

# CHAPTER 4

## MAINTENANCE

### 4.1 INTRODUCTION

This chapter contains general flight-line maintenance and troubleshooting procedures for installations interfaced to WX-1000/SKY497 display or an alternate display. Removal of components is on condition of failure. Troubleshooting is intended to aid in isolating failures to a defective assembly. Each time the TRC, directional antenna, or directional antenna cables (including connectors) are replaced, the TRC must be calibrated to the directional antenna (refer to paragraph 4.4.1).

### 4.2 CONTINUED AIRWORTHINESS

No scheduled maintenance is required to ensure continued airworthiness.

### 4.3 PERIODIC MAINTENANCE

At regular inspection intervals, do the periodic maintenance procedures of paragraph 4.3.1 thru 4.3.3.

#### 4.3.1 WX-1000/SKY497 Display

1. Check that indicator cable is properly mated and secured.
2. Check to ensure unit is properly placed and secured to the instrument panel.

**CAUTION**

Do not use cleaning solvents on the viewing face.

3. Check face-plate for cleanliness. Wipe the viewing face with a damp lint-free, static-free cloth. If necessary, clean with a soft cloth moistened with a mild solution of soap and water. Take care to prevent cleaning solution from running down inside the case.

#### 4.3.2 TRC

1. Check that connectors are properly mated and secure.
2. Check to ensure that the hold-down knobs on the mounting tray are secured to the TRC.

#### 4.3.3 Antenna

1. Check for dents, cracks, and punctures.

**CAUTION**

Do not paint the antennas.

Do not use cleaning solvents on the antennas.

2. Remove all dirt and grease from surface areas. Clean with a soft cloth moistened with mild soap and water.
3. Visually inspect sealant around the antenna base. Reapply sealant if required.

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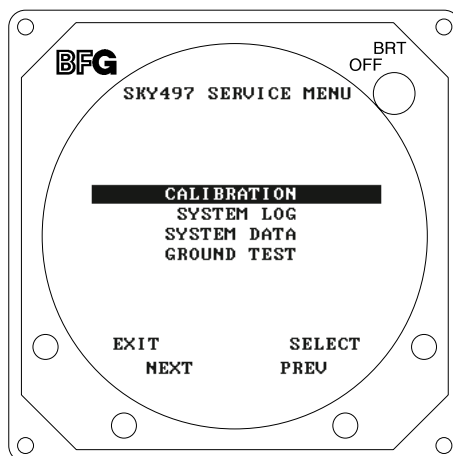
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### 4.4 SERVICE MENU

The Service Menu is intended as an aid in installing, testing and troubleshooting the SKY497. Service Menu items are to be used only for testing and troubleshooting an installation. The Service Menu is not intended to be used by the pilot during normal system operation. When interfaced to an alternate display the service menu functions must be performed by using an RS-232 terminal device, see appendix D for operating instructions.

The Service Menu is accessed by holding soft-keys (1) and (2) (the left two buttons) depressed as the system is turned on. Hold the buttons until the Service Menu is displayed. The Service Menu is shown in figure 4-1.



**Figure 4-1. Service Menu**

The buttons perform the following operations:

- **EXIT** - causes the system to exit the Service Menu and run the power on self-test.
- **SELECT** - selects the highlighted item.
- **PREV** - steps to the previous item.
- **NEXT** - steps to the next item.

The Service Menu provides the following choices:

- Calibration
- System Log
- System Data
- Ground Test (Available only if squat switch input indicates aircraft is on the ground.)

The individual menu items are explained in the following paragraphs.

#### NOTE

Service Menu screens are shown for documentation purposes only. Each system may be configured differently and live data will correspond to the sensors installed in a particular aircraft..

#### 4.4.1 Calibration

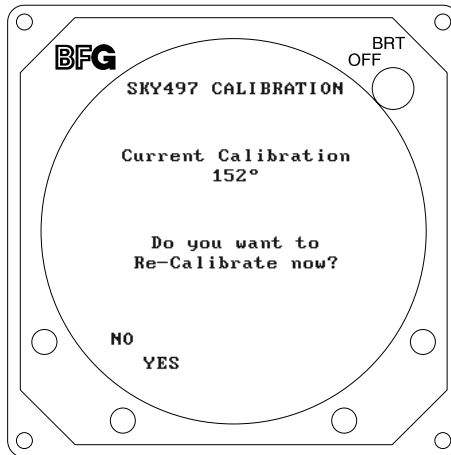
**NOTE**

Ensure transponder is in standby while doing calibration.

Each time the TRC, directional antenna, or any of the directional antenna cables (including connectors) have been repaired or replaced the TRC must be calibrated. Calibration is accessed by selecting that option from the Service Menu (i.e., press **SELECT** with **Calibration** high-lighted). The initial calibration screen (see figure 4-2) shows the current calibration value in degrees. Calibration can be performed with the terminal device by using the Cal command.

**NOTE**

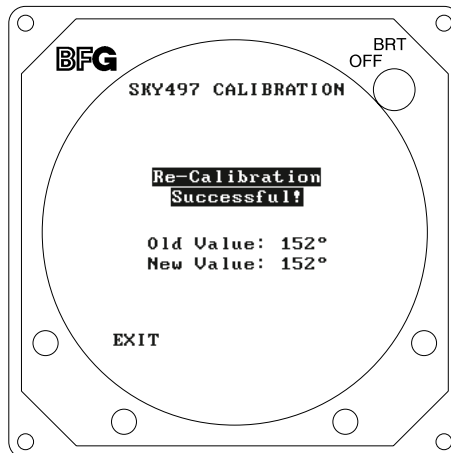
If the TRC has never been calibrated, the current calibration value will be displayed as 999.



**Figure 4-2. Calibration Screen**

Press **YES** to calibrate; press **NO** to return to the Service Menu. Soft-keys (3) and (4) are not used. During the calibration procedure, the message “Re-Calibrating . . .” will be displayed.

After a successful calibration, both old and new calibration values will be displayed (as shown in figure 4-3). Press **EXIT** to return to the Service menu. Soft-keys (2), (3), and (4) are not used.



**Figure 4-3. Successful Re-Calibration**

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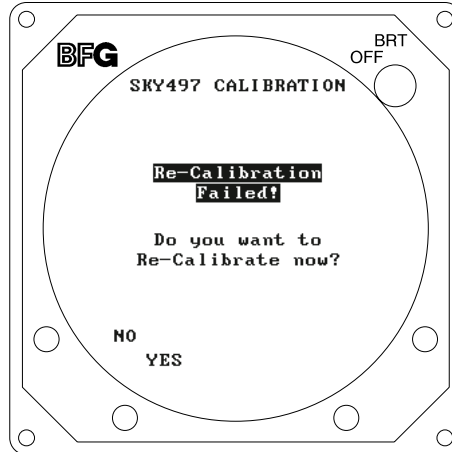
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The calibration value (000-359) is derived from a variety of measurements. Specific values are meaningless however, in a failed TRC, a varying spread may indicate problems with the directional antenna system (antenna, cables, or connectors) or the TRC.

If the calibration failed, the message “Re-calibration Failed!” will be display (see figure 4-4).



**Figure 4-4. Failed Calibration**

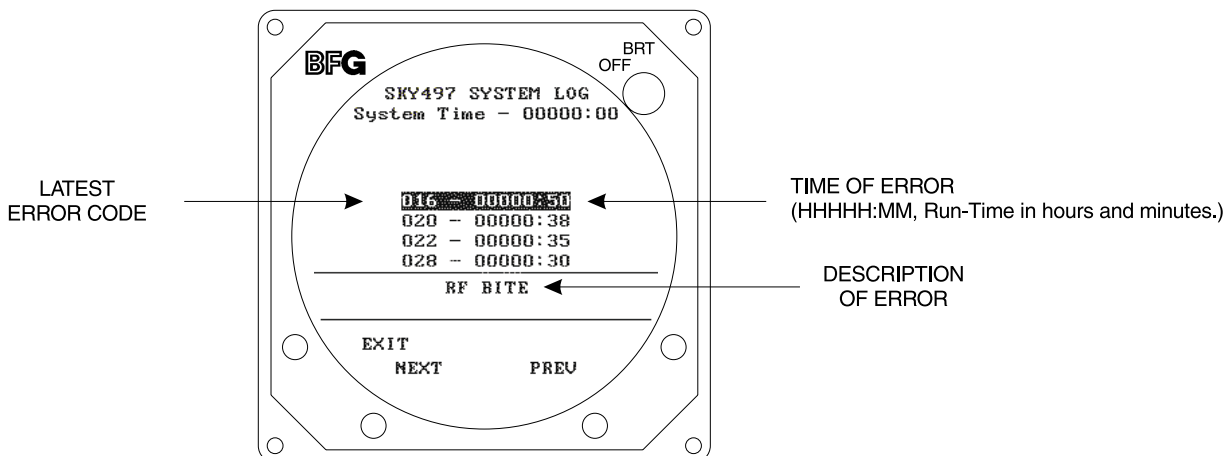
Press **YES** to calibrate; press **NO** to return to the Service Menu. Soft-keys (3) and (4) are not used.

## 4.4.2 System Log

The 20 most recent errors detected by the system self-test are saved in the System Log. For each error, the corresponding error code and run-time of occurrence are saved. The system log, as shown in figure 4-5, is displayed by selecting that option from the Service Menu (i.e., press **SELECT** with **System Log** highlighted). System Log can be accessed with a terminal device by using the Dump command.

### NOTE

Tables 4-2 and 4-3 provide a list and description of each error code (see paragraph 4.6).



**Figure 4-5. System Log**

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The System Log displays the results in the following format:

**### HHHHH:MM**

where:

**###** = Error code.  
**HHHHH:MM** = Run-time (in hours and minutes) at which error occurred.

The total elapsed run-time is displayed in the upper middle portion of the screen (**System Time HHHHH:MM**).

A textual description of the highlighted error entry is displayed in the bottom portion of the screen.

If the System Log is empty, the following message is displayed:

**NO FAULTS DETECTED**

If, due to a failure of non-volatile memory, the System Log cannot be displayed, the following message is displayed:

**DATA NOT AVAILABLE**

The buttons perform the following operations:

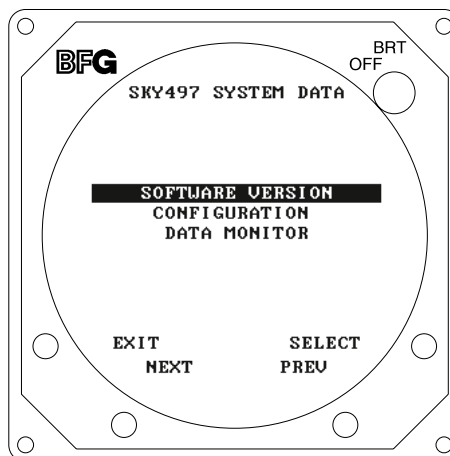
- **EXIT** - causes the system to return the Service Menu.
- **NEXT** - steps to the next entry.
- **PREV** - steps to the previous entry.
- Soft-key (4) is not used.

### 4.4.3 System Data

System Data screens (see figures 4-6 through 4-16) contain a record of setup information (software identification and jumper configuration) and real-time sensor data. If you have problems with the SKY497, verify the configuration screens match the wiring diagrams (see figures 2-2 and 2-3) and have this information available when contacting BFGoodrich Avionics Systems Field Service Engineering. The field service engineer must have adequate information to diagnose a problem. System Data screens are accessed by selecting that option from the Service Menu (i.e., press **SELECT** with **System Data** high-lighted).

The System Data screen provides the following choices:

- Software Version
- Configuration
- Data Monitor



**Figure 4-6. System Data**

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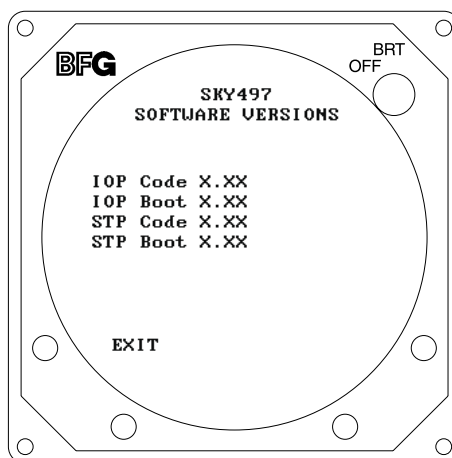
The buttons perform the following operations:

- **EXIT** - returns to the Service Menu (figure 4-1).
- **SELECT** - selects the highlighted item.
- **PREV** - steps to the previous item.
- **NEXT** - steps to the next item.

**4.4.3.1 Software Version.** The software version screen (see figure 4-7) identifies:

- IOP Code Version
- IOP Boot Version
- STP Code Version
- STP Boot Version

Software version can be accessed with a terminal device by using the Version command.



**Figure 4-7. Software Version**

### NOTE

The software version identified on the TRC equipment tag represents the system software configuration (i.e., a collective designator for all software/firmware installed within the unit).

Press **EXIT** to return to the System Data screen. Soft-keys (2), (3) and (4) are not used.

**4.4.3.2 Configuration.** The configuration display consists of 4 pages. Configuration data on pages 1, 3 and 4 must be verified and saved on all new installations or if changes in configuration jumper(s) occur. The buttons perform the following operations:

- **EXIT** - returns to the System Data Menu (figure 4-6).
- **NEXT** - steps to the next page.
- **PREV** - steps to the previous page.
- **SAVE** - saves configuration data for that page (not present if configuration jumpers match configuration memory).

Configuration information can also be accessed with a terminal device by using the Config command.

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## NOTES

1. Saved configuration data is read at power-up and compared with configuration jumpers. If the saved configuration data has never been saved (e.g., new installations) an ERROR 30 Check Configuration will occur when the box comes out of standby. If the saved configuration data does not match the current jumper(s) an error 30 will occur at power-up. The conflicting jumper(s) will be highlighted on configuration screen(s). (See figure 4-8.)
2. Configuration pages 1, 3 and 4 contain configuration jumper data. On each page verify jumpers are correct and press SAVE to write the new configuration into system memory. When done the SAVE button disappears. Repeat this step for each page. Save command can be used if using a terminal device.

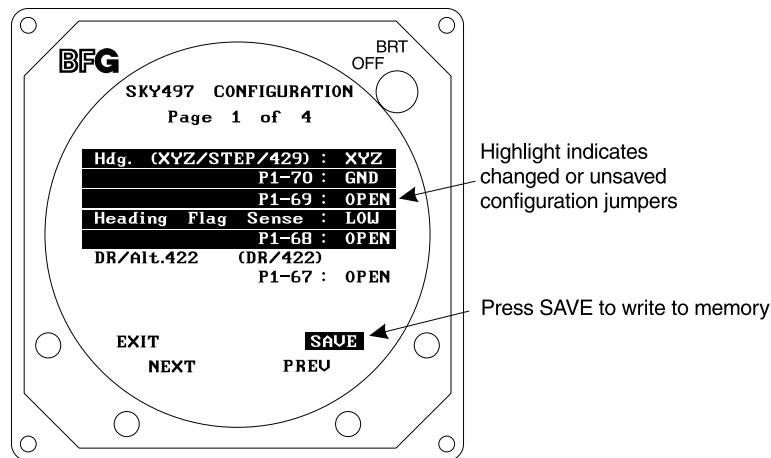


Figure 4-8. Configuration - Page 1

Page 1 of 4 (see figure 4-8) displays:

- Heading Input Source (Hdg.: XYZ, STEP, 429, or NONE)  
Configuration Jumpers P1-69 & P1-70 (OPEN or GND)

	<u>P1-69</u>	<u>P1-70</u>
None	OPEN	OPEN
Synchro XYZ	OPEN	GND
Stepper	GND	OPEN
ARINC 429 Bus	GND	GND

- Heading Flag Sense (HIGH or LOW)  
Configuration Jumper P1-68 (OPEN or GND)

P1-68

- OPEN If LOW level input on HDG\_FLG+ (P1-53) indicates valid heading or no valid heading input is available.
- GND If HIGH level input on HDG\_FLG+ (P1-53) indicates valid heading.

- RS422 Interface (DR/Alt. 422: DR or 422)  
Configuration Jumper P1-67 (OPEN or GND)

	<u>P1-67</u>
Data Recorder	OPEN
Alternate*	GND

\*Future Option

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## NOTE

The RS422 Interface is used for factory testing and evaluation.

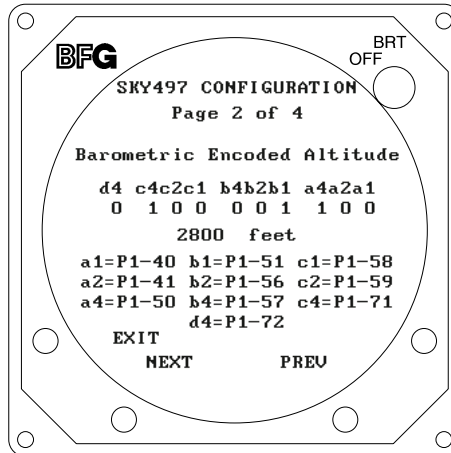


Figure 4-9. Configuration - Page 2

Page 2 of 4 (see figure 4-9) displays:

- Barometric Encoded Altitude (in Gray Code and Feet)
- Connector P1 Pin Assignments for Data Inputs

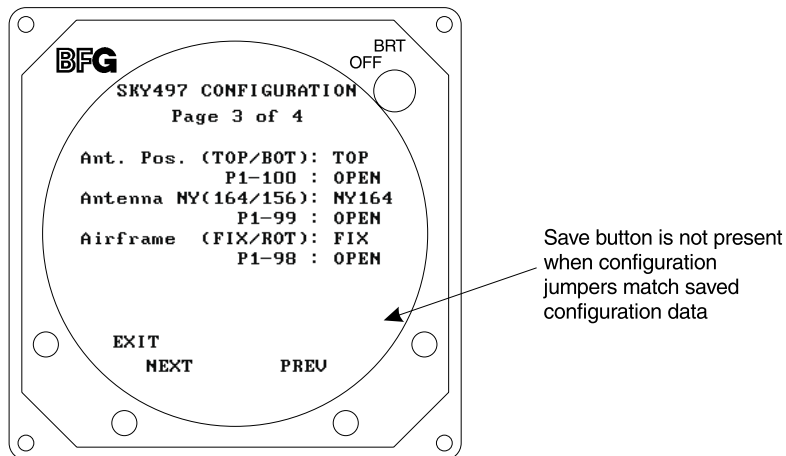


Figure 4-10. Configuration - Page 3

### WARNING

Verify displayed antenna position matches antenna location on the aircraft (top or bottom). Failure to do so could give incorrect traffic bearing.



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Page 3 of 4 (see figure 4-10) displays:

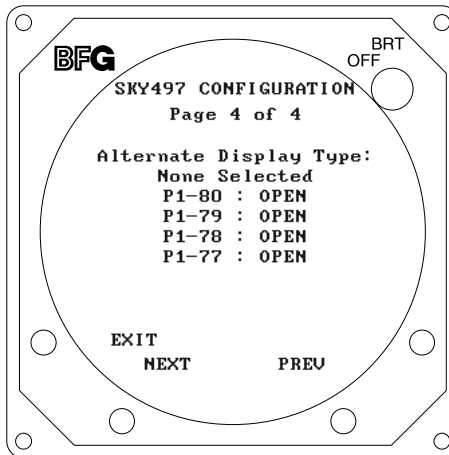
- Antenna Position (Ant. Pos.: TOP or BOT)  
Configuration Jumper P1-100 (OPEN or GND)
 

	<u>P1-100</u>
Top	OPEN
Bottom*	GND

\*See paragraph 2.3 (ANTENNA LOCATION)
- Antenna Type (NY164 or NY156)  
Configuration Jumper P1-99 (OPEN or GND)
 

	<u>P1-99</u>
NY164	OPEN
NY156	GND
- Airframe (Ant. Pos.: FIX or ROT)  
Configuration Jumper P1-98 (OPEN or GND)
 

	<u>P1-98</u>
Fixed Wing	OPEN
Rotorcraft	GND



**Figure 4-11. Configuration - Page 4**

Page 4 of 4 (see figure 4-11) displays:

- Alternate Display Type (None Selected, ARINC 735 Type 1, or Illegal Display)  
Configuration Jumpers P1-77, P1-78, P1-79 & P1-80 (OPEN or GND)
 

	<u>P1-77</u>	<u>P1-78</u>	<u>P1-79</u>	<u>P1-80</u>
None	OPEN	OPEN	OPEN	OPEN
735 Type 1	OPEN	OPEN	OPEN	GND

**4.4.3.3 Data Monitor.** The data monitor display consists of 5 pages. The buttons perform the following operations:

- **EXIT** - returns to the System Data Menu (figure 4-6).
- **NEXT** - steps to the next page.
- **PREV** - steps to the previous page.
- Soft-key (4) is not used.

The data monitor information can be accessed with a terminal device by using the Bar, Head, Rad and Config commands.

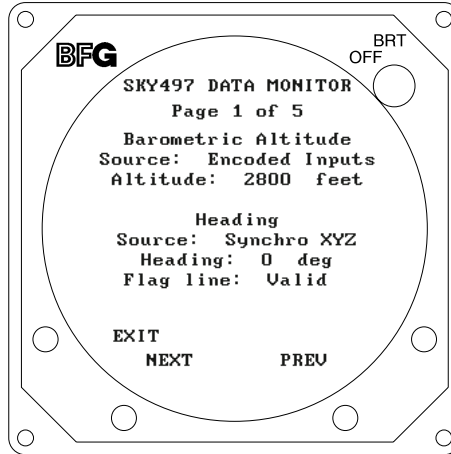
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**Figure 4-12. Data Monitor - Page 1**

**NOTE**

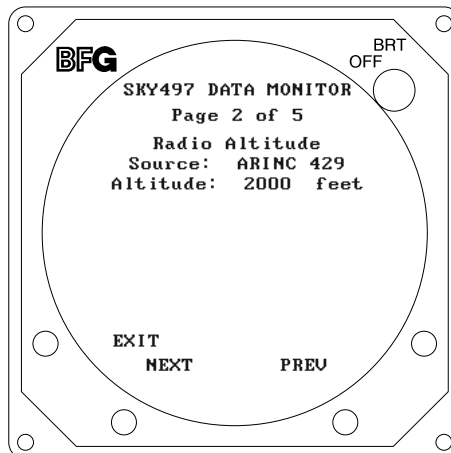
Values displayed on the Data Monitor are continuously updated. The sensor source (e.g., ARINC 429, Synchro XYZ, etc.) is latched at power-up. If it is necessary to change a configuration, cycle power to ensure the correct information is read into memory.

Page 1 of 5 (see figure 4-12) displays:

- Barometric Altitude  
    Source (Encoded Inputs, ARINC 429, or Simulated)  
    Altitude (in Feet)
- Heading Data  
    Source (Synchro XYZ, ARINC 429, None, or Simulated)  
    Heading (in Degrees)  
    Flag Line (Valid or Invalid)

**NOTES**

1. When the system is set to GROUND TEST, the barometric altimeter is simulated to 50,000 ft and the heading simulated to 0 degrees.
2. If an INVALID “Flag Line” is detected, the “Heading” will be flagged INVALID.



**Figure 4-13. Data Monitor - Page 2**

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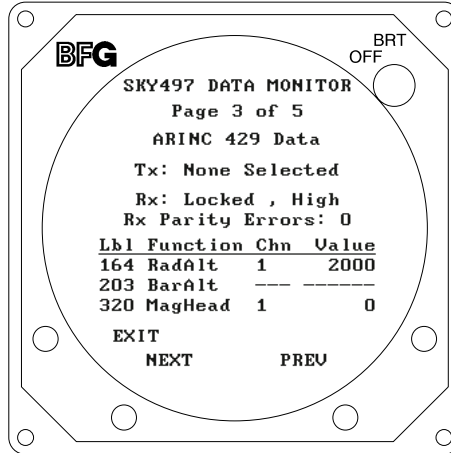
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Page 2 of 5 (see figure 4-13) displays:

- Radio Altitude
  - Source (ARINC 429, None, or Simulated)
  - Altitude (in Feet)

**NOTE**

When the system is set to GROUND TEST, the radio altimeter simulated to 2,500 ft.



**Figure 4-14. Data Monitor - Page 3**

Page 3 of 5 (see figure 4-14) displays ARINC 429 Data:

- Transmit Data (Tx: None Selected or ARINC 735 Type 1\*, Illegal)
  - \*Alternate Display Device
- Received Data (Rx):
  - Status (Locked or Seeking)
  - Speed (High or Low)
  - Number of Parity Errors
- Label Data
  - Label Number & Function
    - 164 RadAlt (Radar Altimeter)
    - 203 BarAlt (Barometric Altimeter)
    - 320 MagHead (Magnetic Heading)
  - Channel (1 or 2)
  - Value (Altitude in Feet; Heading in Degrees)

A "Failed" message will appear if the system fails an internal ARINC 429 communications test.

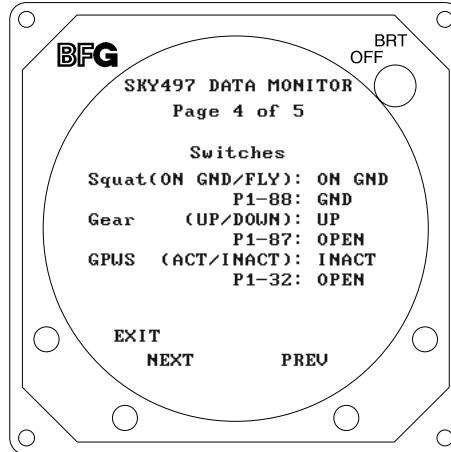
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**Figure 4-15. Data Monitor - Page 4**

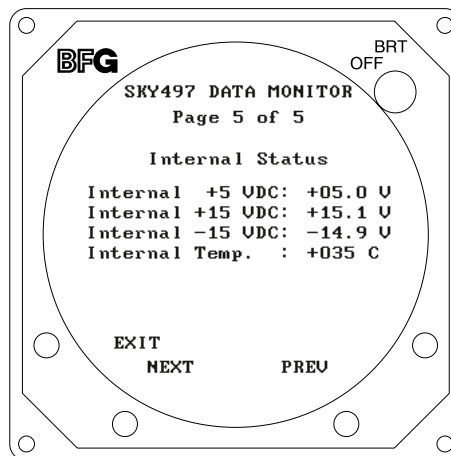
Page 4 of 5 (see figure 4-15) displays switch status:

- Squat Switch (ON GND/FLYING)  
Connector P1-88 (SQUAT) Input (OPEN or GND)

	<u>P1-88</u>
Flying	OPEN
On Ground	GND
  
- Landing Gear (UP/DOWN)  
Connector P1-87 (GEAR) Input (OPEN or GND)

	<u>P1-87</u>
Gear Up	OPEN
Gear Down	GND
  
- GPWS (ACTIVE/INACTIVE)  
Connector P1-33 (GPWS) Input (OPEN or GND)

	<u>P1-32</u>
Inactive	OPEN
Active	GND



**Figure 4-16. Data Monitor - Page 5**

Page 5 of 5 (see figure 4-16) displays measurements of the following internal values:

- Voltage (+5 VDC, + 15 VDC, & -15 VDC)
- Processor Temperature (Degrees C)

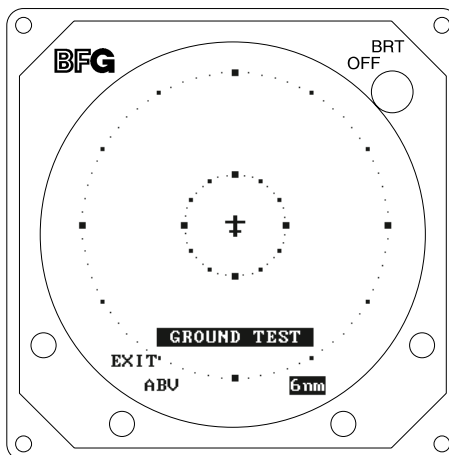
#### 4.4.4. Ground Test

Ground Test initializes the system for on-the-ground testing. In this configuration, the barometric altimeter is simulated to 50,000 ft, heading simulated to 0 degrees, and the radar altimeter simulated to 2,500 ft.

#### NOTE

Ground test is available only if the squat switch input indicates aircraft is on the ground.

Ground test (see figure 4-17) is accessed by selecting that option from the Service Menu (i.e., press **SELECT** with **Ground Test** highlighted). To access ground test with a terminal device use the Ground Test command.



**Figure 4-17. Ground Test**

If the system detects a heading fault, **HDG** will be displayed in the bottom center portion of the screen.

The buttons perform the following operations in this mode:

- **EXIT** - causes the system to return the System Data Menu (figure 4-6).
- Soft-key (2) toggles the system through the above (**ABV**), normal (**NRM**), and below (**BLW**) altitude display modes. It is labeled to indicate current mode (i.e., **ABV**, **NRM**, or **BLW**).
- Soft-key (3) toggles the display range between 2 and 6 nm. It is labeled to indicate current range (i.e., **2nm** or **6nm**).
- Soft-key (4) is not used.

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### 4.5 TROUBLESHOOTING

Table 4-1 is intended to assist trained electronic technicians to determine which assembly is inoperative. Do the corrective action steps in the order described. Use the Service Menu (refer to paragraph 4.4) as an aid in fault isolation. Information available from the service menu can help identify conditions that need to be resolved. If interfaced to an alternate display service menu must be accessed via an RS-232 terminal device, see Appendix D for operating instructions.

**Table 4-1. Fault Isolation**

SYMPTOM	CORRECTIVE ACTION
Display remains dark after SKYWATCH is powered ON.	<ul style="list-style-type: none"> <li>a. Check position of the WX-1000 maintenance switch (NORMAL/OVERRIDE).</li> <li>b. Reset circuit breaker if it is tripped.</li> <li>c. Check aircraft power source.</li> <li>d. Check connection to WX-1000 processor, if installed.</li> <li>e. Check power input at TRC mating connector.               <ul style="list-style-type: none"> <li>P8-A +28V (10.5-34V PWR)</li> <li>P8-B +28V_RET (AIRCRAFT PWR RETURN)</li> </ul> </li> <li>f. Check cables connected to display.</li> <li>g. Replace Display.</li> </ul>
Display is distorted.	Check for interference from aircraft systems.
Incorrect response to buttons (soft-keys).	Check soft-key wiring inside display cable and WX-1000 processor cable (if installed).
SKYWATCH will not enter service menu.	<ul style="list-style-type: none"> <li>a. Check soft-key wiring.</li> <li>b. Verify alternate display pins (P1-77, P1-78, P1-79, or P1-80) are not configured to ground. Service menu is not accessible via softkeys when an alternate display is configured.</li> <li>c. If using an alternate display service menu must be accessed via an RS-232 terminal device.</li> </ul>
The self-test successfully completes without audio annunciation.	<ul style="list-style-type: none"> <li>a. Check headphones/speaker and aircraft audio panel switch settings.</li> <li>b. Check cables connected to TRC.               <ul style="list-style-type: none"> <li>Audio Alert Output:</li> <li>P1-92 (AUDIO_H - 600-Ohm)</li> <li>P1-91 (AUDIO_L - 150-Ohm)</li> <li>P1-90 (AUDIO_C - Common)</li> </ul> </li> </ul>
SKYWATCH Failed.	<ul style="list-style-type: none"> <li>a. Check system log (para 4.4.2) for errors. Error messages are detailed in para 4.6.</li> <li>b. Replace TRC.</li> </ul>
Self-test does not execute. Aircraft is on the ground.	<ul style="list-style-type: none"> <li>a. If standby screen is displayed, check soft-key wiring inside display cable and WX-1000 processor cable (if installed).</li> <li>b. Check connection between the TRC and the squat switch sensor.               <ul style="list-style-type: none"> <li>Squat Switch Input: P1-88</li> </ul> </li> </ul>
The display cannot be switched between SKYWATCH and the WX-1000. Both systems are installed.	<ul style="list-style-type: none"> <li>a. Check circuit breakers. Reset if tripped.</li> <li>b. Check position of the WX-1000 maintenance switch (SW2). It should be set to the NORMAL position.</li> <li>c. Check wiring of the SKYWATCH/<i>Stormscope</i> display mode switch (para 2.6.11/figure 2-2).</li> </ul>
WX-1000 processor has been removed for service; SKYWATCH fails to operate.	Check position of the WX-1000 maintenance switch (NORMAL/OVERRIDE). When the WX-1000 has been removed for service, it should be set to the OVERRIDE position. This switch may be located in the avionics bay.

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**Table 4-1. Fault Isolation (Continued)**

SYMPTOM	CORRECTIVE ACTION
SKYWATCH paints itself as a target (e.g., TA).	a. Verify suppression bus shielded cable is grounded correctly at both ends. b. Connect an oscilloscope to the suppression bus and verify that the SKY497 suppression pulse (100 $\mu$ s $\pm$ 5 $\mu$ s) exceeds +15 V dc. c. If less than +15 V dc, the suppression bus is overloaded. d. Check all equipment connected to the bus. e. Repair/replace the offending device.
SKYWATCH TRC497 has been removed for service; the WX-1000 <i>Stormscope</i> fails to operate.	Check the adapter plug (see para 4.7). If the TRC497 is removed for service, an adapter plug is required to permit continued operation of the WX-1000.

## 4.6 ERROR MESSAGES

SKYWATCH firmware is designed to generate error messages associated with a particular condition or step in the program. The 20 most recent errors detected by the system are saved in the System Log (see para 4.4.2). System Log can be accessed with a terminal device by using the Dump command. For your convenience, in table 4-2, we have listed the error messages that have been associated with SKYWATCH installations. Where appropriate, procedures that may assist in resolving installation problems are provided. When a severe error occurs SKYWATCH will fail.

**Table 4-2. Installation Related Error Messages**

ERROR NO.	MESSAGE	Remarks
ERROR 016	RF BITE	a. Check directional antenna and associated cables. b. Turn system power ON. c. Calibrate directional antenna (para 4.4.1). <p style="text-align: center;"><b>NOTE</b></p> Ensure transponder is in standby and DME is OFF while doing calibration. d. Cycle power. e. Run pilot initiated self-test.
ERROR 017	RF Amplitude	a. Check directional antenna and associated cables. b. Turn system power ON. c. Calibrate directional antenna (para 4.4.1). <p style="text-align: center;"><b>NOTE</b></p> Ensure transponder is in standby and DME is OFF while doing calibration. d. Cycle power. e. Run pilot initiated self-test.
ERROR 18	RF Angle	a. Check directional antenna and associated cables. b. Turn system power ON. c. Calibrate directional antenna (para 4.4.1). <p style="text-align: center;"><b>NOTE</b></p> Ensure transponder is in standby and DME is OFF while doing calibration. d. Cycle power. e. Run pilot initiated self-test.

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**Table 4-2. Installation Related Error Messages (Continued)**

ERROR NO.	MESSAGE	Remarks
ERROR 020	Barometric Altitude Input	<p>a. Check altimeter source. Is the unit turned on and been given enough time to warm up.</p> <p style="text-align: center;"><b>NOTE</b></p> <p>When interfacing via an ARINC 429 serial data bus, at power-up the TRC must adjust (auto-baud) to the speed of the incoming data. Normally the TRC will lock-on after approximately 15 seconds.</p> <p>b. Cycle power.</p> <p>c. Ensure that barometric altitude is input from only one source (Gray Code or ARINC 429, not both).</p> <p>d. Encoded inputs can be checked from the system configuration screen (para 4.4.3.2, Configuration - Page 2).</p> <p>e. Using the Data Monitor, verify barometric source and altitude (para 4.4.3.3).</p> <p>f. Check wiring associated with altimeter source.</p>
ERROR 021	Power Supply	<p>a. Using the Data Monitor, observe internal voltage measurements (para 4.4.3.3, Data Monitor - Page 5).</p> <p>b. Check aircraft power source.</p> <p>c. Check power input at mating connector. P8-A +28V (10.5-34V PWR) P8-B +28V_RET (AIRCRAFT PWR RETURN)</p>
ERROR 30	Check Configuration	<p>Configuration jumpers not saved or changed and need validated.</p> <p>a. Using the Configuration menu, verify pages 1, 3 and 4 are correct then save (para 4.4.3.2, Configuration).</p> <p>b. Check wiring associated with configuration jumpers.</p>
ERROR 152	HDG	<p>Invalid synchro XYZ input.</p> <p>a. Check heading source.</p> <p>b. Verify status of heading configuration jumpers (input source and flag sense - para 4.4.3.2).</p> <p>c. Using the Data Monitor, verify heading data (source, heading &amp; flag - para 4.4.3.3).</p> <p>d. If the heading signals become valid, the system will recover automatically.</p> <p>e. Check wiring associated with compass heading.</p>
ERROR 153	HDG	<p>Invalid heading reference (400 Hz).</p> <p>a. Check heading source.</p> <p>b. Verify status of heading configuration jumpers (input source and flag sense - para 4.4.3.2).</p> <p>c. Using the Data Monitor, verify heading data (source, heading &amp; flag - para 4.4.3.3).</p> <p>d. If the reference signal becomes valid, the system will recover automatically.</p> <p>e. Check wiring associated with compass heading.</p>



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The error messages in table 4-3 are used by factory technicians in determining what actions may have preceded a system failure. These messages do not necessarily indicate a current system failure and are provided for information only. Should the installer observe these messages in the error log without a SKY497 Failed message during normal operation, no service action is required.

**Table 4-3. Informational Error Messages**

<b>ERROR NO.</b>	<b>MESSAGE</b>	<b>ERROR NO.</b>	<b>MESSAGE</b>
ERROR 001	Boot	ERROR 146	Processor
ERROR 019	RF Transmitter	ERROR 147	Processor VGA Memory
ERROR 022	Processor RAM	ERROR 148	Processor RAM (Low Byte)
ERROR 023	Processor ROM	ERROR 149	Processor RAM (High Byte)
ERROR 024	Processor Reset	ERROR 150	Flash Memory Checksum
ERROR 025	RF Self Test Timeout	ERROR 151	HDG
ERROR 026	Processor Not Detected	ERROR 154	Processor Timeout
ERROR 027	Self Test Comm	ERROR 155	Operating System
ERROR 028	Pulse Detection HW	ERROR 156	HDG
ERROR 029	Processor Comm	ERROR 157	Processor Fault
ERROR 129	Boot	ERROR 158	ARINC 429
ERROR 144-145	Processor Comm		

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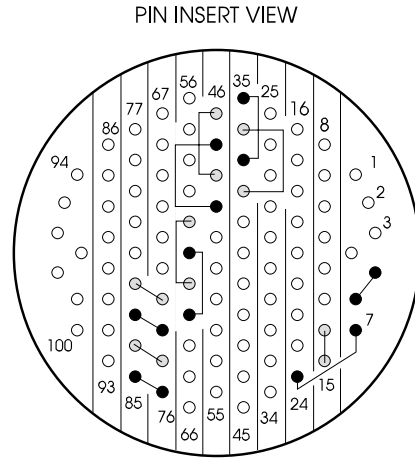
**4.7 TRC497/WX-1000 ADAPTER PLUG**

An adapter plug can be used to by-pass SKYWATCH if a WX-1000 *Stormscope* system is installed. The adapter will permit continued operation of the WX-1000 if the TRC497 is removed for service. It can also be used as a troubleshooting tool when attempting to isolate a problem to either or both systems.

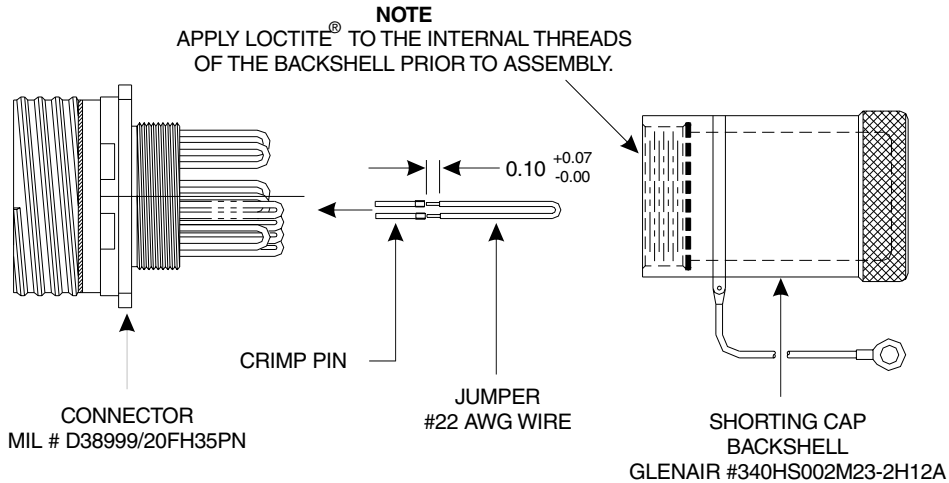
The adapter plug mates with P1. It can be purchased from BFGoodrich Avionics Systems (P/N 805-10810-001) or fabricated locally from the details provided in table 4-4 and figures 4-18 and 4-19.

**Table 4-4. Adapter Plug Jumpers**

JUMPER PINS		FUNCTION
5	6	DPWR-15
7	24	DPWR+15
14	15	DSPLY_GND
35	37	VIDEO_LO
36	38	VIDEO_HI
46	48	HSYNC_LO
47	49	HSYNC_HI
60	62	VSYNC_LO
61	63	VSYNC_HI
73	82	SFTKEY4
74	83	SFTKEY3
75	84	SFTKEY2
76	85	SFTKEY1



**Figure 4-18. Adapter Plug Jumper Installation**



**Figure 4-19. Adapter Plug Assembly**

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#### **4.8 DISPOSITION OF FAILED ITEMS**

Return defective components to your authorized BFG Avionics Systems dealer or to:

BFG Avionics Systems  
Attn: Customer Service  
5353 52nd Street, S.E.  
Grand Rapids, MI USA 49588-0873

If available, pack components in their original shipping container. If the original container is not available, pack them as follows:

<b>CAUTION</b>
----------------

Do not use desiccant crystals when packaging electronic assemblies. Since the assembly must be packed tightly, crystals in bag form cannot be used. The use of loose crystals may cause unnecessary damage resulting in a cleaning problem.

1. Ensure that nonconductive covers/caps are installed on the exposed terminals of cable connectors on the display, TRC, and antenna.
2. The display and TRC contain electrostatic discharge sensitive (ESDS) parts and must be wrapped in static protective materials.
3. Wrap with bubble pack. Secure bubble pack with reinforced tape.
4. Place assembly in a cardboard box.
5. Wrap any accessories in tissue and place in the box. Fill spaces with bubble pack.
6. Put a letter on top of bubble pack. The letter must contain:
  - Your name, address, and telephone number.
  - Purchase order number.
  - Description of component including, when applicable, model and serial number.
  - Date of purchase.
  - A brief description of the difficulty.
  - Type of display and radar altimeter.
  - Copy of error log, if available.
7. Shut box and seal with reinforced tape.
8. Attach packing list to outside of box.

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# APPENDIX A

## SKY497 INTERFACE

### SIGNAL & CABLE CHARACTERISTICS

#### A.1 INTRODUCTION

This appendix defines the electrical characteristics of all input and output signals to the SKY497 System. Sufficient data is included to perform an electrical load analysis for the aircraft. The interface characteristics contained in this appendix are fully compatible with ARINC specifications where noted. Connection information identifies the connector-pin and signal names as they appear on the interconnect wiring diagram (figures 2-2 and 2-3) or, in the case of antenna cables, the connector type (e.g., BNC or TNC).

#### NOTE

External isolation diodes are not required and SHOULD NOT be installed.

#### SIGNAL

Altitude Digitizer /  
Encoding Altimeter Input

#### CHARACTERISTICS

These signals are Gilham Code (or Gray Code) inputs coming from an airdata computer or altitude digitizer (see para 2.6.6). These 10 lines may be connected in parallel with the aircraft transponder. If the aircraft is equipped with selectable altitude encoders, connect the altitude inputs so that SKY497 is always connected to the selected encoder. (Reference ARINC 572-1.)

#### NOTE

Only one altimeter input source (Gray Code or ARINC 429, not both) should be connected. The altimeter input should be from the same source that is interfaced with the transponder or at least as accurate as that source, i.e.,  $\pm 125$  ft.

#### CONNECTION

TRC P1-40 (ALT\_A1)  
TRC P1-41 (ALT\_A2)  
TRC P1-50 (ALT\_A4)  
TRC P1-51 (ALT\_B1)  
TRC P1-56 (ALT\_B2)  
TRC P1-57 (ALT\_B4)  
TRC P1-58 (ALT\_C1)  
TRC P1-59 (ALT\_C2)  
TRC P1-71 (ALT\_C4)  
TRC P1-72 (ALT\_D4)  
TRC P1-81 (ALT\_COMN)

#### CABLE

Minimum 22 AWG wire for each connection for lengths up to 30 ft.

#### VOLTAGE

+30 V input max.

#### CURRENT

<1 mA sourced per line.

#### FREQUENCY

<100 Hz

#### SOURCE Z

>10 k $\Omega$  per line.

#### MAX CAPACITANCE

<20 pF per line.

#### NOTE

If the aircraft has switched encoders that use 28V RETURN or AIRCRAFT GROUND as reference for encoder selection, then ALT\_COMMON (TRC P1-81) should be left unconnected.

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**SIGNAL**

**CHARACTERISTICS**

Antenna	Top Directional SUM (SIGMA) Port (Blue)
	CONNECTION TRC J9, TNC connector.
	CABLE Cable attenuation must not exceed 2.5 dB, VSWR 1.5:1. Refer to para 2.6.1. Impedance: 50 Ω
Antenna	Top Directional BIT PROBE Port (Black)
	CONNECTION TRC J10, BNC connector.
	CABLE Cable attenuation must not exceed 6 dB, VSWR 1.5:1. Refer to para 2.6.1. Impedance: 50 Ω
Antenna	Top Directional DIFFERENCE (DELTA) Port (Red)
	CONNECTION TRC J11, TNC connector.
	CABLE Cable attenuation must not exceed 2.5 dB, VSWR 1.5:1. Refer to para 2.6.1. Impedance: 50 Ω

ARINC 429 External Interface The SKY497 has two ARINC 429 receivers and one transmitter (see para 2.6.5). The receivers operate at either low speed (12.5 kHz) or high speed (100 kHz). The transmitter operates only at high speed (100 kHz).

The ARINC 429 transmitter is intended to provide the capability to interface with alternate display devices other than the WX-1000/SKY497 display.

The two ARINC 429 receivers can be used to input data from other avionics systems. The following labels are supported:

<u>LABEL</u>	<u>FUNCTION</u>
164	Radio Altimeter (See note 1 & 3.)
203	Barometric Altitude (Uncorrected - see note 3.)
320	Magnetic Heading (See note 2 & 3.)

**NOTES**

1. The radio altimeter must provide full range output between 0 and 2500 feet. Not all altimeters provide this full range output. The full range output can sometimes be obtained as a mod to the radio altimeter . Check with the specific altimeter manufacturer for compatibility and availability of modification, if necessary.
2. When using 429 input for heading, the HEADING FLAG SENSE (P1-68 - see para 2.6.2) should remain open (i.e., not jumpered to configuration ground).
3. The TRC can only accept Radio Altimeter input from ARINC 429 source. The Barometric Altitude (uncorrected) can be ARINC 429 or Gilham Code. The Magnetic Heading can be ARINC 429, Synchro (XYZ) or Stepper depending on the configuration pins and interconnect wiring. (See figure 2-2 or 2-3.)

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**SIGNAL**

**CHARACTERISTICS**

ARINC 429 External Interface (Continued).

Both transmitters (data sources) must be set to the same speed. The TRC will automatically adjust both receivers to the speed of the first detected incoming data.

**NOTE**

If 429 barometric altitude is used, it should be from the same source that is interfaced with the transponder or it must be at least as accurate as that source, i.e.,  $\pm 125$  ft.

Once the TRC detects valid ARINC 429 input from a Barometric Altitude sensor (Label 203), it will accept only 429 data from that sensor.

CONNECTION	TRC P1-45 (ARINC-429 RX 1A)
	TRC P1-44 (ARINC-429 RX 1B)
	TRC P1-43 (ARINC-429 RX 2A)
	TRC P1-42 (ARINC-429 RX 2B)
	TRC P1-34 (ARINC-429 TX 1A)
	TRC P1-33 (ARINC-429 TX 1B)

Audio Alert Output

This output is directly compatible with industry standard audio panels (see para 2.6.7).

**NOTE**

Audio output from the TRC is transformer isolated.

This output is disabled when a GPWS alarm is detected (see para 2.6.9) .

CONNECTION	TRC P1-92 (AUDIO_H) - For 600 $\Omega$ audio systems. TRC P1-91 (AUDIO_L) - For 150- $\Omega$ audio systems. TRC P1-90 (AUDIO_C) Audio Common
CABLE	Minimum 22 AWG twisted shielded pair cable for lengths up to 30 ft.
POWER	400 mW into a 600 $\Omega$ load.
FREQUENCY	0 - 3.0 kHz
LOAD Z	Selectable 150 or 600 $\Omega$

Diagnostic Port

NO CONNECTION TO EXISTING AIRCRAFT WIRING. The Diagnostic Port (RS-232) is available to support factory testing and analysis and SHOULD BE LEFT UNCONNECTED. The port defaults to the following settings:

Baud Rate	19,200
Parity:	None
Data Bits	8
Stop Bits`	1

CONNECTION	TRC J7-2 (DIAG_RX)
	TRC J7-3 (DIAG_TX)
	TRC J7-5 (DIAG_GND)

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### SIGNAL

### CHARACTERISTICS

Display Power

Power supply to WX-1000/SKY497 display. +15/-15 V dc from the WX-1000 Processor (if installed) and output to the display.

CONNECTION            P1-24 (DPWR+15\_IN) From Processor  
                           P1-5 (DPWR-15\_IN) From Processor  
                           P1-15 (DSPLY\_GND) From Processor  
                           P1-7 (DPWR+15\_OUT) To Display  
                           P1-6 (DPWR-15\_OUT) To Display  
                           P1-14 (DSPLY\_GND) To Display

CABLE                    See paragraph 2.6.3.

VOLTAGE                +15/-15 V dc

CURRENT                0.7 A input max.

Ground Proximity Warning System (GPWS) Flag Input

This input senses a GPWS alarm and temporarily disables the SKY497 audible alert messages until the warning clears (see para 2.6.9). The input can be either a constant flag signal or an alternating flag output. The flag must be cleared for five (5) seconds before the TRC accepts a "NO ALARM" condition and restores audible alerts. IF THE AIRCRAFT IS NOT EQUIPPED WITH GPWS, LEAVE THIS INPUT UNCONNECTED.

#### NOTE

If the aircraft is equipped with GPWS, it must be connected to the TRC.

CONNECTION            TRC P1-32 (GPWS)  
 CABLE                    Minimum 22 AWG wire for lengths up to 30 ft.  
 VOLTAGE                GPWS ALARM, Aircraft Ground.  
                           NO GPS ALARM, open or 5-35 V dc.  
 CURRENT                <5 mA sourced.

Heading Valid

Indicates that the heading source is providing valid heading information. If the heading source does not have a FLAG LO (-), the heading source FLAG HI(+) input is connected to P1-53 (HDG\_FLG+) and P1-52 (HDG\_FLG-) is connected to ground.

#### NOTE

The active polarity (i.e., HEADING FLAG (+) or HEADING FLAG (-) is selected via the Heading Flag Sense jumper P1-68 (see Table A on the Interconnect Wiring Diagram, figures 2-2 and 2-3, sheet 2) located in the connector back-shell.

If the heading system has a low level flag between 1.5 V dc and 2.7 V dc (when valid), P1-68 (HEADING FLAG SENSE) should not be jumpered to ground and P1-53 (HDG\_FLG+) must remain unconnected.

CONNECTION            P1-53 (HDG FLAG+)  
                           P1-52 (HDG FLAG-)  
 CABLE                    See paragraph 2.6.4.  
 VOLTAGE                High Sense (FLAGHI - FLAGLO):  
                                   Min: 5.0 V dc  
                                   Max: 30.0 V dc  
                           Low Sense (FLAGHI - FLAGLO):  
                                   Min: -30.0 V dc  
                                   Max: 1.0 V dc

INPUT IMPEDANCE    >2 k $\Omega$

INPUT CURRENT      Active:            Min: 1 mA  
                                   Max: 15 mA



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**SIGNAL**

**CHARACTERISTICS**

Horizontal Sync

Balanced horizontal sync from the WX-1000 Processor (if installed) and output to the WX-1000/SKY497 display. Signal levels as specified in RS-422.

CONNECTION            TRC P1-47 (HSYNC\_IN\_HI) From Processor  
                           TRC P1-46 (HSYNC\_IN\_LO) From Processor  
                           TRC P1-49 (HSYNC\_OUT\_HI) To Display  
                           TRC P1-48 (HSYNC\_OUT\_LO) To Display

CABLE                    See paragraph 2.6.3.

VOLTAGE                0-5 V dc

CURRENT                <100 mA

FREQUENCY             16.4 kHz

LOAD Z                 1 k $\Omega$

Landing Gear Switch Input

This signal line is to be connected to the landing gear switch to sense the position of the landing gear (see para 2.6.13).

IF THE AIRCRAFT DOES NOT HAVE A LANDING GEAR SWITCH, THIS INPUT MUST REMAIN UNCONNECTED. With this configuration, if no ARINC 429 compatible radio altimeter is installed, the system will default to the highest TA sensitivity level (level B) and audio TA announcements (i.e., "traffic, traffic") will not be inhibited during takeoff and landing.

CONNECTION            TRC P1-87 (GEAR)

CABLE                    Minimum 22 AWG wire for lengths up to 30 ft.

VOLTAGE                GEAR UP Indication 4.5 - 32 V dc or OPEN  
                           GEAR DOWN Indication, Aircraft Ground

CURRENT                <5 mA sourced.

SOURCE Z               >40 k $\Omega$

MAX CAPACITANCE    <20 pF

Normal/ Over-ride

This is a WX-1000 Maintenance over-ride switch (see para 2.6.11). Over-ride control (SW2 on the Interconnect Wiring Diagram, figure 2-3) is necessary only if a WX-1000 processor is also installed. It enables the SKY497 to be powered-up if the WX-1000 processor has been removed for service. During normal operation, with a WX-1000 processor installed, SW2 should remain in the WX-1000 position. Any general purpose DPDT toggle switch can be used.

CONNECTION            TRC P1-11 (PWR\_SW\_HI)  
                           TRC P1-3 (PWR\_SW\_LO)

CABLE                    Minimum 22 AWG.

VOLTAGE                Less than 0.7 V = ON; open = OFF.

CURRENT                <100 mA

Power Input (TRC)

11-34 V dc. 7.5 A circuit breaker required for 14 V aircraft systems and a 5 A circuit breaker for 28V systems (see para 2.6.14).

CONNECTION            TRC J8-A (+28V)  
                           TRC J8-B (+28V\_RET)

CABLE                    Use twisted shielded pair cable (Beldon 83322, Alpha 2826/2, or equivalent). Terminate shield to airframe at sensor or power source.

VOLTAGE                11 to 34 V dc, 70 Watts (Maximum)

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### SIGNAL

### CHARACTERISTICS

RS422 Interface

NO CONNECTION TO EXISTING AIRCRAFT WIRING. The RS422 Interface is available to support factory testing and analysis and SHOULD BE LEFT UNCONNECTED.

#### NOTE

RS422 interface is configured via jumper P1-67 (see Table A on the Interconnect Wiring Diagram, figures 2-2 and 2-3, sheet 2) located in the connector back-shell.

CONNECTION      TRC P1-9 (DR\_RX+)  
                     TRC P1-8 (DR\_RX-)  
                     TRC P1-2 (DR\_TX+)  
                     TRC P1-1 (DR\_TX-)

Serial Interface

NO CONNECTION TO EXISTING AIRCRAFT WIRING. This interface (RS-232) is available to support factory testing and analysis and SHOULD BE LEFT UNCONNECTED. This serial interface defaults to the following settings:

Baud Rate     19,200  
 Parity:        None  
 Data Bits     8  
 Stop Bits`    1

CONNECTION      TRC P1-21 (IOP\_SERIAL\_TX)  
                     TRC P1-22 (IOP\_SERIAL\_RX)  
                     TRC P1-23 (IOP\_SERIAL\_GND)

SKYWATCH/STORMSCOPE

If a WX-1000 processor is installed, this signal (SW1 on the Interconnect Wiring Diagram, figure 2-3) switches the display between the WX-1000 and SKY497 (see para 2.6.10). Any general purpose SPST toggle switch can be used.

CONNECTION      TRC P1-31 (CWS\_SS)  
                     TRC P1-4 (SW\_RET)

CABLE             Minimum 22 AWG.  
 VOLTAGE          CLOSED (Less than 0.7 V) = Stormscope Display Mode

                    OPEN = SKYWATCH Display Mode.  
 CURRENT          <100 mA

Soft-keys

Soft-key inputs from the WX-1000/SKY497 display and output to the WX-1000 processor (if installed). The pushbuttons on the front of the display are referred to as Soft-keys (1), (2), (3), and (4). In every operating mode a label identifying the button function is displayed next to the button (see paragraph 3.2).

CONNECTION      TRC P1-85 (SFTKEY1\_IN) From Display  
                     TRC P1-84 (SFTKEY2\_IN) From Display  
                     TRC P1-83 (SFTKEY3\_IN) From Display  
                     TRC P1-82 (SFTKEY4\_IN) From Display  
                     TRC P1-76 (SFTKEY1\_OUT) To Processor  
                     TRC P1-75 (SFTKEY2\_OUT) To Processor  
                     TRC P1-74 (SFTKEY3\_OUT) To Processor  
                     TRC P1-73 (SFTKEY4\_OUT) To Processor

CABLE             See paragraph 2.6.3.

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**SIGNAL**

**CHARACTERISTICS**

Soft-keys (Continued)

**VOLTAGE**

Active: Min: 0.0 V  
Max: 1.5 V  
Inactive: Min: 3.5 V or Open  
(Internal 4.7 kΩ pull-up)  
Max: 5.0 V

Squat Switch Input

This signal line is to be connected to the squat switch to sense when the aircraft is on the ground (see para 2.6.12).

**CONNECTION**

TRC P1-88 (SQUAT)

**CABLE**

Minimum 22 AWG wire for lengths up to 30 ft.

**VOLTAGE**

IN FLIGHT Indication  
4.5 - 32 V dc or OPEN  
ON THE GROUND Indication  
Aircraft Ground

**CURRENT**

<5 mA sourced.

Stepper Heading Input  
(King KCS55)

These connections will accept heading information from a King KCS55 stepper drive unit (see para 2.6.4).

**NOTE**

Stepper heading input is selected via the Heading Input Source jumpers P1-69 & P1-70 (see Table A on the Interconnect Wiring Diagram, figures 2-2 and 2-3, sheet 2) located in the connector back-shell.

Stepper Drive Motor 1 & 3

**FREQUENCY**

Min: 0 Hz  
Max: Turn Rate Dependent (.25 degree increments per edge transition)

**VOLTAGE**

Low Level: Min: 0 V  
Max: 2 V  
High Level: Min: 13 V  
Max: 17 V  
Max: 35 Vrms

**INPUT IMPEDANCE**

>50 kΩ

**CONNECTION**

P1-65 (DRIVE MOTOR 1) to KI-525 P2-A  
P1-54 (DRIVE MOTOR 3) to KI-525 P2-H

**CABLE**

See paragraph 2.6.4.

Stepper Drive Motor Unregulated +15 V

**VOLTAGE**

Min: 13 V  
Max: 17 V

**INPUT IMPEDANCE**

>50 kΩ

**CONNECTION**

P1-55 (UNREG +15) to KI-525 P1-V  
CASE GND (AIRFRAME GROUND) to  
KI-525 P1-J

**CABLE**

See paragraph 2.6.4.

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**SIGNAL**

Suppression Bus I/O

**CHARACTERISTICS**

The SKY497 outputs a 100  $\mu$ s ( $\pm$  5  $\mu$ s) suppression pulse on the aircraft suppression bus (see para 2.6.8). In addition, the SKY497 receives suppression signals from all other devices on the suppression bus (e.g., transponder, DME). (Reference ARINC 735-2 and DO-197A.)

**CAUTION**

The aircraft transponder must have suppression circuitry to ensure that SKYWATCH does not paint itself as a target (e.g., TA).

CONNECTION	TRC P1-89 (SUP_BUS)
CABLE	Any size low capacitance shielded cable may be used.
VOLTAGE	18 - 70 V dc input, greater than 20 V dc output.
CURRENT	0.3 A output max.
FREQUENCY	100 $\mu$ s positive pulse output, DC-1 mHz input.
SOURCE Z	2 k $\Omega$
LOAD Z	10.5 k $\Omega$
MAX CAPACITANCE	<50 pF

Vertical Sync

Balanced vertical sync from the WX-1000 Processor (if installed) and output to the display. Signal levels as specified in RS-422.

CONNECTION	TRC P1-61 (VSYNC_IN_HI) From Processor TRC P1-60 (VSYNC_IN_LO) From Processor TRC P1-63 (VSYNC_OUT_HI) To Display TRC P1-62 (VSYNC_OUT_LO) To Display
CABLE	See paragraph 2.6.3.
VOLTAGE	0-5 V dc
FREQUENCY	60 Hz
SOURCE Z	1 k $\Omega$

Video Output

Balanced video from the WX-1000 Processor (if installed) and output to the display. Signal levels as specified in RS-422.

CONNECTION	TRC P1-36 (VIDEO_IN_HI) From Processor TRC P1-35 (VIDEO_IN_LO) From Processor TRC P1-38 (VIDEO_OUT_HI) To Display TRC P1-37 (VIDEO_OUT_LO) To Display
CABLE	See paragraph 2.6.3.
VOLTAGE	0-5 V
CURRENT	<100 mA
FREQUENCY	<15 mHz
LOAD Z	1 k $\Omega$

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**SIGNAL**

**CHARACTERISTICS**

XYZ Synchro Input

These connections from the aircraft heading source (ARINC Synchro Signal Practices) allow the unit to rotate the displayed data as the aircraft turns.

**NOTE**

Synchro heading input is selected via the Heading Input Source jumpers P1-69 & P1-70 (see Table A on the Interconnect Wiring Diagram, figures 2-2 and 2-3, sheet 2) located in the connector back-shell.

X(S1), Y(S3), Z(S2)

FREQUENCY           Min: 50 Hz  
                                  Max: 1500 Hz

VOLTAGE                               Min: 5.0 Vrms (w/reduced angular resolution.)  
  Max: 14.0 Vrms (external padding required for higher levels.)

INPUT IMPEDANCE >50 k $\Omega$

CONNECTION           P1-66 (SYNC\_X)  
                                  P1-65 (SYNC\_Y)  
                                  P1-64 (SYNC\_Z)

CABLE                               See paragraph 2.6.4.

H and C (high and low reference)

FREQUENCY           Min: 50 Hz  
                                  Max: 1500 Hz

VOLTAGE                               Min: 3.5  
  Max: 35 Vrms

INPUT IMPEDANCE >50 k $\Omega$

CONNECTION           P1-55 (SYNC\_HI)  
                                  P1-54 (SYNC\_LO)

CABLE                               See paragraph 2.6.4.

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# APPENDIX B

## INSTALLATION CHECKOUT

### USING THE TCAS-201 RAMP TEST SET

#### B.1 INTRODUCTION

This appendix contains the self test and post installation checkout procedures. Refer to the SKY497 Pilot's Guide for complete operating instructions. The post installation checkout section contains instructions for doing the checkout procedure with an IFR Systems TCAS-201 Ramp Test Set (with TCAS I firmware).

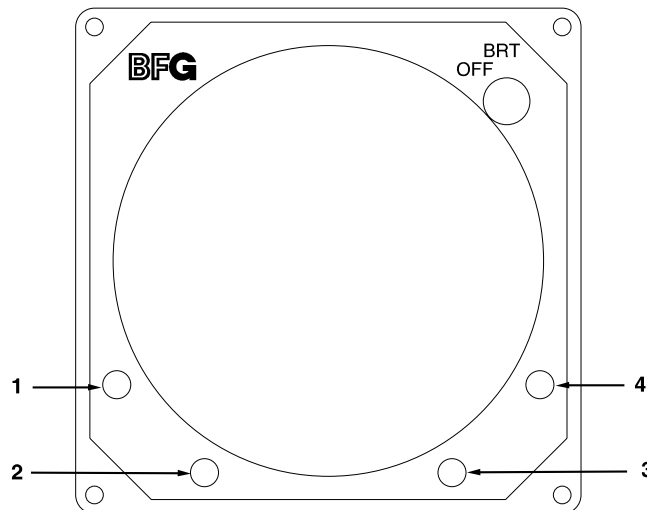
#### NOTES

1. This procedure assumes familiarity with the set up and operation of the TCAS ramp test set.
2. All test equipment used in completing these tests shall be calibrated in accordance with the manufacturer's recommendations.
3. When the SKY497 is interfaced to an alternate display, reference Appendix E while performing this checkout procedure.

This procedure will validate the installation and return to service of the BFGoodrich Avionics Systems SKY497.

#### B.2 CONTROLS

All operating controls are located on the front of the WX-1000/SKY497 display. Figure B-1 shows the locations of the controls. Complete operating instructions for the SKY497 are provided in the SKY497 Pilot's Guide supplied with each system.



**Figure B-1. Controls**

OFF/BRT  
Switch

Power is applied by rotating the knob clockwise past the detent. Continued clockwise rotation increases display brightness.

**1, 2, 3, & 4**  
Pushbuttons

Also referred to as soft-keys (1), (2), (3), and (4). In every operating mode a label identifying the button function will be displayed next to the button.

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**B.3 CHECKOUT PROCEDURE**

If the indications given in the following steps, except for the ramp test set, are not obtained, refer to the troubleshooting procedures in Chapter 4. If indications given for the ramp test set are not obtained, refer to the manual supplied with that equipment.

1. Enter and store the setup information identified in table B-1 (see next page) into the TCAS-201 Ramp Test Set.
- 2.

**Table B-1. IFR Systems TCAS-201 Ramp Test Set Setup Data**

SCREEN	STORAGE NUMBER 1
SETUP #1	INTRUDER TYPE: ATCRBS
	UUT DIST: HORIZ = Distance (ft.) from aircraft
	UUT DIST; VERT = Vertical height (ft.) difference between test antenna and SKY497 antenna
	ALT REPORTING: ON
	STORE 0
	RECALL 0
	GAIN_1030 9.4 dB
	LOSS 1.3 dB
SETUP #2	RANGE MAX: 20 NM
	RANGE MIN: 0 NM
	ALT MAX: 60,000 ft
	ALT MIN: 0 ft
SCENARIO TEST	RANGE: 5.0 NM
	RANGE RATE: +200 kt
	ALT: 51,000 ft
	ALT: RATE: 0 FPM
REPLY TEST	RANGE: 5.0 NM
	ALTITUDE 50,500 ft
	%REPLY: 100 %

3. Make sure the aircraft's transponder is in the STBY mode and the DME is turned OFF. At the aircraft's instruments, verify all compass/HSI flags are valid.

**NOTE**

After power up, it may take a couple of minutes for the altitude encoder to return a valid altitude to the transponder and SKY497.

4. Turn SKY497 ON. The display will show a start-up screen similar to one shown in figure B-2. After start-up screen appears, rotate the OFF/BRT switch. Verify that clockwise rotation increases display brightness.



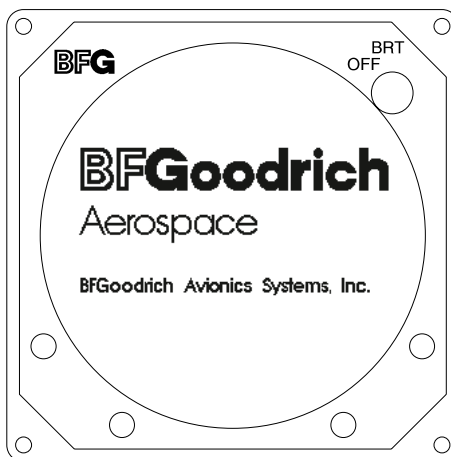
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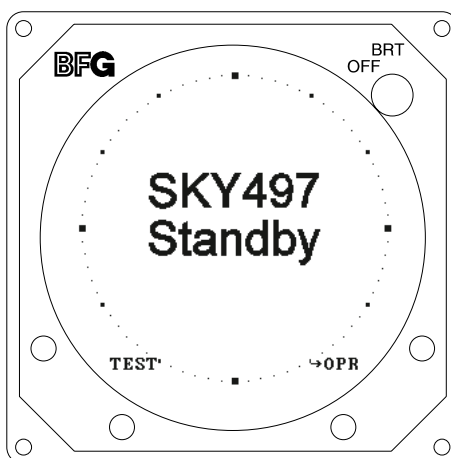


**Figure B-2. Start-up Screen**

After approximately thirty seconds the display will show the STANDBY screen (see figure B-3).

**NOTE**

If the TRC has not been calibrated to the directional antenna (see step 6 below), the display may show a “SKY497 FAILED” message.



**Figure B-3. Standby Screen**

5. Turn SKY497 OFF and then enter the Service Menu (see paragraph 4.4) by holding the left two buttons (soft-keys **1** and **2**) depressed as the system is turned ON.
6. From the Service Menu, calibrate the TRC to the directional antenna (see paragraph 4.4.1).
7. Return to the Service Menu and select System Data (see paragraph 4.4.3).
  - a. Verify status and save the configuration jumpers (see paragraph 4.4.3.2, Configuration).
  - b. Verify that the system has recognized and is responding to installed sensors (see paragraph 4.4.3.3, Data Monitor).
    - 1) Sequence through each Data Monitor display page.
    - 2) Verify that the sensor information displayed is correct.
    - 3) If the information is not correct, the sensor has failed to communicate with the TRC. Check operation of the sensor and cables between the TRC and sensor.

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- 4) Change the status of the landing gear, squat switch, altitude, and heading sensors. Verify that the display shows the correct input (i.e., sensing of these signals).
8. Exit the service menu and do the SKYWATCH self-test (see para 3.4).
9. Do the SKYWATCH self-test (see para 3.4).
10. Turn SKY497 OFF, return to the Service Menu and select Ground Test (see paragraph 4.4.4).
11. Verify operation of range function. Soft-key (3) is labeled to indicate the current range. Press soft-key (3) to toggle the display range between 2 and 6 nm.
12. Select the 6 nautical mile range.
13. Verify that the system toggles through the altitude display modes. Soft-key (2) is labeled to indicate the current mode. Press Soft-key (2) to select normal (NRM), below (BLW), and above (ABV).
14. Select the NRM (normal) mode.
15. Position the aircraft with the nose aligned on any 90 degree heading. Avoid areas within 250 ft of obstructions (e.g., hangers, large aircraft, control towers, etc.) where there is a potential for multipath problems. Locate and mark test points, every 30 degrees (i.e., at 000, 030, 060, 090, 120, 150, 180, 210, 240, 270, 300, and 330 degrees with respect to the SKY497 directional antenna). Mark these points at the same distance, approximately 100 ft, from the aircraft.
16. Do the following static tests:
  - a. Connect the TCAS-201 Flat Antenna (facing towards the test aircraft) to the antenna connector.
  - b. At the TCAS-201 test set, press the REPLY TEST key.
  - c. Initiate the REPLY TEST by pressing the ANTENNA push button switch or the RUN/STOP key.

**NOTE**

The TCAS-201 display will indicate "NO WHISPER-SHOUT SEQUENCE".

- d. Verify that the SKY497 display shows an other traffic symbol (open diamond) at the 12 O'clock position ( $\pm 30$  degrees), approximately 5.0 nm, in level flight, and at an altitude of 500 ft above own aircraft (i.e., "+05").

**NOTES**

If the display reflects a gross error in target bearing, check the directional antenna cables at TRC connectors J9 (sum port) and J11 (difference port). They may be reversed. A further indication of this condition would be a target that moved in a counter-clockwise direction when the test set is moved in a clockwise direction.

Multiple targets or a faulty bearing may result from multipath distortion (see step 2).

During these tests, the SKY497 may detect and display other active targets.

- e. Repeat a, b, c, and d from each of the test points (see step 2).
16. Do the following dynamic test.
  - a. Position the ramp test set on the test point directly in front of the test aircraft (i.e., approximately 100 ft in front of the aircraft, see step 2).
  - b. Connect the TCAS-201 Flat Antenna (facing towards the test aircraft) to the antenna connector.
  - c. At the TCAS-201 test set, press the SCEN key.
  - d. Initiate the SCENARIO TEST by pressing the ANTENNA push button switch or the RUN/STOP key.

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- e. Verify that the display shows an "other traffic" symbol (open diamond) at the 12 o'clock position ( $\pm 30$  degrees) approximately 5.0 nm and in level flight. The traffic symbol should be at an altitude of 500 ft above own aircraft (i.e., "+05") and moving towards your aircraft.
- f. When the target approaches closer than approximately 1 nm from own aircraft, verify that the symbol changes from an other traffic symbol (open diamond) to a traffic advisory (solid circle).

**NOTE**

The voice message, "TRAFFIC, TRAFFIC," will be enunciated over the cockpit audio system.

- g. The target, when it reaches 0.0 nm, will reverse direction and move outbound on the same heading.

**NOTE**

The target may momentarily drop from the display and then reappear as an other traffic symbol (open diamond).

- 17. Restart SKYWATCH by cycling power OFF and then ON.
- 18. This completes the post installation checkout procedure.

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# APPENDIX C

## INSTALLATION CHECKOUT

### USING THE TIC T-49C FLIGHTLINE TESTER

#### C.1 INTRODUCTION

This section contains instructions for using the TIC T-49C Flightline Tester to do post-installation checkout of the BFG Avionics Systems SKY497. Detailed setup, operation and maintenance information for the T-49C Flightline Tester is provided in the T-49C Operating and Maintenance Instruction Manual.

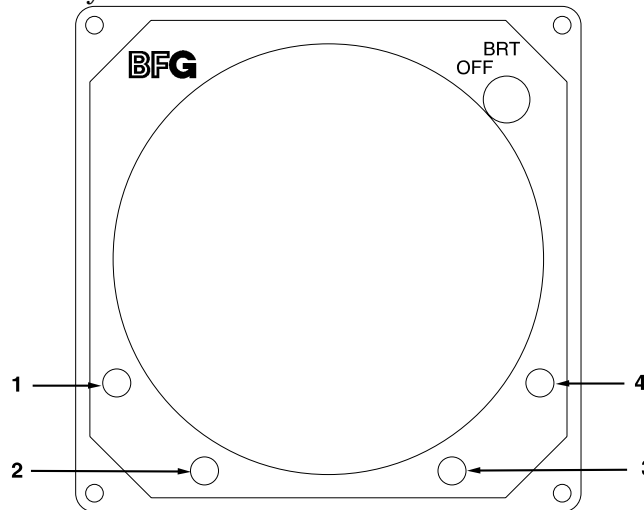
#### NOTES

1. This procedure assumes familiarity with the set up and operation of the T-49C Flightline Tester.
2. All test equipment used in completing these tests shall be calibrated in accordance with the manufacturer's recommendations.
3. When the SKY497 is interfaced to an alternate display, reference Appendix E while performing this checkout procedure.

This procedure will validate the installation and return to service of the BFGoodrich Avionics Systems SKY497.

#### C.2 CONTROLS

All operating controls are located on the front of the WX-1000/SKY-497 display. Figure C-1 shows the locations of the controls. Complete operating instructions for the SKY497 are provided in the SKY497 Pilot's Guide supplied with each system.



**Figure C-1. Controls**

**OFF/BRT**  
Switch

Power is applied by rotating the knob clockwise past the detent. Continued clockwise rotation increases display brightness.

**1, 2, 3, & 4**  
Pushbuttons

Also referred to as soft-keys (1), (2), (3), and (4). In every operating mode a label identifying the button function will be displayed next to the button.

### C.3 CHECKOUT PROCEDURE

The T-49C Flightline Tester simulates a ground based secondary surveillance radar (SSR) when the TCAS INTRUDER selector switch is in the ATCRBS/Mode-S XPDR TEST position. When the T-49C intruder type switch is set to ATCRBS, the unit responds to ATCRBS Mode C interrogations. A varying delay time, controlled from the microprocessor, delays the replies returned to the SKY497 from as far as 14 nautical miles and as close as a few hundred feet. The apparent distance from the simulated intruder to the SKY497 system under test decreases as if the intruder was converging on the aircraft under test. The test set determines the altitude of the aircraft under test by interrogating the transponder using an ATCRBS interrogation. By adding or subtracting the desired differential altitude, as selected by the front-panel scenario switch, the initial altitude of the scenario is controlled by the microprocessor. This altitude, like the distance, is varied so that the simulated intruder converges on the aircraft's position.

1. Make sure the aircraft's transponder is in the STBY mode and the DME is turned OFF. At the aircraft's instruments, verify all compass/HSI flags are valid.

#### NOTE

After power up, it may take a couple of minutes for the altitude encoder to return a valid altitude to the transponder and SKY497.

2. Turn SKY497 ON. The display will show a start-up screen similar to one shown in figure C-2. After start-up screen appears, rotate the OFF/BRT switch. Verify that clockwise rotation increases display brightness.



**Figure C-2. Start-up Screen**

After approximately thirty seconds the display will show the STANDBY screen (see figure C-3).

#### NOTE

If the TRC has not been calibrated to the directional antenna (see step 4 below), the display may show a "SKY497 FAILED" message.

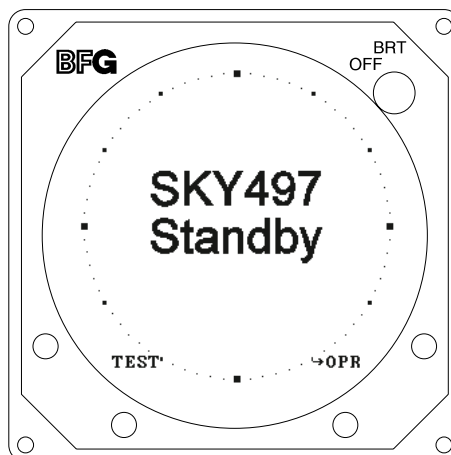
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**Figure C-3. Standby Screen**

3. Turn SKY497 OFF and then enter the Service Menu (see paragraph 4.4) by holding the left two buttons (soft-keys **1** and **2**) depressed as the system is turned ON.
4. From the Service Menu, calibrate the TRC to the directional antenna (see paragraph 4.4.1).
5. Return to the Service Menu and select System Data (see paragraph 4.4.3).
  - a. Verify status and save the configuration jumpers (see paragraph 4.4.3.2, Configuration).
  - b. Verify that the system has recognized and is responding to installed sensors (see paragraph 4.4.3.3, Data Monitor).
    - 1) Sequence through each Data Monitor display page.
    - 2) Verify that the sensor information displayed is correct.
    - 3) If the information is not correct, the sensor has failed to communicate with the TRC. Check operation of the sensor and cables between the TRC and sensor.
    - 4) Change the status of the landing gear, squat switch, altitude, and heading sensors. Verify that the display shows the correct input (i.e., sensing of these signals).
6. Exit the Service Menu. Verify that the display shows the standby screen (figure C-3) and then press Soft-key (**4**), labeled OPR.
7. Verify operation of range function. Soft-key (**3**) is labeled to indicate the current range. Press Soft-key (**3**) to toggle the display range between 2 and 6 nm.
8. Select the 6 nautical mile range.
9. Verify that the system toggles through the altitude display modes. Soft-key (**2**) is labeled to indicate the current mode. Press Soft-key (**2**) to select normal (NRM), below (BLW), and above (ABV).
10. Select the NRM (normal) mode.
11. If installed, turn the radio altimeter OFF.
12. Do the SKYWATCH self-test (see para 3.4).
13. Position the aircraft with the nose aligned on any 90 degree heading. Avoid areas within 250 ft of obstructions (e.g., hangers, large aircraft, control towers, etc.) where there is a potential for multipath problems. Locate and mark test points at 30 degree intervals (i.e., 000, 030, 060, 090, 120, 150, 180, 210, 240, 270, 300, and 330 degrees) with respect to the SKY497 directional antenna. Mark these points at the same distance, between 100 and 150 ft, from the aircraft.

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- 13a. Change the aircraft's transponder from STBY mode to the ON position.
14. Position the T-49C Flightline Tester on one of the test points identified in previous step.

**CAUTION**

The Flightline Tester is not weatherproof when the lid is open. Do not setup or operate the Flightline Tester in conditions of rain, sleet, etc.

15. Setup and verify operation of the T-49C Flightline Tester with the HI/LOW power switch in the HI position and then:
  - a. Set the TCAS INTRUDER selector switch of the T-49C to the ATCRBS/Mode-S XPDR TEST position and press TEST and the INTERROGATE. This will store the aircraft's barometric altitude in the T-49C.

**NOTE**

The T49-C will display the pressure altitude of the aircraft under test.

- b. Verify that the SKY497 display shows the standby screen (figure C-3) and then press soft-key (4), labeled OPR. Select NRM mode and 6 nm range by pressing appropriate soft-key's.
- c. Set the TCAS INTRUDER selector switch to the ATCRBS position and the SCENARIO selector switch to the 0 altitude offset position. Press INTERROGATE, and when the range on the display decreases to 5 NM, press TEST. This will freeze the scenario and represent a stationary intruder aircraft 5 NM away at the same altitude as the UUT aircraft. Verify that the SKY497 displays, in the direction ( $\pm 30$  degrees) of the T-49C, a symbol for other traffic (i.e., open diamond) at 5 NM. Target will be displayed in level flight at own aircraft altitude (i.e., "00" displayed above the traffic symbol).

**NOTES**

- 1) If the display reflects a gross error in target bearing, check the SKY497 directional antenna cables at TRC connectors J9 (sum port) and J11 (difference port). They may be reversed. A further indication of this condition would be a target that moved in a counter-clockwise direction when the T-49C is moved in a clockwise direction.
  - 2) Multiple targets or a faulty bearing may result from multipath distortion (see step 1).
  - 3) During these tests, the SKY497 may detect and display other active targets.
  - 4) To obtain a better line of sight, it may be necessary to elevate the antenna.
- d. Move the T-49C to each test point and verify that the display shows the corresponding bearing displacement.

**NOTE**

It is necessary to wait a few seconds after moving to let the test target stabilize in position.

16. This completes testing with the T-49C, reattach top lid of the T-49C.
17. If installed, TURN ON the radio altimeter.
18. This completes the post installation checkout procedure.



## APPENDIX D

# Using the Terminal Device

(e.g., Laptop Computer)

A terminal device can be used as an aid in installing, testing and troubleshooting the SKY497. The terminal device must be connected to the RS-232 serial data TEST port (J7) located on the front of the TRC497. TRC connector J7 is a female DB9 receptacle. A standard serial cable that has RXD (pin 2), TXD (pin 3), and GND (pin 5) can be used. Any computer, with RS-232 terminal emulation software (e.g., Procomm®, HyperTerminal, etc.), may be used as the terminal device. To communicate with the TRC, the RS-232 terminal device must be setup as follows, with no hardware or software handshaking being used.

Baud Rate:	19200
Parity:	None
Data Bits:	8
Stop Bits:	1

The SKY497 includes the following commands to help with installation, testing, and troubleshooting. These commands are listed in the order they appear when the help menu is accessed and can be typed in upper case or lower case letters. Ctrl+R repeats the last command once; Ctrl+L continually repeats the last command (to stop continuously repeating the command press <Enter>). Help screens have been created for your convenience, to access the command help screen type help or ? at the prompt. To access the help screen for each command, type the command followed by help.

### Commands

### Descriptions

? or Help

The help or ? command displays a list of available commands. Executing the Help command displays the following list.

```
stp>?
? ..... Command help
Arinc429 ..... Arinc 429 cmds
Arinc735 ..... Arinc 735 cmds
Bar ..... Displays barometric altitude
Cal ..... Executes antenna calibration
Config ..... SKY497 Config Options
Dump ..... Displays the List of Logged Errors
Ground ..... Turns ground test mode on or off
Head ..... Displays heading
Help ..... Command help
Rad ..... Displays Radio altitude
Save ..... Saves System Configuration
Say ..... Says Phrase from Speech Chip
Sensors ..... Displays sensor data
Version ..... SW Version information
For information on any particular command, enter the command followed
by help.
```

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**Commands**

**Descriptions**

Arinc429

Displays the ARINC-429 sensor inputs and label status. Data shown is live and will change as the sensor changes. To view changes re-type the command.

```
stp>Arinc429

Arinc429 Operating,
Rx: Seeking, Low
Rx Parity Errors: 0

Lbl   Functn   Chn   Ssm   Value
164   RadAlt   ---   ---   -----
203   BarAlt   ---   ---   -----
320   MagHead   ---   ---   -----
```

Arinc735

Displays the ARINC-735 alternate display type and status. Data shown is latched during turn on, configuration changes will not take affect until power is cycled.

```
stp>arinc735

Tx Selected: None Selected

stp>arinc735

Tx Selected: ARINC735 Type1

stp>arinc735

Tx Selected: Illegal Display
```

Bar (help)

Displays the barometric altitude source, validity, and value. Data shown is live and will change as the sensor changes. To view changes re-type the command.

**Bar help:** Displays the command specific help message.

**Bar:** Displays barometric altitude data.

```
stp>bar

Barometric Altitude source: Encoded Inputs
Barometric Altitude: 1000 feet
Encoded Altitude Bits
d4 c4c2c1 b4b2b1 a4a2a1
0 0 1 0 0 1 1 0 0 0
Encoded Altitude: 1000 feet
```

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## Commands

## Descriptions

Cal (help)

Calibrates the antenna to the system (includes cables, connectors, and TRC497).

**Cal:** Performs system calibration.

```
stp>cal

Asking for current calibration value.
Starting calibration. Please Wait...

Re-Calibration Successful!
Old Cal Value: 283 degrees
New Cal Value: 273 degrees
```

**Cal help:** Displays the command specific help message.

Config

Displays the state of the configuration pins, switches, barometric altitude bits, and internal voltage and temperature readings. Checks the input/output circuitry. Data shown is live and will change as the sensor or configuration changes. To view changes re-type the config command.

```
stp>config

SKY497 Configuration Straps:
Hdg. (XYZ/STEP/429): XYZ
    P1-70 : GND
    P1-69 : OPEN
Heading Flag Sense : HIGH
    P1-68 : GND
DR/Alt.422 (DR/422): DR
    P1-67 : OPEN
Ant. Pos. (TOP/BOT): TOP
    P1-100 : OPEN
Antenna NY(164/156): NY164
    P1-99 : OPEN
Airframe (FIX/ROT): FIX
    P1-98 : OPEN
Alternate Display Type: None Selected
    P1-80 : OPEN
    P1-79 : OPEN
    P1-78 : OPEN
    P1-77 : OPEN

IOP Soft Switches:
Squat (ON GND/FLY): ON GND
    P1-88 : GND
Gear (UP/DOWN): DOWN
    P1-87 : GND
GPWS (ACT/INACT): INACT
    P1-32 : OPEN

Barometric Encoded Altitude:
d4 c4c2c1 b4b2b1 a4a2a1
 0 0 1 0 0 1 1 0 0 0
Altitude: 1000 feet
a1=P1-40 b1=P1-51 c1=P1-58
a2=P1-41 b2=P1-56 c2=P1-59
a4=P1-50 b4=P1-57 c4=P1-71
d4=P1-72

IOP Internal Status:
Internal +5 VDC: +5.1 V
Internal +15 VDC: +15.0 V
Internal -15 VDC: -15.1 V
Internal Temp. : +34 C
```

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## Commands

## Descriptions

Dump (help)

Displays the error messages stored in the error log. If no errors are stored in the system log, the message NO FAULTS DETECTED is displayed.

Dump help: Displays command specific help message.

Dump: Displays system error log.

```
stp>dump
```

```
SKY497 SYSTEM LOG
```

```
System Time - 00704:14
```

<u>Err#</u>	<u>Time</u>	<u>Description</u>
019	- 00693:41	- RF Transmitter
018	- 00668:47	- RF Angle
020	- 00668:03	- Barometric Altitude Input
024	- 00647:52	- Processor Reset
153	- 00647:38	- HDG

Ground (help | test | off)

SKY497 enters the ground test mode.

Ground help: Displays the command specific help message.

Ground (or Ground Off): Exits ground test mode (if active).

Ground Test: Enters ground test mode.

```
stp> ground help
```

```
Parameter:
```

```
TEST to enter ground test mode or OFF (or nothing) to exit mode
```

```
stp>ground
```

```
System no longer in Ground Test Mode  
Returning to aircraft sensors and switch inputs
```

```
stp> ground test
```

```
System in Ground Test Mode  
Simulating Barometric Altitude: 50,000 ft.  
Simulating RADAR Altimeter: 2,500 ft.  
Simulating Heading: 0 deg  
Gear and Squat switch override in effect
```

Head (help)

Displays the current heading source, degrees, and heading flag status (valid or invalid). Heading source is latched during turn on and will not change until power is cycled, all other data is live.

Head help: Displays the command specific help message.

Head: Displays heading data.

```
stp>head
```

```
Heading Source: Synchro XYZ  
Heading: 0 degrees  
Flag line: Valid
```

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**Commands**

**Descriptions**

Help or ?

The help or ? command displays a list of available commands. Executing the Help command displays the following list.

```
stp>?

? ..... Command help
Arinc429 ..... Arinc 429 cmds
Arinc735 ..... Arinc 735 cmds
Bar ..... Displays barometric altitude
Cal ..... Executes antenna calibration
Config ..... SKY497 Config Options
Dump ..... Displays the List of Logged Errors
Ground ..... Turns ground test mode on or off
Head ..... Displays heading
Help ..... Command help
Rad ..... Displays Radio altitude
Save ..... Saves System Configuration
Say ..... Says Phrase from Speech Chip
Sensors ..... Displays sensor data
Version ..... SW Version information
For information on any particular command, enter the command followed
by help.
```

Save

Saves all configuration jumper settings into system memory. Once the data is written to memory the saved configuration data is displayed on the terminal device. The system configuration is read on power up and compared to the current jumpers. If the jumpers disagree with the saved memory, an Error 30 will occur. Configuration jumpers can also be read by typing the Config command.

```
stp>save

Saving SKY497 Config Straps:

Configuration P1-70, Heading. set to Ground.
Configuration P1-69, Heading. set to Open.
Configuration P1-68, HeadFlgSen set to High.
Configuration P1-67, DR/Alt.422 set to Data Rec.
Configuration P1-100, Ant.Pos. set to Top.
Configuration P1-99, Ant.Type set to NY-164.
Configuration P1-98, Airframe set to Fixed Wing.
Configuration P1-80, AltDispType set to Open.
Configuration P1-79, AltDispType set to Open.
Configuration P1-78, AltDispType set to Open.
Configuration P1-77, AltDispType set to Open.
```

Say (help | 1-4)

Forces the TRC to announce one of four commands, depending on the number (1 thru 4) entered after the command SAY. Can be used to help troubleshoot audio output problems.

say help: Displays command specific help message.

say 1: Traffic Avoidance System Test

say 2: Passed

say 3: Failed

say 4: Traffic! Traffic!

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**Commands**

**Descriptions**

Sensors (help)

Displays the current source and value for the heading, barometric altitude, and radio altitude.

Sensors help: Displays command specific help message.

Sensors: Displays current sensor status.

```
stp>>sensors  
  
Heading source: Synchro XYZ  
Heading is Valid, 0 degrees  
Barometric Altitude source: Encoded Inputs  
Barometric Altitude is Valid, 1000 feet  
Radio Altitude source: ARINC 429  
Radio Altitude is Invalid
```

Version

Displays the versions for the IOP Code, IOP Boot, STP Code, and STP Boot software. Contact customer service department for version information.

```
stp>>version  
  
IOP Code X.XX  
IOP Boot X.XX  
STP Code X.XX  
STP Boot X.XX
```

# APPENDIX E

## Installation Checkout Using an Alternate Display

### E.1 INTRODUCTION

This section contains installation checkout procedures for the SKY497 that is interfaced to an alternate display (e.g., BFGoodrich Avionics Systems RGC250).

#### NOTES

1. This section provides checkout information for the BFGoodrich Avionics Systems SKY497 interfaced to an Alternate Display. When interfacing to an alternate display the TRC497 must have software version 1.4 or above.
2. This procedure assumes familiarity with the set up and operation of the TT391 Flightline Tester and RS-232 terminal device (see Appendix D). If using another approved tester refer to the appropriate appendices for test procedure.
3. All test equipment used in completing these tests shall be calibrated in accordance with the manufacturer's recommendations.

This procedure will validate the installation and return to service of the BFGoodrich Avionics Systems SKY497.

### E.2 CONTROLS

Operating instructions for each alternate display are provided with the display manufacturers documentation.

#### NOTE

When using an alternate display all SKY497 functions are controlled through the alternate display. Each alternate display will show information consistent with the capabilities of that particular display. Therefore, the text displayed may be different from what is called out in this procedure. Reference the alternate display documentation for appropriate screen text.

### E.3 CHECKOUT PROCEDURE

The TT391 Flightline Tester simulates both a ground based secondary surveillance radar (SSR) and an airborne transponder. With the SKY497 set to GROUND TEST (i.e., the barometric altimeter is simulated to 50,000 ft, heading simulated to 0 degrees, and the radar altimeter simulated to 2,500 ft) the TT391 will simulate two targets; a Traffic Advisory (i.e., a solid circle) at ¼ nm and Other Traffic (i.e., open diamond) at 4.5 nm. Both targets will be displayed in level flight at own aircraft altitude (i.e., "00" displayed above the traffic symbol).

If the indications given in the following procedure, except for the Flightline Tester, are not obtained, refer to the troubleshooting procedures in Chapter 4. If indications given for the Flightline Tester are not obtained, refer to the maintenance section of the TT391 Instruction Manual.

1. Connect the RS-232 terminal device to J7 TEST port on the TRC497. Setup and turn on the terminal device. (See Appendix D for terminal device commands, setup, and operating instructions.)
2. Make sure the aircraft's transponder is in the STBY mode and the DME is turned OFF. At the aircraft's instruments, verify all compass/HSI flags are valid.

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### NOTE

After power up, it may take a couple of minutes for the altitude encoder to return a valid altitude to the transponder and SKY497.

3. Turn SKY497 ON. After approximately thirty seconds the display will show the standby screen.

### NOTE

If the TRC has not been calibrated to the directional antenna, the display may show a FAIL message. Calibrate the system (see step 4 below).

4. At the terminal device, type Cal <Enter>. Verify the Re-Calibration Successful! is displayed.
5. Type Config <Enter>. Verify status of the configuration jumpers displayed on the screen. (You may need to page up in order to see all of the data. See Appendix D for example.) Once correct configuration is verified type Save <Enter>.

Change the status of the landing gear, squat switch, and altitude sensors. Type Config <Enter> again and verify that the displayed information changed correctly (i.e., sensing of these signals).

6. At the terminal device, type the commands listed below. For each command verify the sensor information displayed is correct (see Appendix D for examples). If the information is not correct, the configuration setting may be wrong or the sensor communication with the TRC may have failed. Check operation of the sensor and cables between the TRC and sensor.

Arinc429 <Enter>

Arinc735 <Enter>

Bar <Enter>

Rad <Enter>

Head <Enter> (Change heading of aircraft and verify heading changes.)

7. At the alternate display, perform the SKYWATCH self-test (see paragraph E.3.1).
8. At the terminal device, type Ground Test <Enter>.
9. At the alternate display, change the display ranges (if applicable) and verify display patterns are correct.
10. Select the 6 nautical mile range.
11. Change the altitude display modes from normal (NRM), below (BLW), and above (ABV). Verify that the system toggles through the altitude display modes correctly.
12. Select the normal (NRM) mode.
13. Position the aircraft with the nose aligned on any 90 degree heading. Avoid areas within 250 ft of obstructions (e.g., hangers, large aircraft, control towers, etc.) where there is a potential for multipath problems. Locate and mark test points at 30 degree intervals (i.e., 000, 030, 060, 090, 120, 150, 180, 210, 240, 270, 300, and 330 degrees) with respect to the directional antenna. Mark these points at the same distance, between 100 and 150 ft, from the aircraft.
14. Position the TT391 Flightline Tester on one of the test points identified above.

**CAUTION**

The Flightline Tester is not weatherproof when the lid is open. Do not setup or operate the Flightline Tester in conditions of rain, sleet, etc.

15. Setup and verify operation of the TT391 Flightline Tester:
  - a. Open the chassis lid and remove the lid from the chassis by sliding the lid off of the hinge pins (sliding it to the right). The lid "stay" must be removed from the lid before mounting. The stay will pop off of the lid. (The stay is the hinged part that props the lid open on the chassis).



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**NOTE**

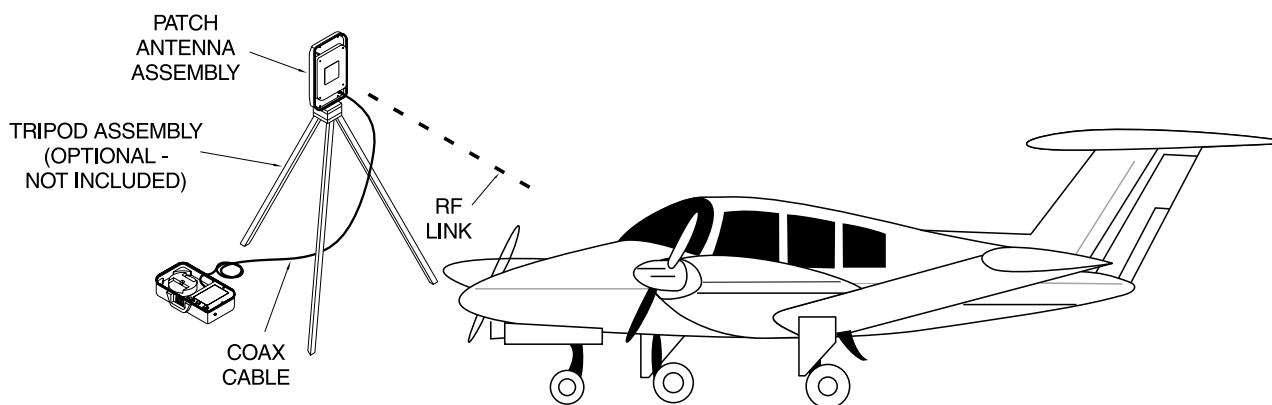
The Patch Antenna may be used without a tripod. The Patch Antenna can be held, or secured, and pointed towards the SKYWATCH aircraft under test WITH THE MOUNTING STUD POINT TOWARD THE GROUND. This orientation is critical.

- b. Mount the chassis lid, with the Patch Antenna facing the aircraft, onto a tripod (not included). The tripod must be capable of holding the antenna (approximately 2.5 lb) and must provide a standard base mounting stud threaded 1/4"-20. A typical tripod mount is shown in figure E-1.
- c. If the internal batteries are being utilized, proceed to sub-step f. If the Flightline Tester AC Converter Power Supply is to be utilized, proceed to sub-step d.
- d. Connect the AC Converter Power Supply cable connector to the chassis external connector.
- e. Connect the AC Converter Power Supply input power cable connector to one of the following AC sources:
  - 115 Vac, 60 Hz
  - 115 Vac, 400 Hz
- f. Set the Flightline Tester POWER switch to the ON position.
- g. Verify that the LOW indicator is not steady on (it may flash). If the LOW indicator remains on (i.e., lit), perform one of the following three options:
  - Use the AC Converter Power Supply to power the unit.
  - Recharge the internal batteries.
  - Replace the internal batteries.
- h. Set the SELF-TEST switch to the 1030 position and verify that the 1030 indicator blinks on for 1/2 second every 5 seconds.
- i. Set the SELF-TEST switch to the 1090 position and verify that the 1090 indicator blinks on for 1/2 second every 5 seconds.
- j. Set SELF-TEST switch to center position (off). Set the POWER switch to the OFF position.

**NOTE**

Care should be taken to ensure that the Patch Antenna is connected to TT391 connector J1 and **NOT J2**. IF THE PATCH ANTENNA IS CONNECTED TO J2 THE TT391 WILL NOT FUNCTION CORRECTLY.

- k. Connect the Flightline Tester coax cable to J3 on the Patch Antenna and to connector J1 in the chassis. (J2 should remain capped by the dust cover).



**Figure E-1. Typical Patch Antenna Tripod Mount**

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16. From each test point (see step 13):
  - a. Position the TT391 Patch Antenna facing the SKYWATCH aircraft under test.
  - b. Set the TT391 POWER switch to the ON position.
  - c. Verify that the display shows, in the direction ( $\pm 30$  degrees) of the TT391, two targets; a Traffic Advisory (i.e., a solid circle) at  $\frac{1}{4}$  nm and Other Traffic (i.e., open diamond ) at 4.5 nm. Both targets will be displayed in level flight at own aircraft altitude (i.e., "00" displayed above the traffic symbol).

**NOTES**

1. If the display reflects a gross error in target bearing, check the directional antenna cables at TRC connectors J9 (sum port) and J11 (difference port). They may be reversed. A further indication of this condition would be a target that moved in a counter-clockwise direction when the TT391 is moved in a clockwise direction.
  2. Multiple targets or a faulty bearing may result from multipath distortion (see step 1).
  3. During these tests, the SKY497 may detect and display other active targets.
  4. To obtain a better line of sight, it may be necessary to elevate the patch antenna.
- d. Set the TT391 POWER switch to the OFF. Repeat procedure from each test point. Step 16 can be done from the last test point.

**NOTE**

To prevent SKYWATCH from tracking the movement of the test-set, it is necessary to set the TT391 POWER switch to OFF after completing each bearing measurement.

17. Return the TT391 assemblies to their position in the aluminum carrying case.
18. Restart SKYWATCH by cycling power OFF and then ON.
19. Connect an oscilloscope to the suppression bus and verify that the SKY497 suppression pulse ( $100 \mu\text{s} \pm 5 \mu\text{s}$ ) exceeds +15 Vdc. If less than +15 Vdc, the suppression bus is overloaded. Check all equipment connected to the bus. Repair/replace the offending device.
20. This completes the post installation checkout procedure.

### **E.3.1 Self Test**

1. Turn SKYWATCH OFF and then:
  - a. Make sure the aircraft's transponder is in the STANDBY, ON, or ALT mode.

**NOTE**

After power up, it may take a couple of minutes for the altitude encoder to return a valid altitude to the transponder and SKY497.

- b. If installed, power up the radio altimeter.
  - c. Make sure all compass/HSI flags are cleared from the aircraft's instruments.
2. Turn SKYWATCH ON.
3. After approximately thirty seconds, observe the standby screen and then perform the SKYWATCH self test (see alternate display operating instructions on how to perform self test).
4. If SKYWATCH passes the self-test, the system will return to the standby screen and the voice message, "TRAFFIC ADVISORY SYSTEM TEST PASSED," will be enunciated over the cockpit audio system.
5. If you do not hear the voice message or if the voice message is of insufficient volume:
  - a. Check headphones/speaker and aircraft audio panel switch settings.

**NOTE**

Audio levels are adjusted at the aircraft audio panel. There is no internal audio adjustment.

- b. Check audio connection to the TRC:
    - 1) 600-ohm audio systems should be connected to P1-92 (AUDIO\_H).
    - 2) 150-ohm audio systems should be connected to P1-91 (AUDIO\_L).
    - 3) Audio common is connected to P1-90 (AUDIO\_C).

**NOTE**

Audio output from the TRC is transformer isolated.

6. If SKYWATCH fails the self-test:
  - a. The fail screen will be displayed.
  - b. The voice message, "TRAFFIC ADVISORY SYSTEM TEST FAILED", will be enunciated over the cockpit audio system.
  - c. Refer to the fault isolation procedures and error messages in Chapter 4.

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