

FAULT ISOLATION1. General

Fault isolation is the process of locating the source of a TCAS failure at the LRU or aircraft wiring level. Fault isolation for TCAS involves observation of TCAS failure indicators and use of functional self-test. After the fault has been isolated, the appropriate aircraft repair procedures are used to correct the problem. See the [INSTALLATION AND MAINTENANCE](#) section for details.

TCAS failures can be indicated by failure annunciations on the radar/TCAS display or dedicated traffic unit display, an electromechanical fail flag on the RA/VSI unit, and failure indicator lamps on the front panels of the TCAS LRU components. TCAS failures are detected and failures indicated through full-time TCAS built-in test equipment monitoring or manually initiated TCAS self-test.

TCAS faults and fault codes can be viewed on the left side of the TCAS processor (as viewed from the front) or on a diagnostic computer with the appropriate diagnostic programs. Real-time failures can be observed and fault memory can be searched for recurring problems by the diagnostic computer. TCAS faults can be recorded and analyzed using special recording programs with dedicated computer equipment.

For these reasons, it is very important that the TCAS installation contains accessible diagnostic and recorder connections. Additionally, the diagnostic computer is necessary for system checkout and installation fault isolation.

2. Fault Isolation

Fault isolation is typically performed on the ground, as a result of failures indicated during post-installation or preflight testing, or malfunctions that were observed during flight operation.

A. General

- (1) The TCAS processor is capable of detecting any malfunctions of TCAS components that degrade or prevent possible collision avoidance protection. A failure of the TCAS system during normal operation results in the following actions by the TCAS processor:
 - Provides an indication to flight crew that an abnormal condition exists. Typically, a yellow "TCAS" flag will annunciate on the traffic display.

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- Causes any Mode S transmissions that report own aircraft status to indicate that own aircraft has no on-board resolution advisory capability.
- Prevents interrogations by own aircraft TCAS.
- Deactivates the normal TCAS display functions.

NOTE: Refer to the pilot's guide for specific failure indications that will appear on RA/VSI, TA/RA/VSI, dedicated TCAS display, etc.

- (2) There are three methods for initiating and observing functional self-test results or failure causes of the Mode S/TCAS system:
 - The first method is to initiate self-test at the Mode S/TCAS control unit. Detected failures are annunciated on the traffic display, with the exception of the IVA-81A/IVA-81C/IVA-81D TA/RA/VSI.
 - The second method is to observe self-test fault codes annunciated on the TPU side-panel LED indicator (located inside the cover of the processor).
 - The third method is to use a diagnostic computer program to view faults in real-time or to recover faults stored in fault memory.
- (3) Before performing TCAS system self-test, ensure that the following aircraft systems are powered and operating with no failure flags on the appropriate cockpit instruments:
 - Mode S transponder system
 - Encoding Altitude Sources (Air Data Systems)
 - Radio Altimeter Systems
 - Attitude (Vertical Gyro) Systems
 - Heading (Compass) Systems
- (4) If the attitude and heading data supplied to the TCAS system are from an AHRS, IRS, or INS they must be aligned and be in an operational mode.

B. Fault Isolation Using the Mode S/TCAS Control Unit

NOTE: If a TCAS/Weather Radar display is used as the traffic display, the radar system should be in SBY or TST before the next step for about 5 seconds to allow the display to warm up.

- (1) In a dual Mode S-equipped aircraft, set the transponder select switch to #1 position to test the number one transponder. Select the test mode, observe for the fail annunciation.
- (2) If there are no malfunctions, the test sequence will be as follows:
 - (a) A test pattern appears on the traffic display to allow verification of each type of intruder symbol. The traffic display shows the TCAS traffic test pattern and "TEST" is displayed. See [Figure 1001 TCAS Test Pattern](#).

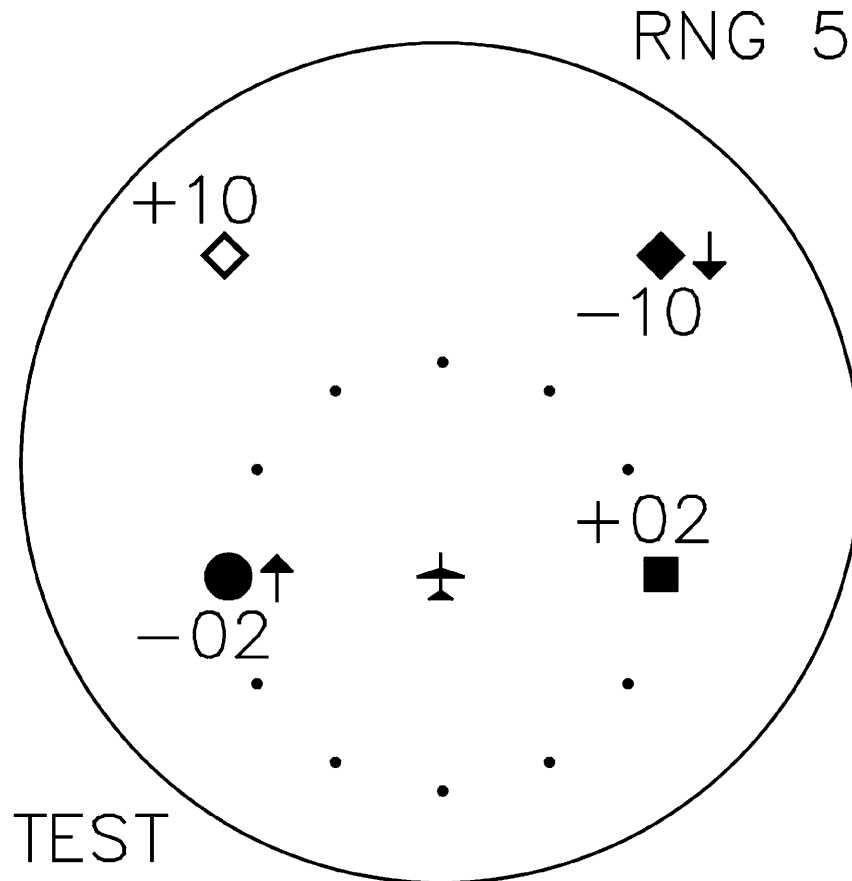


Figure 1001 TCAS Test Pattern

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(b) For aircraft equipped with RA/VSI:

- 1 During the first few seconds of the test, the RA/VSI red and green lamps (climb/descend indicators) illuminate sequentially. The TCAS flag is in view throughout the test period.
- 2 After the RA/VSI sequential lamp test, the red and green climb/descend lamps display a fixed test command representing a typical resolution advisory throughout the remainder of the test sequence.

NOTE: Loss of valid vertical speed input will cause the VSI flag to appear on the RA/VSI. If a TA/RA/VSI is used, the legend "VSI" will appear on the display. A TCAS processor failure will cause the TCAS flag to appear on the RA/VSI, and TCAS to be displayed on the TA/RA/VSI.

(c) For aircraft equipped with TA/RA/VSI:

The TA/RA/VSI indicates a fixed Resolution Advisory and the traffic symbol test pattern. A "TEST" is indicated.

(d) For aircraft equipped with a radar/TCAS or dedicated display:

Both displays indicate the TCAS display test pattern and "TEST" is displayed.

(e) At the successful conclusion of self-test, the TCAS processor outputs onto the audio bus the synthesized voice message, "TCAS SYSTEM TEST OK."

(3) If there is a failure detected during self-test, the voice message output from the TCAS processor is, "TCAS SYSTEM TEST FAIL." The radar/TCAS display or dedicated display will announce the failed system component(s).

Possible traffic display fault annunciations are as follows:

- TCAS PROCESSOR•
- UPPER ANTENNA
- LOWER ANTENNA
- RADIO ALT #1

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- RADIO ALT #2•
 - RADIO ALT #1 and #2
 - XPNDR DATA BUS #1
 - XPNDR DATA BUS #2
 - TRAFFIC DISPLAY
 - RA DISPLAY #1
 - RA DISPLAY #2
 - RA DISPLAY #1 AND #2
 - SELECTED XPNDR
 - XPNDR TOP ANTENNA
 - XPNDR BOTTOM ANTENNA
 - XPNDR CONTROL DATA
 - XPNDR ALT DATA #1 and #2
 - #1 XPNDR ALT DATA
 - #2 XPNDR ALT DATA
 - ATTITUDE
 - HEADING
 - GP RAM
 - NO TCAS 429 DATA
 - TCAS FAIL
- (4) If the self-test results were not successful, perform the following:
- (a) If a TCAS/Weather Radar display is used, check and record fault annunciations. Refer to [Table 1001 TCAS/Weather Radar Display Fault Annunciations](#) for fault isolation procedures.
 - (b) In non-TCAS/Weather Radar display aircraft, view the LED on the left side of the TPU 67A unit for further clarification of problem, refer to [Table 1003 TCAS Processor Fault Codes](#).

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- (c) Use a diagnostic computer to view the fault conditions of the TCAS Processor.

CAUTION: REMOVE POWER PRIOR TO REPLACING A TCAS SYSTEM COMPONENT. DAMAGE TO THE EQUIPMENT MAY OTHERWISE RESULT.

FAULT ANNUNCIATION	FAULT ISOLATION
#1 ALT DATA #2 ALT DATA ALT DATA #1 and #2	Check altitude source and associated wiring. Check proper altitude type is selected.
CONTROL DATA	Check TCAS control unit.
TCAS PROCESSOR	Replace TCAS processor.
UPPER ANTENNA LOWER ANTENNA	Check antenna and associated wiring. Use diagnostic computer to determine failed antenna connection.
ATTITUDE HEADING	Check attitude & heading sources and associated wiring. Check proper attitude type is selected.
TCAS FAIL/NO TCAS TRAFFIC DISPLAY	Check power and associated wiring. Replace traffic display unit.
TA DISPLAY #2 TA DISPLAY #1 and #2	Check vertical speed source (on TA/RA/VSI), power, and associated wiring. Replace traffic display unit.
RADIO ALT #1 or #2	Check selected radio altimeter source. Radio altimeter #2 will be indicated on single radio altimeter installations. Check proper altitude type selected.

Table 1001 TCAS/Weather Radar Display Fault Annunciations

- (5) In a dual Mode S-equipped aircraft, set the transponder select switch to #2 position to test the number two transponder. Select the test mode, observe any fail annunciations.

C. Fault Isolation Using TCAS Processor LED Fault Codes

The TCAS processor fault codes are displayed on an LED indicator located at top center on the left side of the TCAS processor (inside the top cover).

- (1) Normally, with no fault, the seven LED segments light one at a time in a figure eight pattern. The decimal also blinks.
- (2) Typically, the fault codes shown in [Table 1003 TCAS Processor Fault Codes](#) are associated with external inputs to the TCAS processor. Use these fault codes for fault isolation of the TCAS system in the aircraft.

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The following legend and abbreviations apply to [Table 1003 TCAS Processor Fault Codes](#).

F-UUU-xx - OS_DEFAULT_INTERRUPT_SERVICE_SW_EXCEPT - 80960KB Unassigned Interrupt, xx is the vector of the undefined interrupt.

SPM - System Performance Monitoring
CS - Cold Start
WS - Warm Start (power interruption < 1 sec)
FT - Functional Test

The fault codes listed apply to -0101/-0201/-1111/-1211 except as follows:

F-85-00 - applies to -1111/-1211 only
F-85-01 - applies to -1111/-1211 only
F-89-37 - applies to -1111/-1211 only
F-90-03 - applies to -1111/-1211 only

NOTE: Additional fault classes and codes may be indicated. Typically, any codes not shown in [Table 1003 TCAS Processor Fault Codes](#) indicate an internal TCAS processor failure. A single letter code, as shown below, indicates a catastrophic internal TCAS processor failure. All fault codes and unit serial number should be recorded to share with Honeywell Product Support.

CODE	FAILURE
A	RAM address line stuck low
d	RAM address line stuck high
F	CPU reserved RAM data test
b	Program memory boot block checksum failure
C	CPU Instruction
H	Program memory main block checksum failure

Table 1002 Catastrophic Single Letter Failure Codes

NOTE: Fault codes that indicate problems with the antenna or antenna cables will require additional troubleshooting to determine the cause of the fault. The [DIAGNOSTIC APPENDICES](#) list the necessary test equipment and recommended procedures for troubleshooting the antenna system.

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SYMBOL	CLASS	CODE	FAILURE
F	01	01	RAM data (SPM) - RAM on computer board not reliable
F	01	02	RAM data (CS, WS, FT) - RAM on computer board not reliable
F	01	05	Voice EPROM - Xilinx/Voice memory EPROM on I/O board failed checksum
F	01	07	ATAN EPROM - deleted with TPU67A2.10 release - part no longer on 8876 computer bd.
F	01	08	EEPROM - Factory Cal and Fault Log EEPROM on computer bd. fails checksum
F	01	09	POWER SUPPLY +3.3 V - voltage divider on I/O board reading out of spec.
F	01	10	POWER SUPPLY +6 V - voltage divider on I/O board reading out of spec.
F	01	11	POWER SUPPLY +10.5 V - voltage divider on I/O board reading out of spec.
F	01	12	POWER SUPPLY -10.5 V - voltage divider on I/O board reading out of spec.
F	01	13	POWER SUPPLY +30 V - voltage divider on I/O board reading out of spec.
F	01	14	POWER SUPPLY +50 V - voltage divider on I/O board reading out of spec.
F	01	15	POWER SUPPLY -250 V - voltage divider on I/O board reading out of spec.
F	01	18	Transmit Power - TX power read on I/O board is reading out of spec.
F	01	19	Power Supply +2.5V ref. / 5 V - voltage divider on I/O board reading out of spec.
F	01	20	429 TA/RA #1 Transmit - wrap around receiver not receiving transmitted 429 data on computer bd.
F	01	21	429 TA/RA #2 Transmit - wrap around receiver not receiving transmitted 429 data on computer bd.
F	01	22	429 XPNDR #1 Transmit - wrap around receiver not receiving transmitted 429 data on computer bd.
F	01	23	429 XPNDR #2 Transmit - wrap around receiver not receiving transmitted 429 data on computer bd.
F	01	24	429 RA #1 Transmit - wrap around receiver not receiving transmitted 429 data on computer bd.
F	01	25	429 RA #2 Transmit - wrap around receiver not receiving transmitted 429 data on computer bd.
F	02	01	Top Antenna - matching resistor on I/O bd not correct or 50 ohm loads not connected
F	02	02	Bottom Antenna - matching resistor on I/O bd not correct or 50 ohm loads not connected
F	02	04	Roll - 429 (computer bd) or Synchro (I/O bd) data invalid based on selected source
F	02	05	Pitch - 429 (computer bd) or Synchro (I/O bd) data invalid based on selected source
F	02	06	Heading (SPM) - 429 (computer bd) or Synchro (I/O bd) data invalid based on selected source

Table 1003 TCAS Processor Fault Codes

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F	02	07	Heading (CS) - 429 (computer bd) or Synchro (I/O bd) data invalid based on selected source
F	02	08	Radio Altimeter (SPM) - 429 (computer bd) or Analog (I/O bd) data invalid based on selected source
F	02	09	Radio Altimeter (CS) - 429 (computer bd) or Analog (I/O bd) data invalid based on selected source
F	02	11	RA Display Integrity - One display valid line to RA #1 or #2 must be valid (I/O bd)
F	02	12	TA Display Integrity - One display valid line to TA #1 or #2 must be valid (I/O bd)
F	02	13	XPNDR #1 failure - 429 (computer bd) data invalid
F	02	14	XPNDR #2 failure - 429 (computer bd) data invalid
F	02	15	XPNDR #1 - Control Panel failure - 429 (computer bd) data invalid, specifically label 013, 015, and 016
F	02	16	XPNDR #1 - Altitude failure - 429 (computer bd) data invalid, specifically label 203
F	02	17	XPNDR #1 - Gillham Compare failure - must be strapped for gillham compare to be done by TCAS in the config. module and have gillham inputs from port 1 and 2 differ by more than 500 feet
F	02	18	XPNDR #2 - Control Panel failure - 429 (computer bd) data invalid, specifically label 013, 015, and 016
F	02	19	XPNDR #2 - Altitude failure - 429 (computer bd) data invalid, specifically label 203
F	02	20	XPNDR #2 - Gillham Compare failure - must be strapped for gillham compare to be done by TCAS in the config. module and have gillham inputs from port 1 and 2 differ by more than 500 feet
F	04	01	VIDEO Ram data (CS, WS, FT) - Ram on video bd. not reliable
F	04	02	VIDEO Ram address stuck low - video bd.
F	04	03	VIDEO Ram address stuck high - video bd.
F	04	04	VIDEO Suppression Latch Clear Error - Video bd suppression latch will not clear
F	04	05	VIDEO Suppression Latch Mode C Error - Video bd suppression latch will not set
F	04	06	VIDEO Suppression Latch Mode S Error - Video bd suppression latch will not set
F	04	07	VIDEO Set End of Interrogation (EOI) - EOI line on video bd will not set
F	04	08	VIDEO Clear EOI - EOI line on video bd will not clear
F	04	09	VIDEO Top/Bottom Switch - Top Error video bd.
F	04	10	VIDEO Top/Bottom Switch - Bottom Error video bd.
F	04	11	VIDEO MS_ATCX True error - Mode S/Mode C bit, ATCX bit video bd.

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F	04	12	VIDEO MS_ATCX False error - Mode S/Mode C bit, ATCX bit video bd.
F	04	13	VIDEO SQ_MODEX True error - Squitter Mode bit, video bd.
F	04	14	VIDEO SQ_MODEX False error - Squitter Mode bit, video bd.
F	04	15	VIDEO EXT_CNTL True error - External control bit on video bd.
F	04	16	VIDEO EXT_CNTL False error - External control bit on video bd.
F	04	17	VIDEO MD3X Mode C error - MD3X bit on video bd
F	04	18	VIDEO MD3X Mode S error - MD3X bit on video bd
F	10	XX	Software task duration failure - XX is !MultiTask task number (software problem)
F	20	XX	Software task frequency failure - XX is !MultiTask task number (software problem)
F	81	00	Bite Ram Data Exception - software error
F	81	01	Bite Task in Progress - BITE test not completed before starting again, software error
F	81	02	Bite Software Monitor - Invalid MT! task number during SW monitor test, software error
F	81	03	TPU Initialization Timeout Error - Initialization taking too long, bad cable cal. at startup causes this failure, see also F-89-33 through F-89-36. Additionally, previous releases to 01/10 had this problem due to high suppression bus activity during cal.
F	82	00	MT_RELMEM_ERROR-MT! memory error, software error
F	82	01	MT_PERIOD_ERROR-MT! periodic event error, software error
F	82	02	MT_TASK_ERROR-MT! task initialization error, software error. Also have received in the factory when 429 inputs on xpndr channels on 8876 computer boards.
F	82	03	MT_RETURN_ERROR - Return from MT! error, software error
F	82	04	MT_GENERAL_ERROR - Invalid MT! task number, software error
F	82	05	CRIT_REG_ERROR - Incorrect critical region type requested, software error
F	82	06	MT_INVALID_SLOT - Invalid task slot number, software error
F	82	07	PWR_BAD_PDR_RAM_CS_ - RAM copy of Power Down Record has bad checksum
F	82	08	PWR_BAD_BITE_CS_ - BITE fault record has bad checksum
F	82	09	PWR_BAD_VIDEO_CS - Video warm start record has bad checksum
F	82	10	BAD_EEPROM_WRITE - Error writing to EEPROM
F	84	01	INVALID_RANGE_EXCEPTION - software error
F	84	02	DMA_422_TIMEOUT_EXCEPTION - DMA interrupt does not occur or is not seen at end of 422 transmission
F	84	03	INVALID_DISPLAY_TACODE - software error

Table 1003 TCAS Processor Fault Codes

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F	85	00	OS_DEFAULT_FAULT_SERVICE_SW_EXCEPT - An internal 80960 KB fault - possible software problem - Fault LED will display F-FAL-tt-ss-aaaaaaa where tt is fault type, ss is fault sub-type, and aaaaaaa is the address where the fault occurred
F	85	01	OS_DEFAULT_INTERRUPT_SERVICE_SW_EXCEPT - Interrupt without assigned handler executed - Fault LED will display F-UUU-xx where xx is the vector of the undefined interrupt
F	85	02	OS_DEFAULT_SPT_SERVICE_SW_EXCEPT - software error
F	85	03	OS_RETURN_FROM_MAIN_SW_EXCEPT - software error
F	85	04	OS_DMA_1030_SW_EXCEPT - 1030 Receive DMA buffer size exceeded, DMA on computer bd or software error
F	85	05	RECEIVE COORDINATION_QUEUE_OVERRUN - software error
F	85	06	DMA VOICE TIMEOUT - DMA interrupt does not occur or is not seen at end of voice message
F	85	07	RECEIVE NON-COORDINATION_QUEUE_OVERRUN - software error
F	85	08	Configuration Module Compatibility Code - Cfg module needs to be reprogrammed, ensure that ATE enable discrete input is disabled unless interface is necessary to chamber or RGS
F	85	09	Configuration Module Checksum Failure - Cfg module needs to be reprogrammed, ensure that ATE enable discrete input is disabled unless interface is necessary to chamber or RGS
F	85	50	I/O Voice Mailbox Exception - !Multitask mailbox system not working, software error
F	85	51	I/O Data Recorder Mailbox Exception - !Multitask mailbox system not working, software error
F	85	52	BITE Failure Mailbox Exception - !Multitask mailbox system not working, software error
F	85	53	BITE LED Write Mailbox Exception - !Multitask mailbox system not working, software error
F	85	54	OS 429 Mailbox Exception - !Multitask mailbox system not working, software error
F	85	55	OS CPROC EXEC Mailbox Exception - !Multitask mailbox system not working, software error
F	85	56	OS CFG MODULE Mailbox Exception - !Multitask mailbox system not working, software error
F	85	57	VIDEO CFG MODULE Mailbox Exception - !Multitask mailbox system not working, software error
F	86	00	SURV: SHOULD _NOT_BE_HERE - software error
F	86	01	SURV: NOT_ADDED_TO_HASH - too many Mode S address squitters which have a common bit pattern
F	86	02	SURV: BAD_PARAMETER - software error

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F	86	03	SURV: IDENTICAL_TIMESTAMPS - TISI did not increment timestamps, software problem
F	87	01	TRACK_TOO_FEW_INITIAL - software error
F	87	02	TRACK_ITF_NUMS_OVRFLW - software error
F	88	00	UTIL_INVALID_MODES_UF0_FIELD - software error
F	88	01	UTIL_INVALID_MODES_UF16_FIELD - software error
F	88	02	UTIL_INVALID_MODES_DF0_FIELD - software error
F	88	03	UTIL_INVALID_MODES_DF11_FIELD - software error
F	88	04	UTIL_INVALID_MODES_MSG_TYPE - software error
F	89	01	MODES_EOI_STUCK_EXCEPTION - EOI should transition at end of interrogation on video bd
F	89	03	MODES_PROC_REPLIES2_EXCEPTION - software error
F	89	04	MODES_INTERROGATE1_EXCEPTION - software error
F	89	07	MODEC_TRANSMIT_EXCEPTION - software error
F	89	08	MODEC_PROCESS_RX_EXCEPTION - software error
F	89	09	MODEC_BUFFER_FULL_EXCEPTION - too many valid Mode C replies received for buffer to be processed by Surveillance
F	89	10	MODEC_INTERROGATE_EXCEPTION - software error
F	89	11	SWAP_SWITCH_EXCEPTION - software error
F	89	12	PHASE_SHIFT_EXCEPTION - software error
F	89	13	RANGE_COUNTER1_EXCEPTION - software error
F	89	14	RANGE_COUNTER2_EXCEPTION - software error
F	89	15	WS_SEQUENCE_TYPE_EXCEPTION - software error
F	89	16	VPSDATA_FIND_NULL_EXCEPTION1 - software error
F	89	18	VPSDATA_CABLE_CAL_EXCEPTION - software error
F	89	23	MODEC_SUPPRESSION_EXCEPTION - glitch on suppression bus can cause problem
F	89	25	MODES_SUPPRESSION_EXCEPTION - glitch on suppression bus can cause problem
F	89	27	MODEC_EOI_STUCK_EXCEPTION - EOI should transition at end of interrogation on video bd
F	89	28	DMA_COUNT1_EXCEPTION - too many replies or malfunctioning DMA operation
F	89	29	DMA_COUNT2_EXCEPTION - too many replies or malfunctioning DMA operation
F	89	30	VILIMIT_DEFAULT_EXCEPTION - software error
F	89	31	EEPROM write of video data failed - EEPROM on computer bd not writable
F	89	32	EEPROM read of video data failed - EEPROM on computer bd not readable
F	89	33	VPSDATA_DYN_RANGE_T_EXCEPTION - cable calibration failure on top antenna caused by dynamic range too low (improperly aligned)

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F	89	34	VPSDATA_ZERO_COUNTS_T_EXCEPTION - cable calibration failure on top antenna caused by too many zero counts (improperly aligned)
F	89	35	VPSDATA_DYN_RANGE_B_EXCEPTION - cable calibration failure on bottom antenna caused by dynamic range too low (improperly aligned)
F	89	36	VPSDATA_ZERO_COUNTS_B_EXCEPTION - cable calibration failure on bottom antenna caused by too many zero counts (improperly aligned)
F	89	37	INCORRECT_INEQUALITY_SELECTION - incorrect interference limiting inequality selected, software error
F	90	00	COORDINATION_UNLOCK_TIMEOUT - in coordination lock too long, software error
F	90	01	COORDINATION_LOCK_TIMEOUT - waiting for coordination lock too long, software error
F	90	02	TOO_MANY_INITIAL_INTENTS - software error
F	90	03	CAS_BARO_ALTITUDE_FAILURE - CAS logic has determined that own aircraft baro altitude is not credible

Table 1003 TCAS Processor Fault Codes

D. Fault Isolation Using the Diagnostic Computer

- (1) The 9-pin diagnostic test connector must be installed and accessible in the aircraft, to use the diagnostic computer.
- (2) Diagnostic Software
 - (a) TPU Diagnostic/Configuration Module Set-up Software for TPU 67A unit SW version 01/09 and below is provided on 3.5 inch diskette p/n 222-00359-00() and 5.25 inch diskette p/n 222-00358-00(). TPU diagnostic software must be loaded onto a diagnostic computer having the requirements listed in the TPUDIAG - TPU Field Diagnostic Program User Instructions ([DIAGNOSTIC APPENDICES](#)). Refer to instructions on the diskette for operation of the TPU diagnostic software.
 - (b) TCAS Diagnostic/Configuration Module Set-up Software for TPU 67A unit SW version 01/10 and above is provided on 3.5 inch diskette p/n 222-00386-00(). TCAS diagnostic software must be loaded onto a diagnostic computer having the requirements listed in the TCASDIAG - TCAS Field Diagnostic Program User Instructions ([DIAGNOSTIC APPENDICES](#)). Refer to instructions on the diskette for operation of the TCAS diagnostic software.
 - (c) TCAS Diagnostic/Configuration Module Set-up Software for TPU 67A unit SW version 01/10 and above is provided on CD-ROM p/n 222-30003-00(), TCASDIAG for Windows. TCAS diagnostic software must be loaded onto a diagnostic computer having the requirements listed in the TCASDIAG - TCAS Field Diagnostic Program User Instructions ([DIAGNOSTIC APPENDICES](#)). Refer to instructions on the CD-ROM for operation of the TCAS diagnostic software.
- (3) The diagnostic software performs two basic functions:
 - Reads and displays the current status of TPU Input Data
 - Reads and writes to disk, the contents of the TPU Diagnostic Log

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(4) The following is a sample of the Input/Output Data Dump.

```
***** I/O Dump *****
Mag. Heading (Deg.):      0.00          Pitch (Deg.):            0.00
Heading Status:          VAL            Pitch Status:           VAL
Heading Type:            429            Attitude Type:         ARINC 429
Enc. Altitude (ft.):     8000.00        Roll (Deg.):            0.00
Enc. Alt. Status:        VAL            Roll Status:           VAL
Enc. Alt. Resolution:    Fine          Rad. Alt. (ft.):       4000.00
XNDR Source:             Port #1        Rad. Alt. Status:      VAL
Landing Gear (A21):      Retracted     Rad. Alt. Type:        429 Rad. Alt.
Air/Ground (A22):        Airborne      Rad. Alt Source (A66): Port #1

Aircraft (Mode S) Address: N200ZC        A19445 (HEX)           50312105 (Octal)
Airborne Funct Test:      Allowed       Max. Airspeed:         150-300 kts.
Performance Limit:       Enabled      Display Intruder Limit: No Limit
Functional Test (A20):    INACTIVE    Adv. Inhibits #1 - #2: OPEN OPEN
Aural Output: No Tone or Muting          Intruder File Format:   ARINC 735
Altitude Limit:          60000      Adv./Annunciator Cancel: NO (OPEN)
Attitude/Heading Source: Port #1        Display All Traffic:    YES
Own A/C Sensitivity:      5           Gnd Display Mode:      TA ONLY

Air Volume:              40 mW, 4.0 W        Gnd Volume:            40 mW, 4.0 W
Climb Inhibit 1-2       OPEN OPEN          Inc Climb Inhib 1-2:  OPEN OPEN
TA Flag #1, #2 (A34, 35): VAL VAL            RA Flag #1, #2 (B85,86): VAL VAL
Top antenna (J1-J4):     7f 80 80 80       Bottom antenna (J1-J4): 00 01 01 03
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(5) Description of TCAS Input/Output Parameters

Mag. Heading (Deg.) displays a digital value between 0.00° and ±180.00° (+ RT); or between 0.00° and ±360.00° (+ RT) for TPU 67A unit SW version 01/11 and higher. This value should be reasonably stable and reflect the compass reading in the cockpit.

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Heading Status indicates VAL (Valid) or INV (Invalid). A Valid indicates all the heading parameters meet the electrical requirements. An Invalid may indicate an invalid flag; determined by the Analog Flag A 86 or Binary label 014/320 inputs. An invalid may also indicate an incorrect 26 Vac 400 Hz reference input.

Heading Type (A 23) will indicate either ARINC 429 or synchro data. Program option 0 = ARINC 429; option 1 = Synchro.

Enc. Altitude (ft.) Encoding Altitude is a digital value between -1,000 ft. and 127,000 feet. This value should be reasonably stable and reflect the 29.92" altimeter reading in the cockpit. Additionally, this value should match the encoded altitude being broadcast by the transponder.

Enc. Alt. Status indicates VAL (Valid) or INV (Invalid).

Enc. Alt. Resolution indicates coarse or fine from transponder.

XNDR Source indicates which Mode S, diversity transponder is active, #1 or #2.

Landing Gear (A 21) indicates Extended or Retracted. Extended is shown when a GND is on the designated pin.

Air/Ground (A 22) also called WOW indicates On-Ground or Airborne. On-Ground is shown when a GND is on the designated pin.

Pitch (Deg.) displays a digital value between 0.00° and ±180.00° (+ UP) for TPU 67A unit SW version 01/10 and lower; or (+ UP/- DOWN) for TPU 67A unit SW version 01/11 and higher. This value should be reasonably stable and reflect the attitude reading in the cockpit.

Pitch Status indicates VAL (Valid) or INV (Invalid). A Valid indicates all the pitch attitude parameters meet the electrical requirements. An Invalid may indicate an invalid flag; determined by the Analog Flag, A 85, or binary label 324 input. An Invalid may also indicate an incorrect 26 Vac 400 Hz reference input.

Attitude Type (A 24, 25) will indicate Synchro or ARINC 429 data. Synchro indicates 3-wire ARINC 407 attitude input. Program option 0 = ARINC 429, option 1 = Synchro.

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Roll (Deg.) displays a digital value between 0.00° and ±180.00° (+RT Bank) for TPU 67A unit SW version 01/10 and lower; or (-LT/+RT) for TPU 67A unit SW version 01/11 and higher. This value should be reasonably stable and reflect the attitude reading in the cockpit.

Roll Status indicates VAL (Valid) or INV (Invalid). A Valid indicates all the roll attitude parameters meet the electrical requirements. An Invalid may indicate an invalid flag; determined by the Analog, A 85, or binary label 325 input. An Invalid may also indicate an incorrect 26 Vac 400 Hz reference input.

Rad. Alt. (Radio Altitude) is the height above the ground in feet. This value is usually between -20 ft. and 2,500 ft on analog systems and up to 4,000 ft. on some digital 429 systems.

Rad. Alt. Status indicates VAL (Valid) or INV (Invalid). A Valid indicates the selected radio altitude source is valid. An Invalid may indicate an invalid flag; determined by the Analog Flag, A 37/39, or ARINC label 164/165 inputs.

Rad. Alt. Type (A 53, 40, 42) will indicate ARINC 429, KRA 405, SPERRY, COLLINS, ARINC 552A data. This program option should agree with the voltage scale used from the radio altitude source; i.e., the KRA 405 has outputs to match the KING, SPERRY or COLLINS voltage scales. Configure the TPU 67A for COLLINS when using a Collins (dual slope) output from the KRA 405 unit. Program option 0 = ARINC 552A, option 1 = Collins (ALT50/55), option 2 = Sperry, option 3 = King (KRA 405), option 4 = ARINC 429.

Rad. Alt Source (A 66) indicates Port #1 or Port #2 as the source. A GND on pin A 66 will select port #2, otherwise port #1 is the radio altitude source.

Aircraft (Mode S) Address will indicate the ICAO aircraft address. If the aircraft is US registered the "N" field will show the N number. The HEX and Octal values will also be indicated. Insure that these values correspond with the aircraft being tested.

Airborne Functional Test (A 31) indicates Allowed or Inhibited. Program option 0 = Not inhibited; option 1 = Inhibited. Typically, option 0 is used.

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Performance Limit (1500 fpm) cannot climb determined by FMS or by Altitude Limit. Program option 0 = not limited; option 1 = Performance limited by altitude limits.

Functional Test (A 20) also called FT will indicate Inactive or GND to reflect the state of the discrete switch input.

Aural Output Function No delay in voice, audio tone output 1 second prior to voice, or voice muting.

Altitude Limit indicates the maximum altitude at which the aircraft is capable of climbing at 1500 fpm. Indicated as an even number between 0 and 62000 feet. This limit will be active only when Performance Limit is active.

Attitude/Heading Source is used as the Heading/Attitude Source Port Identifier for TPU 67A p/n 066-01146-0201,-1211. It is not used by TPU 67A p/n 066-01146-0101,-1111.

Own A/C Sensitivity indicates Standby, 1-7. The processor determines this value by altitude.

Max. Airspeed (B 74, 75, 76) indicates NO MAX, < 75 kts, 75-150 kts, 150-300 kts, 300-600 kts, 600-1200 kts, > 1200 kts, or Invalid. The configuration should reflect the aircraft type; typically turbo-props are 150 to 300 kts and jets are 300 to 600 kts.

Display Intruder Limit (B 77, 78, 79) indicates MAX. (30), 24, 20, 16, 12, 8, 4, MIN. (3). Program options limit the number of intruders that can be displayed. Typically radar indicators are set to Max. (30) and the 3 ATI indicators are set to 12 intruders.

Adv. Inhibits #1 - #2 (A 17, 18) will indicate OPEN when inactive and GND when the appropriate input is grounded. Typically, these straps are OPEN except during a GPWS or Wind Shear inhibit condition.

Intruder File Format indicates the intruder file format (BCAS or ARINC 735) TCAS will transmit. Program option 0 = ARINC 735, option 1 = Honeywell BCAS format. Typically option 0 is used.

Adv./Annunciator Cancel (A 72) indicates NO (OPEN) or YES (GND). Typically this switch is not used.

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Display All Traffic (A 32) indicates YES (OPEN) or NO (GND). When program option 1 is selected (and other conditions are met) all traffic is only displayed during a TA or RA. When option 0 is selected all traffic is displayed. Typically option 1 is used.

Ground Display Mode (A33) indicates TA ONLY; or STANDBY. Program option 0 = TA ONLY mode on ground. Program option 1 = STANDBY on ground. Typically option 0 is used.

Air Volume will indicate the speaker audio level program option in watts. Program options: 0=4, 1=2, 2=1, 3=0.5, 4=0.25, 5=0.125, 6=0.0625, or 7=6.5 watts are the values that will be annunciated. Four watts is the default indication. The headphone audio level program option in milli-Watts (mW) 0=40, 1=20, 2=10, 3=5, 4=2.5, 5=1.25, 6=100, or 7=80 mW are the values that will be annunciated. Forty mW is the default indication. Insure this value agrees with the design specification.

Ground Volume (A 76, 77, 78) (A 82, 83, 84) program options for the speaker and headphone audio output levels are the same as listed under Air Volume above. Insure this value agrees with the design specification.

Climb Inhibit 1-2 (B87,88) indicates when the aircraft cannot climb at a rate of 1500 fpm. If input #1 and #2 are grounded, climb is inhibited.

Increase Climb Inhibit 1-2 (A98, 99) indicates when the aircraft cannot climb at a rate of 2500 fpm. If inputs #1 and #2 are grounded, increase climb is inhibited.

TA Flag #1, #2 (A34, 35) and RA Flag #1, #2 (B85, 86) indicates INV (Invalid) when the appropriate pin is invalid or open and Valid when the input is LO or grounded. At least one TA and one RA input must be Valid for TCAS to operate (display traffic).

Top & Bottom Antenna Elements (J1 - J4) annunciates a HEX value that indicates the status of the antenna elements. A HEX value between 72H and 8DH is annunciated if the processor confirms the correct directional antenna element resistance. If ANT 67A directional antennas are installed and a different value is shown, then the antenna installation must be inspected to determine the fault.

A HEX value between 00H and 0DH is indicated on Bottom elements J2 - J4 when the 50 ohm terminations are correct for a bottom omni antenna installation. The J1 antenna element should indicate 00H (Short Circuit). A TCAS tester is required to verify that the bottom omni TCAS antenna is transmitting properly.

(6) TPU Diagnostic Log

The TPU Diagnostic Log contains data that is accumulated over the operating history of the TPU unit. This data is stored in non-volatile memory and is maintained when the TPU is turned off. Using the TPU Diagnostic Program, the Diagnostic Log is read from the TPU and stored in a file for later viewing, printing, or importing into a spreadsheet.

The Diagnostic Log contains three types of information: unit configuration information, cumulative operating history, and power cycle log.

- (a) Unit Configuration Information: Information contained in this section includes the unit part number, the unit serial number, and the software version identification data.
- (b) Cumulative Operating History: This section contains information that is accumulated over the lifetime of the TPU unit. This information includes:
 - 1 Current Hobbs Meter: This is the total time that the unit has been running in terms of hours and tenths of hours.
 - 2 Minimum Temperature: This is the minimum internal operating temperature that the TPU unit has experienced. The Hobbs at Minimum Temperature is the value of the Hobbs meter when the minimum temperature occurred.
 - 3 Maximum Temperature: This is the maximum internal operating temperature that the TPU unit has experienced. The Hobbs at Maximum Temperature is the value of the Hobbs meter when the maximum temperature occurred.
 - 4 Cumulative Power Cycles: This is the total number of times that the TPU has been powered on and off.