With each press of the button, the screen changes to display the traffic detected within the chosen display range. The numerical value of the chosen display range (2, 6, or 15 nm) is displayed next to the button.

The SKY899 continues to track up to 35 intruder aircraft within its maximum horizontal surveillance range (35 nmi radius) regardless of the display range selected.

Change the Vertical Display Mode

You can change the vertical display mode when the SKY899 is in normal operating mode.

1. Press the vertical display mode button to toggle between above, normal, below, and unrestricted.

With each press of the button, the screen changes to display the traffic detected within the chosen vertical display mode (figure 1-5). The name of the chosen vertical display mode (ABV, NRM, BLW, or UNR) is displayed next to the button.

The SKY899 continues to track up to 35 intruder aircraft within its maximum vertical surveillance range (±10,000 ft) regardless of the vertical display mode selected.

Switch Between SKYWATCH & Stormscope

If you have a *Stormscope* WX-1000 installed with the SKY899, you can switch between SKYWATCH and *Stormscope* screens (figures 1-2 and 1-3) using the remote SKYWATCH/*Stormscope* mode switch. Once in *Stormscope* mode, you can use the buttons on the display bezel to control *Stormscope* functions.



If the SKY899 is in SKYWATCH mode, the display will not automatically switch into Stormscope mode to display thunderstorms or Stormscope errors. Use the remote SKYWATCH/Stormscope mode switch to periodically check for thunderstorms or Stormscope errors.

The SKY899 does not superimpose SKYWATCH data on top of *Stormscope* data or vice versa; however, if the SKY899 is in *Stormscope* mode and the SKY899 detects a TA, the display automatically switches to SKYWATCH mode until the TA goes away. Also, if the SKY899 is in *Stormscope* mode and the SKY899 detects a failure, a special SKY899 Failed screen appears that doesn't have a TEST button label, but does display the message

"Press Any Key to Ack." Pressing any button or waiting 10 seconds switches the SKY899 back to Stormscope mode.

Observe the Display



The SKY899 relies on information obtained from transponders in nearby aircraft. The SKY899 does not detect or track aircraft which are not equipped with an operating Air Traffic Control Radar Beacon System (ATCRBS) transponder.



The SKY899 does not track intruder aircraft approaching at a closure rate greater than 1200 knots.



Some traffic within the chosen display range may not be displayed due to traffic prioritizing, antenna shielding, or ground intruder filtering.

CAUTION

Optimum SKY899 performance is realized when intruder aircraft are reporting their altitude (via a mode C or other altitude reporting transponder).

Monitor the activity of any traffic displayed. Keep in mind the following points when watching traffic on the display:

- Traffic Prioritizing The SKY899 tracks up to 35 intruder aircraft simultaneously, but to reduce clutter, it displays only the 8 most threatening aircraft of those tracked.
- Ground Intruder Filtering If a radio altimeter is connected to the SKY899, no traffic symbols are displayed for traffic detected under 380 ft Above Ground Level (AGL) when your aircraft is below 1,700 ft AGL.
- Refer to chapter 4 for a description of the TA criteria and other factors that affect the display of traffic symbols.

Respond to Traffic Advisories



MARNING Do not attempt evasive maneuvers based solely on traffic information on the display. Information on the display is provided to the flight crew as an aid in visually acquiring traffic; it is not a replacement for Air Traffic Control (ATC) and See & Avoid techniques.

When the SKY899 issues a TA, look outside for the intruder aircraft. When you spot an intruder aircraft, use normal rightof-way procedures to maintain separation.

Turn Off the SKY899 and the Optional WX-1000

Rotate the OFF/BRT knob on the display bezel counterclockwise until the switch turns off.

Operate the WX-1000 Without the SKY899

After removing the SKY899 for maintenance, maintenance personnel must install a jumper plug if you want to continue using the WX-1000.

Operate the SKY899 Without the WX-1000

After removing the WX-1000 for maintenance, maintenance personnel will move the WX-1000 maintenance switch to the OVERRIDE (WX-1000 maintenance) position to allow continued operation of the SKY899.

Message Response

When the SKY899 detects a fault, it determines whether the system has failed or is just degraded. A failed system can not perform any collision warning functions. A degraded system can perform some collision warning functions but may not be able to provide some features such as intruder position enhancement via ADS-B (due to the loss of GPS communications).

Respond to a Failed System

In the case of a failed system, the SKY899 displays a Failed screen (figure 3-4). All errors indicated by a Failed screen prevent continued operation of the SKY899 in SKYWATCH mode; however, error #20, Barometric Altitude Input, is a recoverable error. For example, if you turn on and try to operate the SKY899 before you turn on the barometric altitude source and it comes on line, a SKY899 Failed screen appears with error #20 and continued operation of the SKY899 in SKYWATCH mode is not possible; but when you eventually turn on the barometric altitude source, the Failed screen disappears and operation returns to normal.

If you see a SKY899 Failed screen, respond as follows:

1. If the Barometric Altitude Input error (#20) occurs, make sure the barometric altitude source has been turned on and given enough time to warm up.

Most #20 errors are due to the failure of equipment external to the SKY899.

- If any other error occurs, or if error #20 remains after 5 minutes, write down the error number and description; then, if you don't have a *Stormscope* WX-1000, skip to step 9.
- 3. If the SKYWATCH/Stormscope mode switch is in the Stormscope position, switch it into the SKYWATCH position.
- 4. Press the TEST button.

The resulting self test may provide another error code to write down.

- 5. If you see MSG or **MSG** on the Failed screen, press the message button and write down the degraded items you see listed on the message screen.
- 6. Press the EXIT button to return to the Failed screen.
- 7. Switch into *Stormscope* mode using the SKYWATCH/ *Stormscope* mode switch.
- 8. Press any key or wait 10 seconds to remove the SKY899 Failed screen.

The Stormscope screen is displayed.

9. Press the TEST button.

The resulting self test may provide another error code to write down.

- 10. If you see MSG or MSG on the Failed screen, press the message button and write down the degraded items you see listed on the message screen.
- 11. Press the EXIT button to return to the Failed screen.
- 12. Remove power from the SKY899 at the circuit breaker.

If you have a WX-1000 *Stormscope* and you haven't already manually switched into *Stormscope* mode, the display will automatically switch into *Stormscope* mode once you disconnect power from the SKY899 regardless of the position of the SKYWATCH/*Stormscope* mode switch.

13. Contact your authorized BFGoodrich Avionics Systems dealer for troubleshooting help. Be sure to give the troubleshooting personnel the error numbers and descriptions that you wrote down.

Respond to a Degraded System

In the case of a degraded system, the SKY899 displays **MSG** on the traffic screen and on the Standby screen (figure 2-1).

If you see **MSG**, respond as follows:

1. Press the button next to MSG to display the message screen (figure 3-8).

The message screen lists the faults that are causing the degraded operation. If there are more faults than can fit on one screen, press the NEXT button to go to the next screen of messages.



Figure 3-8. Message Screen With Two Messages

2. Write down the faults then press the EXIT button to return to the previous screen.

Once you've read the Degraded Operation screen, the **MSG** indicator on the traffic screen or standby screen changes to

MSG (with no highlighting box). With **MSG** displayed, you can press the adjacent button to see the message screen again. Once the faults responsible for the degraded condition are corrected, the **MSG** symbol disappears from the traffic screen, but remains on the Standby screen. Pressing the message button in this case on the Standby screen displays the message screen with no messages (figure 3-9).

3. Contact your authorized BFGoodrich Avionics Systems dealer for troubleshooting help. Be sure to tell the troubleshooting personnel about the faults that you wrote down in step 2.



Figure 3-9. Message Screen With No Messages

Chapter 4 **Principles of Operation**

Introduction

This chapter describes, lists, and illustrates Traffic Advisory (TA) criteria and other factors that affect the display of traffic symbols including Automatic Dependent Surveillance Broadcast (ADS-B). Table 4-1 on the next page summarizes the criteria necessary for the SKY899 to display a TA.

Sensitivity Levels

The SKY899 uses one of two sensitivity levels, A or B, to determine when to display a TA. Having two sensitivity levels allows the SKY899 to reduce the number of nuisance TAs during takeoff and landing (sensitivity level A), and to maximize the detection of TAs during the cruise phase of your flight (sensitivity level B).

Sensitivity Level A

Sensitivity level A consists of two criteria for displaying a TA:

1. The intruder aircraft enters into a cylinder of airspace surrounding your aircraft defined by a 0.2 nmi horizontal radius and a height of ±600 ft from your aircraft. (See figures 4-1 through 4-3.)

OR...

2. The intruder aircraft approaches your aircraft on a course that will intercept your aircraft within 15 or 20 seconds (within 15 seconds for a non-altitude reporting intruder aircraft; within 20 seconds for an altitude reporting intruder aircraft).

	The SKY899 Will Issue a Traffic Advisory				
		And Your	And Your	And Your	And An Intruder
No	If Your Ainonoft	Aircraft's	Landing Coon Io	Ground Speed	Aircraft Is
110.			Geal IS	15	
1	has a radio	ACI			within a 0.2 nmi
	attifficter	nge			+600 ft relative altitude
2					within 15_20 sec
					of CPA**
3		above 2000 ft			within a 0.55 nmi
		AGL			horizontal radius and a
					±800 ft relative altitude
4					within 20–30 sec.
5	1		1		
)	have a radio		down		horizontal radius and a
	altimeter*				± 600 ft relative altitude
6					within 15–20 sec.
					of CPA**
7			up		within a 0.55 nmi
					horizontal radius and a
					±800 ft relative altitude
8					within 20–30 sec.
			C 1		
9			пхеа	not available	horizontal radius and a
					±800 ft relative altitude
10					within 20–30 sec.
					of CPA**
11				available and	within a 0.55 nmi
				greater than or	horizontal radius and a
				equal to 120 knots	±800 ft relative altitude
12					within 20–30 sec. of CPA**
13				available and less	within a 0.2 nmi
				than 120 knots	horizontal radius and a
					±600 ft relative altitude
14					within 15–20 sec.
					of CPA**
		Sensitivit	v Level A	Sensitivity Level B	

Table 4-1. Fourteen Situations in Which a Traffic Advisory Will Occur

* Having a radio altimeter means having a compatible radio altimeter wired to the SKY899 and providing valid altitude information.

** CPA means Closest Point of Approach.

*** Ground speed is not available whenever your GPS navigation information is not available.

The SKY899 uses sensitivity level A in the following situations (corresponds to numbers 1, 2, 5, 6, 13, and 14 in table 4-1):

- 1. Your aircraft has a radio altimeter and is below 2,000 ft AGL.
- 2. Your aircraft has no radio altimeter but its retractable landing gear is down.
- 3. Your aircraft has no radio altimeter, a fixed landing gear, and your ground speed is available and is less than 120 knots.

Sensitivity Level B

Sensitivity level B consists of two criteria for displaying a TA:

1. The intruder aircraft enters into a cylinder of airspace surrounding your aircraft defined by a 0.55 nmi horizontal radius and a height of ±800 ft from your aircraft. (See figures 4-1 through 4-3.)

OR...

2. The intruder aircraft approaches your aircraft on a course that will intercept your aircraft within 20 or 30 seconds (within 20 seconds for a non-altitude reporting intruder aircraft; within 30 seconds for an altitude reporting intruder aircraft).

The SKY899 uses sensitivity level B in the following situations (corresponds to numbers 3, 4, 7, 8, 9, 10, 11, and 12 in table 4-1):

- 1. Your aircraft has a radio altimeter and is above 2,000 ft AGL.
- 2. Your aircraft has no radio altimeter but its retractable landing gear is up.
- 3. Your aircraft has no radio altimeter, a fixed landing gear, and your ground speed is not available.
- 4. Your aircraft has no radio altimeter, a fixed landing gear, and your ground speed is available but is greater than or equal to 120 knots.



Figure 4-1. TA Zones If Your Aircraft Has a Radio Altimeter



Figure 4-2. TA Zones If Your Aircraft Has No Radio Altimeter, But Does Have a Retractable Landing Gear



Figure 4-3. TA Zones If Your Aircraft Has No Radio Altimeter and a Fixed Landing Gear

Audio Inhibit, SKY899

This audio inhibit feature prevents the aural part of TAs, "traffic traffic," from being announced during takeoff and landing in order to minimize pilot distraction. The corresponding TA symbols are still displayed.

The SKY899 uses this audio inhibit feature in the following situations:

- 1. Your aircraft has a radio altimeter and you're below 400 ft AGL. (See figure 4-1.)
- 2. Your aircraft has no radio altimeter but its retractable landing gear is down. (See figure 4-2.) (Audio is not inhibited if you have fixed landing gear and no radio altimeter.)

Audio Inhibit, GPWS, EGPWS, or TAWS

If your aircraft has a Ground Proximity Warning System (GPWS), Enhanced GPWS (EGPWS), or Terrain Awareness and Warning System (TAWS) interfaced with the SKY899 and an alarm from one of those systems occurs, the SKY899 senses the alarm and delays the aural "traffic, traffic" component of any TAs issued until the alarm clears.

TA Symbol Duration

A TA symbol remains on the screen for at least 8 seconds, even if the intruder aircraft no longer meets the TA criteria, as long as the SKY899 continues to track the aircraft.

Ground Intruder Filtering

Ground intruder filtering reduces the clutter of visual symbols and aural announcements that would otherwise be generated for intruder aircraft typically present on or near the ground near airports.

For intruder aircraft determined to be below 380 ft AGL, ground intruder filtering prevents the issuing of TAs and PAs, and prevents the display of OT symbols. (See figure 4-1.)

The SKY899 uses ground intruder filtering only if your aircraft has a radio altimeter and you're below 1,700 ft AGL.

ADS-B

Unlike the current ATC system of ground-based Secondary Surveillance Radar (SSR) interrogations and aircraft transponder replies, the ADS-B-based Free Flight Air Traffic Management (ATM) system of the future will depend more on aircraft-toaircraft exchange of aircraft state information (figure 4-4).



Figure 4-4. ADS-B

The SKY899 anticipates the future Free Flight environment by continuously monitoring the dedicated data link frequency (1090 MHz) for ADS-B mode S extended squitter messages within 50 nmi. These messages are broadcast, without interrogation, from aircraft with ADS-B-capable mode S transponders. The SKY899 does not require a mode S transponder, ADS-Bcapable or otherwise, to perform its ADS-B surveillance.

An ADS-B message contains nav data for the intruder aircraft including GPS position, ident, ground speed, and intent. The SKY899 uses this nav data along with its own aircraft GPS nav data to calculate the relative position of the intruder to enhance its active ATCRBS surveillance of the intruder.

Chapter 5 **Display** Interpretation

Introduction

This chapter explains the meaning of several sample screens. The abbreviation CPA used in some of the figures means closest point of approach.



Traffic Advisory

Intruder aircraft at 1 o'clock, 2 nmi away, 300 ft above you, descending at a rate greater than 500 fpm. CPA within 20 to 30 seconds.

Other Traffic

Intruder aircraft at 4:30, 4 nmi away, 700 ft below you, ascending at a rate greater than 500 fpm. No immediate threat. Displays as a PA (solid diamond) on TCAS installations.

Figure 5-1. TA & OT on 15 nmi Range, UNR Mode



Other Traffic Non-altitude-reporting intruder aircraft at 10:30, 9 nmi away. No immediate threat.

Other Traffic Intruder aircraft at 8 o'clock, 11 nmi away, 9,900 ft below you in level flight. No immediate threat.

Figure 5-2. Other Traffic on 15 nmi Range, UNR Mode



Other Traffic

Intruder aircraft at 5 o'clock, 4.5 nmi away, at your altitude, ascending at a rate greater than 500 fpm. No immediate threat.

New Messages Indicates one or more new messages are waiting to be read.





Traffic Advisory Non-altitude-reporting intruder aircraft at 2 o'clock, 1 nmi away. CPA within 15 to 20 seconds.

Other Traffic Intruder aircraft at 5 o'clock, 1.5 nmi away, 1,000 ft above you, ascending at a rate greater than 500 fpm. No immediate threat. Displays as a PA (solid diamond) on TCAS installations.

Figure 5-4. TA & OT on 2 nmi Range, BLW Mode



Off-Screen TA

Intruder aircraft at 9:30, more than 2 nmi away. 500 ft above you, descending at a rate greater than 500 fpm. CPA within 20 to 30 seconds.

Old Messages Indicates there are one or more old messages that are still valid, but no new messages.

Figure 5-5. Off-Screen TA on 2 nmi Range, ABV Mode



Standby

When in standby, the SKY899 does not transmit interrogations or track intruder aircraft. Press the button labeled \rightarrow OPR to begin tracking intruder aircraft.

Figure 5-6. Standby Screen

SKY899 Failed

Occurs any time the SKY899 detects an error that prohibits further operation of the SKY899 in SKYWATCH mode as long as the message remains on the screen.



Error 20

Indicates that the barometric input is missing or invalid. Once the valid barometric input returns, this screen goes away and normal operation resumes.

Figure 5-7. Failed Screen

Chapter 6 **Specifications**

Table 6-1. TRC899 Specifications*

Part Number Definition: 805-11900-001

Size:

Not including mounting tray: 7.62 in (19.36 cm) high 3.56 in (9.04 cm) wide 12.52 in (31.90 cm) deep

Weight:

Not including mounting tray: 8.75 lb (3.97 kg) Including standard mounting tray: 9.63 lb (4.37 kg) Including ruggedized mounting tray: 10.76 lb (4.88 kg)

Tracking Capability:

Up to 35 intruder aircraft (displays only the 8 highest priority aircraft)

Surveillance Range:

Horizontal tracking radius: 35 nmi maximum for ATCRBS surveillance 50 nmi maximum for ADS-B surveillance Relative altitude tracking range: ±10,000 ft maximum

Display Ranges:

Horizontal display ranges: 2, 6, and 15 nmi Vertical display modes: ±2,700 ft (normal mode)

- +9,000 ft to -2,700 ft (above mode/look up)
- +2,700 ft to -9,000 ft (below mode/look down)
- ±9,900 ft (unrestricted mode)

(Continues on next page)

*Specifications subject to change without notice.

Table 6-1. TRC899 Specifications* (Continued) Range Accuracy: 0.05 nmi typical **Bearing Accuracy:** 5° RMS typical with NY156 antenna 7° RMS typical with NY164 antenna Altitude Accuracy: +200 ft Maximum Closure Rate: 1200 knots **Power Input Requirements:** 18 to 32 V dc, 2 A maximum at +28 V dc Transmitter Power Output: Peak 1030 MHz RF output power of 52 dBm (158.5 W) ±1dB **Operating Temperature:** -55 to +70 °C (-67 to +158 °F) Storage Temperature: -55 to +85 °C (-67 to +185 °F) **Operating Altitude:** 55,000 ft maximum Cooling: Conduction and forced air convection (internal fan) Certification Compliance: U.S. FAA TSO C147 and C118. Contact BFG for the latest foreign country certifications. Refer to the latest revision of FSAW 98-04 for Flight Standards Service (AFS) policy concerning follow-on field approvals. **RTCA Compliance:** Environmental: DO-160D Category (F2X)BAB(S[2BM]U[2G])XXXXXZBABA(RR)L(XXXX)XXA Software: DO-178B Level D

*Specifications subject to change without notice.

Table 6-2. BFG WX-1000/SKY497 Display Specifications*



Table 6-3. NY164 Directional Antenna Specifications (for TAS installations only)*

Part Number: 805-10890-001 Size: 1.30 in (3.25 cm) high 6.23 in (15.82 cm) wide 11.12 in (28.24 cm) deep Weight: 2.3 lb (1.04 kg) Speed: Rated to 600 knots (0.9 Mach) @ 25,000 ft Frequency: 1,030-1,090 MHz TSO Category: C118 Environmental Category: DO-160C F2-AC(CLM)XSFDFSXXXXXXL(2A)X Finish: Gloss white Skydrol resistant polyurethane paint *Specifications subject to change without notice.

Table 6-4. NY156 Directional Antenna Specifications (required for TCAS I installations, optional for TAS)*

Part Number: 805-10003-001

Size:

1.30 in (3.25 cm) high 6.25 in (15.88 cm) wide 11.12 in (28.24 cm) deep

Weight:

2.3 lb (1.04 kg)

Speed:

Rated to 600 knots (0.9 Mach) @ 25,000 ft

Frequency:

1,030-1,090 MHz

TSO Category:

C118

Environmental Category:

DO-160C F2-AC(CLM)XSFDFSXXXXXXL(2A)X

Finish:

Gloss white Skydrol resistant polyurethane paint

^{*}Specifications subject to change without notice.

Chapter 7 Warranty Information

Introduction

The SKY899 is warranted for 2 years from the date of installation (not to exceed 30 months from the date of shipment from BFGoodrich Avionics Systems, Inc.) subject to the following limitations.

Warranty Statement

BFGoodrich Avionics Systems, Inc. (hereinafter called BFGAS) warrants each item of new equipment manufactured or sold by BFGAS to be free from defects in material and workmanship, under normal use as intended, for a period of 30 months from date of shipment by BFGAS to an authorized facility, or 24 months from date of installation by an authorized facility, whichever occurs first. No claim for breach of warranties will be allowed unless BFGAS is notified thereof, in writing, within thirty (30) days after the material or workmanship defect is found.

The obligation of BFGAS shall be limited to replacing or repairing at its factory the equipment found defective under terms of this warranty certificate; providing that such equipment is returned in an approved shipping container, transportation charges prepaid, to BFGAS, Grand Rapids, Michigan, or such other location as BFGAS may authorize. BFGAS reserves the right to have necessary repairs performed by an authorized agency. This warranty shall not apply to any unit or part thereof which has not been installed or maintained in accordance with BFGAS instructions, or has been repaired or altered in any way so as to adversely affect its performance or reliability, or which has been subjected to misuse, negligence or accident.

This warranty is exclusive and is accepted by buyer in lieu of all other guaranties or warranties express or implied, including without limitation the implied warranties of merchantability and fitness for a particular purpose. Buyer agrees that in no event will BFGAS liability for all losses from any cause, whether based in contract, negligence, strict liability, other tort or otherwise, exceed buyer's net purchase price, nor will BFGAS be liable for any special, incidental, consequential, or exemplary damages.

BFGAS reserves the right to make changes in design or additions to or improvements in its equipment without the obligation to install such additions or improvement in equipment theretofore manufactured.

A Subsidiary of The BFGoodrich Company

Related Policies and Procedures

a. If the original registered owner of a SKY899 sells the aircraft in which the SKY899 is installed during the warranty period, the remaining warranty may be transferred. Written notification of the transaction must be submitted by the initial recipient of the warranty to:

ATTENTION: WARRANTY ADMINISTRATOR BFGoodrich Avionics Systems, Inc. 5353 52nd Street, S.E. Grand Rapids, MI 49512 USA

Telephone: (800)253-9525

- b. Equipment must be installed by a BFG Avionics Systems, Inc. authorized dealer or installer. Installation of equipment by facilities not specifically authorized will void the equipment warranty.
- c. Notice of a claimed product defect must be given to BFG Avionics Systems, Inc. or a designated BFG Avionics

Systems, Inc. service agency within the specified warranty period.

d. A product which is defective in workmanship and/or material shall be returned to BFG Avionics Systems, Inc. via any authorized dealer with transportation charges prepaid. After correction of such defects, the equipment will be returned to the dealer, transportation prepaid by BFG Avionics Systems, Inc. via surface transportation. Any other means of transportation must be paid by the customer.

The risk of loss or damage to all products in transit shall be assumed by the party initiating the transportation of such products. All items repaired or replaced hereunder shall be warranted for the unexpired portion of the original warranty.

- e. BFG Avionics Systems, Inc. is in no way obligated or responsible for supporting or participating in the costs of the installation warranty. The entire responsibility lies with the BFG Avionics Systems, Inc. authorized dealer making the installation. BFG Avionics Systems, Inc. is only responsible for the product warranties outlined in the warranty statement.
- f. BFG Avionics Systems, Inc. cannot authorize warranty credit for troubleshooting of other systems in the aircraft in order to reduce noise interference with the SKY899.

Record of Important Information

Dealer Information

Name
Address
City, State, Zip
Telephone
Equipment Information
Date of Purchase
Installation Date
TRC:
Model Number
Part Number
Serial Number
Mod Letter
Software Version
Antenna:
Model Number
Part Number
Serial Number
Mod Letter
Display:
Model Number
Part Number
Serial Number
Mod Letter

NOTE

To ensure that a new or repaired SKY899 meets the TSO, meets foreign government certification requirements, and meets BFG performance standards, your SKY899 must be installed and tested by a BFG-authorized SKY899 dealer.



Aerospace

BFGoodrich Avionics Systems, Inc. 5353 52nd Street, S.E. Grand Rapids, MI 49512 USA (800)253-9525 or (616)949-6600 www.bfgavionics.com 009-11901-001 (Rev. 91, 2/14/01)

