examine the relays (APRELAY, YDRELAY) relative to their select/engage status flags (APSELECT=1? MTSELECT=1?).

Next, examine the status of the TCS and manual trim select pushbuttons

to determine if a synchronization mode was chosen.

Finally, check the priority status and the status of the cross-FGC (XSTATUSV) to determine the single/dual configuration.

After you've compiled this data and re-created the state of the system, compare the actual bit sequence with its corresponding progression defined in Appendix 2. Any differences will highlight the miscompared flags, and hopefully direct you to the cause of the fault.

Example 1

A flight fault summary reads:

| | word 1 | word 2 | word 3 | word 4 |
|---|---|---|---|---|
| line A | 0000 | 0013 | 7E8C | 1A63 |
| line B | 4700 | 4300 | 1AB3 | 3B60 |
| line C | 000000000000 | | 000000000000 | |

Both the A and B-processors indicate failures of their servo switching monitors (line A, word 2, bit 4 and line B, word 2, bit 8).

The first step is to decode the servo switching monitor's data into 1's and 0's. This will give us the following information:

| | word 3 | word 4 | |
|---|---|---|---|
| 7E8C 1A63= | 0111 1101 1000 1100 | 0001 1010 0110 0011 | - line A |
| 1AB3 3B60= | 0001 1010 1011 0011 | 0011 1011 0110 0000 | - line B |

Step 1: Which processor tripped first?

A-processor: SRVPWROFF= word 3, bit 14= 1
B-processor: SRVPWROFF= word 3, bit 14= 0

Therefore, the B-processor tripped first.

Step 2: What is the state of the system when the fault occurred?

Concentrating on the B-processor's data (since it tripped first):

YD Brake =1
YD Brake Relay =0
AP Clutch =1
AP Clutch Relay =0
Elev Trim Clutch =1
Elev Trim Relay =0

this tells us that all servos were engaged, but not by this FGC.

This correlates with the AP and YD Select status flags (both =1). In addition, we can see that Mach Trim was also selected (MTrim

Select-Standby =1).

Examining the pushbuttons:
YD Quick Disconnect =1
AP Quick Disconnect =1
TCS =0
Manual/emergency trim =0
shows that none are active.

Finally, checking the priority status flags shows that this FZ is standby, or not high priority (Active Channel =0) and that the cross-FGC is valid (Cross-status valid =1).

In summary, the state of this FZ, when the fault occurred:
1. The B-processor failed first
2. when the AP and YD were both selected and engaged
3. by a valid cross-FGC
4. while this FZ was the standby channel
5. with no synchronization modes selected.

Step 3: Nail the cause.

We can identify the flag(s) that caused this monitor to fail by comparing this fault code with its allowed state(s) found in Appendix 2.

Look at the B-processor data (line B, words 3 and 4) under STANDBY - AP/YD/MSEL. This represents the only allowable state for this condition. Compare this with the fault code. The flags that fall-out represent the signals that have failed.

```
0011 x0x0 x011 x0xx  0011 1xx1 x110 000x - allowed state
0001 1010 1011 0011  0011 1011 0110 0000 - failed state
  ↑
  Mismatch
```

The failed signal: SERVOS OFF.

Since this signal is strictly internal to the FGC, replace this unit.

Example 2

A flight fault summary reads:

| | word 1 | word 2 | word 3 | word 4 |
|---|---|---|---|---|
| line A | 0000 | 0013 | 5809 | 1B73 |
| line B | 4700 | 4300 | 9FE7 | 13D0 |
| line C | 000000000000 | | 000000000000 | |

Both the A and B-processors indicate failures of their servo switching monitors (line A, word 2, bit 4 and line B, word 2, bit 8).

The first step is to decode the servo switching monitor's data into 1's and 0's. This will give us the following information:

| | word 3 | word 4 | |
|---|---|---|---|
| 5809 1B73= | 0101 1000 0000 1001 | 0001 1011 0111 0011 | - line A |
| 9FE7 13D0= | 1001 1111 1110 0111 | 0001 0011 1101 0000 | - line B |

Step 1: Which processor tripped first?

A-processor: SRVPWROFF= word 3, bit 14= 1
B-processor: SRVPWROFF= word 3, bit 14= 0

Therefore, the B-processor tripped first.

Step 2: What is the state of the system when the fault occurred?

Concentrating on the B-processor's data (since it tripped first):

YD Brake =1
YD Brake Relay =1
AP Clutch =1
AP Clutch Relay =1
Elev Trim Clutch =1
Elev Trim Relay =1

This tells us that all servos were engaged by this FGC when the monitor tripped.

Since all servos were engaged, we would expect both the AP and the YD to be selected. However, a mismatch can be seen with the select status flags. Only YDSELECT=1 while APSELECT=0. Looking further shows yet another mismatch. This time with the monitor bypass flags. The YD monitor bypass is cleared indicating that these monitors are operational, but the AP monitor bypass is set, indicating that the AP performance monitors are not executing. Both bypasses should have been cleared.

Mach trim was also selected (MTrim Select-Engage =1). Since the AP is engaged, the Mach trim monitor bypass is set. This is

expected.

Examining the pushbuttons:
YD Quick Disconnect =1
AP Quick Disconnect =1
TCS =0
Manual/emergency trim =0
shows that none were active when the fault data was latched.

Finally, the priority status flags show that this FZ is high priority (Active Channel =1) and that the cross-FGC is valid (Cross-status valid =1).

Note also that the aircraft was in its final phase of approach (APPT=1).

In summary, the state of this FZ, when the fault occurred:
1. The B-processor failed first
2. when the AP and YD were both engaged by this FGC
3. with a valid cross-FGC
4. during an approach
5. with no synchronization modes selected
6. and failed because the AP was engaged but not selected to be engaged.

Step 3: Nail the cause.

We can identify the flag(s) that caused this monitor to fail by comparing this fault code with its allowed state(s) found in Appendix 2.

Look at the B-processor data (line B, words 3 and 4) under AP/YD/MSEL-DUAL. This represents the only allowable state for this condition. Compare this with the fault code. The flags that fall-out represent the signals that have failed.

```
100x 1111 1111 0111  0000 0011 x101 000x - allowed state
1001 1111 1110 0111  0001 0011 1101 0000 - failed state
              ↑          ↑
           Mismatch   Mismatch
```

The mismatched signals: APSELECT and AP Monitor Bypass

With this data alone, we cannot conclusively derive the cause of the fault. Something caused the software to think that the AP should be disengaged, but a disengagement did not occur.

Inputs to the FGC that affect disengagements include AP quick disconnect, stall warning and TCS. The primary suspect is the AP

quick disconnect.

Recommended actions would be to verify these interfaces via ground maintenance test and, if no faults are detected, to check the impedance of each AP quick disconnect to the FGC. If nominal values are measured, do not replace any FGCs. Instead, monitor this aircraft for additional faults.

## Appendix 1

### Falcon 900 Servo Switching Monitor Flags

**LINE A, WORD 3**

| Bit No | Name | Active Signal Description (=1) | Ref Page |
|---|---|---|---|
| 15 | Engage Valid | This FGC is engaged or may be engaged at any time. | 4-11 |
| 14 | Servo Power Off FB | The servo power relay is in its off or open position. | 4-3 |
| 13 | Servos Off | No servos are engaged by this FGC | 4-1 |
| 12 | Cross-status Valid | The cross-FGC is capable of engaging the system | 4-11 |
| 11 | YD Brake | YD servo brake is active | 4-1 |
| 10 | YD Brake Relay | This FGC's YD brake relay is on or engaged | 4-1 |
| 9 | AP Clutch | Elevator and aileron servo clutches are active or engaged | 4-1 |
| 8 | AP Clutch Relay | This FGC's AP clutch relay is on or engaged | 4-1 |
| 7 | Elev Trim Clutch | The Elev trim servo clutch is active or engaged | 4-1 |
| 6 | Elev Trim Relay | This FGC's Elev trim clutch relay is on or engaged | 4-1 |
| 5 | YD Selected-Engage Status | The YD is selected and engaged by this FGC | 4-14 |
| 4 | AP Selected-Engage Status | The AP is selected and engaged by this FGC | 4-14 |
| 3 | YD Selected-Standby Status | The YD is selected, but not engaged by this FGC (this FGC is low priority) | 4-14 |
| 2 | AP Selected-Standby Status | The AP is selected, but not engaged by this FGC (this FGC is low priority) | 4-15 |

**LINE A, WORD 3 (cont)**

| Bit No | Name | Active Signal Description (=1) | Ref Page |
|---|---|---|---|
| 1 | YD Off-Standby Status | The YD is not selected and this FGC is not high priority | 4-15 |
| 0 | AP Off-Standby Status | The AP is not selected and this FGC is not high priority. | 4-15 |

**LINE A, WORD 4**

| Bit No | Name | Active Signal Description (=1) | Ref Page |
|---|---|---|---|
| 15 | YD Off-Invalid Status | The YD is not selected and this FGC is invalid. | 4-15 |
| 14 | AP Off-Invalid Status | The AP is not selected and this FGC is invalid | 4-15 |
| 13 | High Priority Status | This FGC will be the first to engage servos (AFCS MASTER) | 4-11 |
| 12 | YD Quick Disconnect | YD quick disconnect is not being pushed (inactive) | 4-6 |
| 11 | AP Quick Disconnect | AP quick disconnect is not being pushed (inactive) | 4-6 |
| 10 | Touch Control Steering | Touch control steering active | 4-6 |
| 9 | AP Monitors Bypass | Pitch and roll performance monitors are not being executed (typically because this FGC is not engaged) | 4-10 |
| 8 | YD Monitors Bypass | Yaw performance monitors are not being executed (typically because this FGC is not engaged) | 4-10 |
| 7 | Spare | Spare | --- |
| 6 | AHRS (IRS) Sensor Valid | The data from the AHRS (IRS) sensor(s) is(are) being properly received by this FGC. | 4-9 |
| 5 | DADC Sensor Valid | The data from the DADC sensor is being properly received by this FGC. | 4-9 |
| 4 | Approach Track Mode | This FGC is in its final phase of an approach mode | 4-9 |
| 3 | Stall Warning | The stall warning or stick shaker inputs to this FGC are active. | 4-6 |
| 2 | Manual or emergency trim | Either manual pitch trim or emergency trim has been activated. | 4-6 |

**LINE A, WORD 4 (cont)**

| Bit No | Name | Active Signal Description (=1) | Ref Page |
|---|---|---|---|
| 1 | Mach Trim Selected | Mach Trim is selected to be engaged. | 4-14 |
| 0 | Spare | Spare | --- |

**LINE B, WORD 3**

| Bit No | Name | Active Signal Description (=1) | Ref Page |
|---|---|---|---|
| 15 | Engage Valid | This FGC is engaged or may be engaged at any time. | 4-12 |
| 14 | Servo Power Off FB | The servo power relay is in its off or open position. | 4-3 |
| 13 | Servos Off | No servos are engaged by this FGC | 4-1 |
| 12 | Cross-status Valid | The cross-FGC is capable of engaging the system | 4-12 |
| 11 | YD Brake | YD servo brake is active | 4-1 |
| 10 | YD Brake Relay | This FGC's YD brake relay is on or engaged | 4-1 |
| 9 | AP Clutch | Elevator and aileron servo clutches are active or engaged | 4-1 |
| 8 | AP Clutch Relay | This FGC's AP clutch relay is on or engaged | 4-1 |
| 7 | Elev Trim Clutch | The Elev trim servo clutch is active or engaged | 4-1 |
| 6 | Elev Trim Relay | This FGC's Elev trim clutch relay is on or engaged | 4-1 |
| 5 | YD Select Status | The YD has been selected to be engaged. | 4-14 |
| 4 | AP Select Status | The AP has been selected to be engaged. | 4-14 |
| 3 | Touch Control Steering | Touch control steering is active | 4-6 |
| 2 | Active Channel Status | Basically, this flag is the same as high priority status, but for the B-processor | 4-12 |
| 1 | YD Quick Disconnect | YD quick disconnect is not being pushed (inactive) | 4-6 |
| 0 | AP Quick Disconnect | AP quick disconnect is not being pushed (inactive) | 4-6 |

**LINE B, WORD 4**

| Bit No | Name | Active Signal Description (=1) | Ref Page |
|---|---|---|---|
| 15 | AP Trim Inoperative | A fault in the Elevator trim system was detected by the trim inoperative monitors | 4-11 |
| 14 | AP Servo Monitor | A fault affecting either the aileron or Elevator servos has been detected. | 4-11 |
| 13 | Elev Trim Monitors Bypass | All Elev trim monitors are being bypassed, indicating that AP trim is not engaged. | 4-11 |
| 12 | AP Monitors Bypass | All AP monitors are being bypassed, indicating that AP is not engaged. | 4-10 |
| 11 | YD Monitors Bypass | All YD monitors are being bypassed, indicating that the YD is not engaged. | 4-10 |
| 10 | Stall Warning | The stall warning or stick shaker inputs to this FGC are active. | 4-6 |
| 9 | AHRS (IRS) Sensor Valid | The data from the AHRS (IRS) sensor(s) is(are) being properly received by this FGC. | 4-9 |
| 8 | DADC Sensor Valid | The data from the DADC sensor(s) is being properly received by this FGC. | 4-9 |
| 7 | Approach Track Mode | This FGC is in the final phase of an approach mode | 4-9 |
| 6 | Mach Trim Monitor Bypass | All Mach trim monitors are being bypassed, indicating that Mach trim is not engaged. | 4-11 |
| 5 | Mach Trim Selected-Standby Status | Mach trim is selected, but not engaged by this FGC. | 4-15 |
| 4 | Mach Trim Selected-engaged Status | Mach trim is selected and engaged by this FGC. | 4-15 |
| 3 | Mach Trim Off-Standby Status | Mach trim is not selected and this FGC is not high priority. | 4-15 |

**LINE B, WORD 4 (cont)**

| Bit No | Name | Active Signal Description (=1) | Ref Page |
|---|---|---|---|
| 2 | Mach Trim Off-Invalid Status | Mach trim is not selected and this FGC is invalid. | 4-15 |
| 1 | Manual or emergency trim | Either manual pitch trim or emergency trim has been activated. | 4-6 |
| 0 | Spare | Spare | --- |

## Appendix 2

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | TCS ↑ | | |
| | AP/YD ENGAGED ↑ | | YD ENGAGED ↑ | | YD MSEL ↑ | YD MSYNC ↑ | AP/YD ↑ | | AP/YD/ MSEL ↑ |
| **LINE A, WORD 3** | | | | | | | | | |
| Engage Valid | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Servo Power Off FB | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Servos Off | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cross-status Valid | X | X | X | X | X | X | X | X | X |
| YD Brake | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| YD Brake Relay | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| AP Clutch | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AP Clutch Relay | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Elev Trim Clutch | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| Elev Trim Relay | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| YD Selected-Engage | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| AP Selected-Engage | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| YD Selected-Standby | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AP Selected-Standby | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| YD Off-Standby | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AP Off-Standby | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **LINE A, WORD 4** | | | | | | | | | |
| YD Off-Invalid | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AP Off-Invalid | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| High Priority | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| YD Quick Disconnect | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| AP Quick Disconnect | 1 | 1 | X | X | X | X | 1 | 1 | 1 |
| TCS | 0 | 0 | X | X | X | X | 1 | 1 | 1 |
| AP Monitors Bypass | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| YD Monitors Bypass | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spare | X | X | X | X | X | X | X | X | X |
| AHRS (IRS) Valid | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| DADC Valid | 1 | X | X | 1 | 1 | 1 | X | 1 | 1 |
| Approach Track Mode | X | 1 | 1 | X | X | X | 1 | X | X |
| Stall Warning | 0 | 0 | X | X | X | X | 0 | 0 | 0 |
| Man or Emerg Trim | 0 | 0 | X | X | 0 | 1 | 0 | 0 | 0 |
| Mach Trim Selected | 0 | 0 | X | X | 0 | 1 | 0 | 0 | 0 |
| Spare | X | X | X | X | X | X | X | X | X |

X = Don't Care

Servo Switching Monitor

| | SINGLE | | | | STANDBY | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | YD ENGAGED | | YD/ MSEL | YD/ MSYNC | AP/YD ENGAGED | | AP/YD/ TCS | YD | NO MODE |
| **LINE A, WORD 3** | | | | | | | | | |
| Engage Valid | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 |
| Servo Power Off FB | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Servos Off | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 |
| Cross-status Valid | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | X |
| YD Brake | 1 | 1 | 1 | 1 | X | X | X | X | 0 |
| YD Brake Relay | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| AP Clutch | 0 | 0 | 0 | 0 | X | X | X | X | 0 |
| AP Clutch Relay | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Elev Trim Clutch | 0 | 0 | 1 | 0 | X | X | X | X | 0 |
| Elev Trim Relay | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| YD Selected-Engage | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| AP Selected-Engage | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| YD Selected-Standby | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 |
| AP Selected-Standby | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |
| YD Off-Standby | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AP Off-Standby | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| **LINE A, WORD 4** | | | | | | | | | |
| YD Off-Invalid | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AP Off-Invalid | X | X | X | X | 0 | 0 | 0 | 0 | 0 |
| High Priority | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 |
| YD Quick Disconnect | 1 | 1 | 1 | 1 | 1 | 1 | 1 | X | X |
| AP Quick Disconnect | X | X | X | X | 1 | 1 | 1 | X | X |
| TCS | X | X | X | X | 0 | X | 1 | X | X |
| AP Monitors Bypass | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| YD Monitors Bypass | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 |
| Spare | X | X | X | X | X | X | X | X | X |
| AHRS (IRS) Valid | 1 | 1 | 1 | 1 | X | X | X | X | X |
| DADC Valid | X | 1 | 1 | 1 | 1 | X | X | X | X |
| Approach Track Mode | 1 | X | X | X | X | X | X | X | X |
| Stall Warning | X | X | X | X | 0 | 0 | 0 | X | X |
| Man or Emerg Trim | X | X | 0 | 1 | 0 | 0 | 0 | X | X |
| Mach Trim Selected | 0 | 0 | 1 | 1 | X | 0 | X | X | 0 |
| Spare | X | X | X | X | X | X | X | X | X |

Servo Switching Monitor

| | | | STANDBY | | SINGLE | | |
|---|---|---|---|---|---|---|---|
| | MSEL | MSYNC | NO MODE | MSEL | MSEL | MSYNC | NO MODE |
| **LINE A, WORD 3** | ↑ | ↑ | ↑ | ↑ | ↑ | ↑ | ↑ |
| Engage Valid | 1 | 1 | X | X | 1 | 1 | 1 |
| Servo Power Off FB | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Servos Off | 0 | 1 | 1 | 1 | 0 | 1 | 1 |
| Cross-status Valid | X | X | 1 | 1 | 0 | 0 | 0 |
| YD Brake | 0 | 0 | X | X | 0 | 0 | 0 |
| YD Brake Relay | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AP Clutch | 0 | 0 | X | X | 0 | 0 | 0 |
| AP Clutch Relay | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Elev Trim Clutch | 1 | 0 | X | X | 1 | 0 | 0 |
| Elev Trim Relay | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| YD Selected-Engage | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AP Selected-Engage | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| YD Selected-Standby | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AP Selected-Standby | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| YD Off-Standby | 0 | 0 | X | 1 | 0 | 0 | 0 |
| AP Off-Standby | 0 | 0 | X | 1 | 0 | 0 | 0 |
| **LINE A, WORD 4** | | | | | | | |
| YD Off-Invalid | 0 | 0 | X | 0 | 0 | 0 | 0 |
| AP Off-Invalid | 0 | 0 | X | 0 | X | X | X |
| High Priority | 1 | 1 | 0 | 0 | 1 | 1 | 1 |
| YD Quick Disconnect | X | X | X | X | X | X | X |
| AP Quick Disconnect | X | X | X | X | X | X | X |
| TCS | X | X | X | X | X | X | X |
| AP Monitors Bypass | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| YD Monitors Bypass | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Spare | X | X | X | X | X | X | X |
| AHRS (IRS) Valid | X | X | X | X | X | X | X |
| DADC Valid | 1 | 1 | X | X | 1 | 1 | X |
| Approach Track Mode | X | X | X | X | X | X | X |
| Stall Warning | X | X | X | X | X | X | X |
| Man or Emerg Trim | 0 | 1 | X | X | 0 | 1 | X |
| Mach Trim Selected | 1 | 1 | 0 | 1 | 1 | 1 | 0 |
| Spare | X | X | X | X | X | X | X |

| **LINE B, WORD 3** | AP/YD/ MSEL ↑ | AP/YD ENGAGED ↑ | | | | YD/ MSEL ↑ | YD ENGAGED ↑ | | YD/ MSYNC ↑ |
|---|---|---|---|---|---|---|---|---|---|
| Engage Valid | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Servo Power Off FB | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Servos Off | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cross-status Valid | X | 1 | 1 | 0 | 0 | X | X | X | X |
| YD Brake | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| YD Brake Relay | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| AP Clutch | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| AP Clutch Relay | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| Elev Trim Clutch | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 |
| Elev Trim Relay | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 |
| YD Select | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| AP Select | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| TCS | 0 | 0 | 0 | 0 | 0 | X | X | X | X |
| Active Channel | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| YD Quick Disconnect | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| AP Quick Disconnect | 1 | 1 | 1 | 1 | 1 | X | X | X | X |
| **LINE B, WORD 4** | | | | | | | | | |
| AP Trim Inoperative | 0 | 0 | 0 | X | X | X | X | X | X |
| AP Servo Monitor | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ETrim Monitor Bypass | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| AP Monitors Bypass | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| YD Monitors Bypass | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Stall Warning | 0 | 0 | 0 | 0 | 0 | X | X | X | X |
| AHRS Valid | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| DADC Valid | 1 | X | 1 | X | 1 | 1 | X | 1 | 1 |
| Approach Track Mode | X | 1 | X | 1 | X | X | 1 | X | X |
| MTrim Monitor Bypass | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 |
| MTrim Select-Standby | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| MTrim Select-engaged | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| MTrim Off-Standby | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| MTrim Off-Invalid | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Man or Emerg Trim | 0 | 0 | 0 | 0 | 0 | 0 | X | X | 1 |
| Spare | X | X | X | X | X | X | X | X | X |

Servo Switching Monitor

| | SINGLE | | | | | TCS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | AP/YD/ MSEL | YD/ MSEL | YD ENGAGED | | YD/ MSYNC | AP/YD/ MSEL | AP/YD | | | |
| **LINE B, WORD 3** | | | | | | | | | | |
| Engage Valid | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Servo Power Off FB | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Servos Off | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cross-status Valid | 0 | 0 | 0 | 0 | 0 | X | 0 | 0 | 1 | 1 |
| YD Brake | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| YD Brake Relay | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| AP Clutch | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AP Clutch Relay | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Elev Trim Clutch | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| Elev Trim Relay | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| YD Select | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| AP Select | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 |
| TCS | 0 | X | X | X | X | 1 | 1 | 1 | 1 | 1 |
| Active Channel | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| YD Quick Disconnect | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| AP Quick Disconnect | 1 | X | X | X | X | 1 | 1 | 1 | 1 | 1 |
| **LINE B, WORD 4** | | | | | | | | | | |
| AP Trim Inoperative | X | X | X | X | X | 0 | X | X | 0 | 0 |
| AP Servo Monitor | 0 | X | X | X | X | 0 | 0 | 0 | 0 | 0 |
| ETrim Monitor Bypass | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| AP Monitors Bypass | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| YD Monitors Bypass | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Stall Warning | 0 | X | X | X | X | 0 | 0 | 0 | 0 | 0 |
| AHRS Valid | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| DADC Valid | 1 | 1 | X | 1 | 1 | 1 | X | 1 | 1 | X |
| Approach Track Mode | X | X | 1 | X | X | X | 1 | X | X | 1 |
| MTrim Monitor Bypass | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 |
| MTrim Select-Standby | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| MTrim Select-engaged | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |
| MTrim Off-Standby | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| MTrim Off-Invalid | 0 | 0 | X | X | 0 | 0 | 0 | 0 | 0 | 0 |
| Man or Emerg Trim | 0 | 0 | X | X | 1 | 0 | 0 | 0 | 0 | 0 |
| Spare | X | X | X | X | X | X | X | X | X | X |

Servo Switching Monitor

| LINE B, WORD 3 | AP/YD ↑ | AP/YD/ MSEL ↑ | YD/ MSEL ↑ | YD ↑ | MSEL ONLY ↑ | NO MODE ↑ |
|---|---|---|---|---|---|---|
| | | | STANDBY ↑ | | | |
| Engage Valid | 0 | 0 | 0 | 0 | X | X |
| Servo Power Off FB | 0 | 0 | 0 | 0 | 0 | 0 |
| Servos Off | 1 | 1 | 1 | 1 | 1 | 1 |
| Cross-status Valid | 1 | 1 | 1 | 1 | 1 | 1 |
| YD Brake | X | X | X | X | X | X |
| YD Brake Relay | 0 | 0 | 0 | 0 | 0 | 0 |
| AP Clutch | X | X | X | X | X | X |
| AP Clutch Relay | 0 | 0 | 0 | 0 | 0 | 0 |
| Elev Trim Clutch | X | X | X | X | X | X |
| Elev Trim Relay | 0 | 0 | 0 | 0 | 0 | 0 |
| YD Select | 1 | 1 | 1 | 1 | 0 | 0 |
| AP Select | 1 | 1 | 0 | 0 | 0 | 0 |
| TCS | X | X | X | X | X | X |
| Active Channel | 0 | 0 | 0 | 0 | 0 | 0 |
| YD Quick Disconnect | X | X | X | X | X | X |
| AP Quick Disconnect | X | X | X | X | X | X |
| **LINE B, WORD 4** | | | | | | |
| AP Trim Inoperative | 0 | 0 | X | X | X | X |
| AP Servo Monitor | 0 | 0 | 0 | 0 | X | X |
| ETrim Monitor Bypass | 1 | 1 | 1 | 1 | 1 | 1 |
| AP Monitors Bypass | 1 | 1 | 1 | 1 | 1 | 1 |
| YD Monitors Bypass | 1 | 1 | 1 | 1 | 1 | 1 |
| Stall Warning | X | X | X | X | X | X |
| AHRS Valid | X | X | X | X | X | X |
| DADC Valid | X | 1 | X | X | 1 | X |
| Approach Track Mode | X | X | X | X | X | X |
| MTrim Monitor Bypass | 1 | 1 | 1 | 1 | 1 | 1 |
| MTrim Select-Standby | 0 | 1 | 1 | 0 | 1 | 0 |
| MTrim Select-engaged | 0 | 0 | 0 | 0 | 0 | 0 |
| MTrim Off-Standby | 1 | 0 | 0 | 1 | 0 | X |
| MTrim Off-Invalid | 0 | 0 | 0 | 0 | 0 | X |
| Man or Emerg Trim | 0 | 0 | X | X | X | X |
| Spare | X | X | X | X | X | X |

X as in don't care

Servo Switching Monitor

| | | | | SINGLE ↑ | | | |
|---|---|---|---|---|---|---|---|
| **LINE B, WORD 3** | MSEL ↑ | MSYNC ↑ | NO MODE ↑ | TCS/AP/ YD/MSEL ↑ | MSEL ↑ | MSYNC ↑ | NO MODE ↑ |
| Engage Valid | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Servo Power Off FB | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Servos Off | 0 | 1 | 1 | 0 | 0 | 0 | 1 |
| Cross-status Valid | X | X | X | 0 | 0 | 0 | 0 |
| YD Brake | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| YD Brake Relay | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| AP Clutch | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AP Clutch Relay | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Elev Trim Clutch | 1 | 0 | 0 | 1 | 1 | 0 | 0 |
| Elev Trim Relay | 1 | 0 | 0 | 1 | 1 | 0 | 0 |
| YD Select | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| AP Select | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| TCS | X | X | X | X | X | X | X |
| Active Channel | 1 | 1 | 1 | 1 | 1 | 1 | X |
| YD Quick Disconnect | X | X | X | 1 | X | X | X |
| AP Quick Disconnect | X | X | X | 1 | X | X | X |
| **LINE B, WORD 4** | | | | | | | |
| AP Trim Inoperative | X | X | X | 1 | X | X | X |
| AP Servo Monitor | X | X | 0 | 0 | X | X | X |
| ETrim Monitor Bypass | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| AP Monitors Bypass | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| YD Monitors Bypass | 1 | 1 | 1 | 0 | 1 | 1 | 1 |
| Stall Warning | X | X | X | 0 | X | X | X |
| AHRS Valid | X | X | X | 1 | X | X | X |
| DADC Valid | 1 | 1 | X | 1 | 1 | 1 | X |
| Approach Track Mode | X | X | X | X | X | X | X |
| MTrim Monitor Bypass | 0 | 1 | 1 | 0 | 0 | 1 | 1 |
| MTrim Select-Standby | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| MTrim Select-engaged | 1 | 1 | 0 | 1 | 1 | 1 | 0 |
| MTrim Off-Standby | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| MTrim Off-Invalid | 0 | 0 | X | 0 | 0 | 0 | X |
| Man or Emerg Trim | 0 | 1 | X | 0 | 0 | 1 | X |
| Spare | X | X | X | X | X | X | X |