TC-201A/B

TCAS/Transponder Antenna Couplers
Operation Manual

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Operation Manual

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The equipment conforms with all applicable UKCA marking directives. Please request the UK Declaration of Conformity for further details.

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The China RoHS Materials Declaration is shipped with the equipment when required.

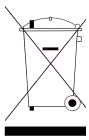
Safety Information

Read and follow all warning notices and instructions marked on the product and included in user documentation.

Symbols and Markings

Some or all of the following symbols and markings may be found on the instrument and in product documentation:

Table 1 Symbols and Markings

	This symbol indicates a note that includes important supplemental information or tips related to the main text.
	**Attention Symbol** This symbol represents a general hazard. It may be associated with either a DANGER, WARNING, CAUTION, or ALERT message. See Table 2 for more information.
	**ESD Sensitive** Indicates item is static sensitive. Item should only be handled by Qualified Service Personnel.
	**Explosive Hazard** This symbol represents a risk of explosion. It may be associated with either a DANGER, WARNING, CAUTION or ALERT message.
	**Voltage Symbol** This symbol represents hazardous voltages. It may be associated with either a DANGER, WARNING, CAUTION, or ALERT message. See Table 2 for more information.
	**Toxic Symbol** Indicates a toxic hazard. Item should only be handled by Qualified Service Personnel. Dispose of item in accordance with local regulations.
	**WEEE Symbol** This symbol, located on the equipment or the packaging indicates that the equipment must not be disposed of in a land-fill site or as municipal waste, and should be disposed of according to your national regulations.
	**CE Compliant** CE Label indicates item meets the requirements of the applicable European Directives.
	**Fuse Symbol** Indicates a fuse location (AC or DC).

Safety Definitions

This manual uses the following terms to indicate conditions or activities which are potential safety hazards:

Table 2 Safety Definitions

Term	Definition
WARNING	Identifies conditions or activities that, if ignored, can result in personal injury or death.
Avertissement	Identifiez les conditions ou les activités qui, si ignorées, peuvent entraîner des blessures personnelles voire mortelles.
CAUTION	Identifies conditions or activities that, if ignored, can result in equipment or property damage, e.g., Fire.
Mise en Garde	Identifiez les conditions ou les activités qui, si ignorées, peuvent entraîner des dommages à l'équipement ou aux biens, p. ex. un incendie.

Safety Hazards

Toxic Hazards

WARNING

Some of the components used in this device may include resins and other materials which give off toxic fumes if incinerated. Dispose of such items appropriately.

Avertissement

Certains des composants utilisés dans cet appareil peuvent comprendre des résines et d'autres matériaux qui produisent des émanations toxiques lorsqu'ils sont incinérés. Éliminez adéquatement de tels éléments.

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Preface

This prefix explains how to use this manual. Topics discussed include the following:

- About this Manual 0-2
  - Purpose and Scope 0-2
  - Assumptions 0-2
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About this Manual

This manual is a product of the VIAVI Technical Publications Department, issued for use with the TC-201A/B TCAS/Transponder Antenna Coupler.

Purpose and Scope

The purpose of this manual is to help you successfully use the TC-201A/B features and capabilities.

It provides instructions for setup and use of the TC-201A/B, specifications, and contact information for VIAVI's Technical Assistance Center (TAC).

NOTE

Since the release of the TC-201A coupler, VIAVI has developed the TC-201B coupler which fits smaller fuselage aircraft that use the Collins TSA-4100 antenna. This document will refer to the coupler as "TC-201A/B" except where the differences in the couplers are discussed.

Assumptions

This manual is intended for novice, intermediate, and experienced users who want to use the TC-201A/B effectively and efficiently. It is assumed that the user has basic aircraft maintenance experience.

Ordering information

This manual is a product of the VIAVI Technical Publications Department, issued for use with the TC-201A/B. The PDF format of this manual is available on the VIAVI product website.

- The part number associated with this publication is 22136337 on CD 142969
- Type TC-201 to find the manuals associated with the TC-201A/B

Go to: https://www.viavisolutions.com/en-us/resources/literature-library

Contact Information

Contact the Technical Assistance Center (TAC) for technical support or with any questions regarding this or other VIAVI products.

- Phone: 1-844-GO-VIAVI
- Email: Techsupport.Avcomm@viavisolutions.com

For the latest TAC information, go to:

- https://www.viavisolutions.com/support/technical-product-support

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1

Overview

This chapter provides a general description of the TC-201A/B. Topics discussed in this chapter include the following:

- About the TC-201A/B 2
- Differences of the TC-201A and TC-201B 3
  - Effects of Multi-path 4
  - TCAS Display Clutter 4
  - Features and Capabilities 4
- Controls and Connectors 5
  - Antenna Coupler 5
- Accessories 7

About the TC-201A/B

The VIAVI TC-201A and TC-201B TCAS/Transponder Antenna Couplers are used for testing both TCAS and combined TCAS/Transponder directional antennas.

The series includes the following models:

- TC-201A

  Kit: 140889 / Coupler-only: 22130799
- TC-201B

  Kit: 22163082 / Coupler-only: 22163085

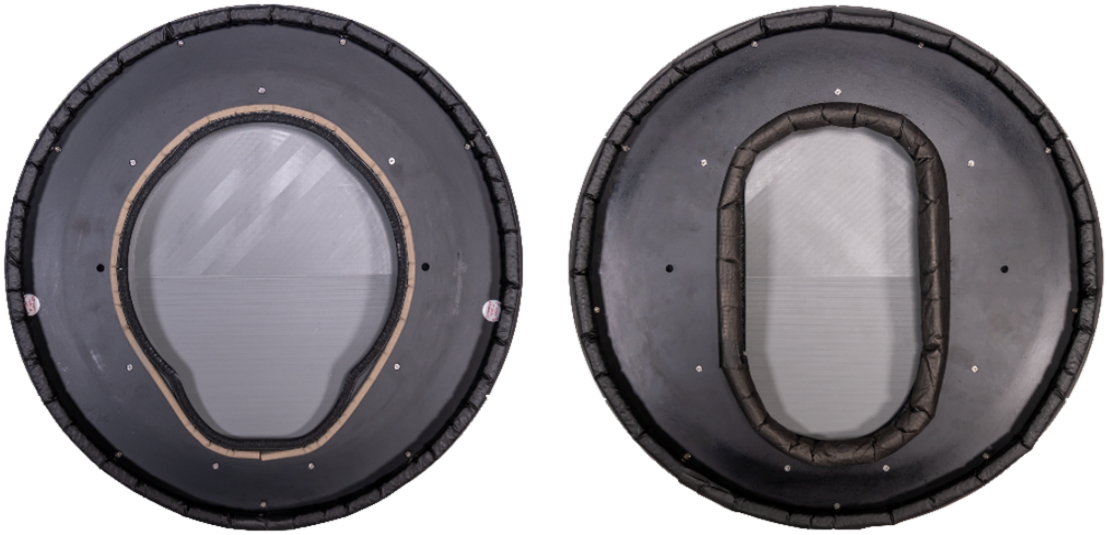
The TC-201B model functions just like the TC-201A, but is designed for use on smaller diameter airframes.

When used with any configurations of the AVX-10K, IFR6000, IFR6015, or APM-424(V)5, the TC-201A/B supports maintenance testing in the airborne condition, by helping to minimize interference with air traffic control or nearby aircraft.

Figure 1-1 TC-201A/B Kit

Differences of the TC-201A and TC-201B

The basic design of the TC-201A and TC-201B are the same. The baseplate of the TC-201B has been replaced and additional RF foam added around the oval cutout which supports the Collins TSA-4100 antenna.



TC-201A Baseplate **TC-201B Baseplate**

Figure 1-2 TC-201A Baseplate and TC-201B Baseplate

Supported Antennas

Supported Equipment	TC-201A	TC-201B
Collins TSA-4100 and Similar	■	■
Honeywell/ACSS AT-910 and Similar	■	—
Minimum Recommended Fuselage Size	110"	92"

Figure 1-3 TC-201A/B Kit

The supported antennas are depicted here in Figure 1-3.

Effects of Multi-path

The special design/application of the coupler shields the RF signal during testing.

TC-201A/B couplers aid in the mitigation of errors due to effects of multi-path. TCAS is tested as a coupled connection through the UUT antenna avoiding multi-path from the ramp, hangar, buildings and other aircraft, eliminating the need for moving UUT aircraft away from factors causing multi-path.

TCAS Display Clutter

TC-201A/B couplers provide isolation needed to reduce actual airborne traffic from responding to TCAS interrogations. Therefore, fewer targets are displayed, allowing the Ramp Test Set generated target to be easily distinguished.

Features and Capabilities

The TC-201A/B operate in conjunction with Ramp Test Sets.The TC-201A/B is compatible with Phase and Amplitude TCAS systems and combined transponder systems and features the following:

- Accommodates both phase-type and amplitude-type antennas
- Reliable, FAR Part 43, Appendix F, ERP and MTL testing in high multi-path environments
- Provides >20 dB of isolation
- Provides proper shielding for all transponder and ADS-B performance testing
- Lower antenna adjustable support pole
- Perform four-quadrant testing by simply rotating the bearing selector dial
- TCAS bearing accuracy < 10 degrees

Controls and Connectors

Antenna Coupler

This section identifies and describes the Antenna Coupler controls.

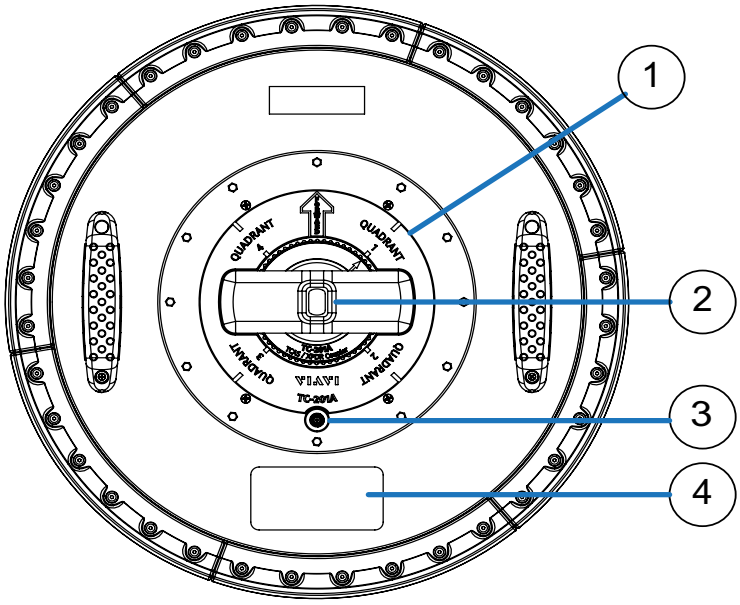


Figure 1-4 TC-201A/B Controls and Connector Diagram

Quadrant Selection Control (1)

Selects quadrant of the intruding aircraft simulated by the TC-201A/B. For correct quadrant, the TCAS Coupler must be placed over the TCAS UUT Antenna so the FORWARD label is towards the front of the aircraft.

Support Pole Socket (2)

Secures the support pole or extender pole used with the support pole to TCAS Coupler.

Antenna Connector (3)

TNC connector used to connect the Ramp Test Set (ANT Connector) to the TCAS Coupler.

Loss Label (4)

Contains coupler loss information for supported antenna types.

Table 1-1 Loss Label/Placard Example

TCAS		w/30dB Atten	
Antenna	**Loss**	**Distance**	**Height**
ACSS Amplitude	15.6 dB	13 FT	4 FT
Collins Amplitude	15.5 dB	13 FT	4 FT
Collins Phase	17.5 dB	17 FT	2 FT
Honeywell Phase	13.7 dB	11 FT	1 FT
Transponder		**w/30dB Atten**	
Antenna	**Loss**	**Distance**	**Height**
ACSS Amplitude	14.8 dB	12 FT	4 FT
Collins Amplitude	17.1 dB	16 FT	3 FT
Serial#:			**1000000004**

The values used from this table will depend on the test set connected to the TC-201A/B coupler. The values in the Loss column are the coupler loss values that VIAVI has established with each of the OEM antennas listed.

For test sets where the TC-201A/B coupler is connected to the RF I/O port, the values from the Loss column are used.

When using a test set where the TC-201A/B coupler is connected to the Antenna port, the values from the Distance and Height columns are used for Antenna Range and Antenna Height in the setup of the test equipment.

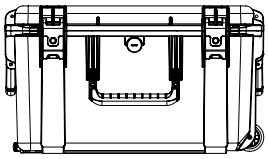
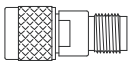
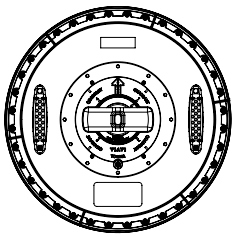
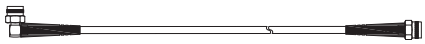
For example, if you are testing a Honeywell TCAS system, you will use 11 Ft for the Antenna Range and 1 Ft for the Antenna Height. For the Collins TCAS systems, you will need to contact your engineering department to determine whether the aircraft is using a Collins Amplitude vs. a Collins Phase TCAS.

When testing an ACSS Transponder with the TC-201A/B, use 12 Ft for Antenna Range and 4 Ft for Antenna Height. When testing a Collins Transponder with the TC-201A/B, use 16 Ft for Antenna Range and 3 Ft for Antenna Height.

Accessories

This section identifies the accessories that shipped with the device.

Table 1-2 TC-201A/B Accessories List

Item	Part Number	Description	Qty
	142743	Transit Case	1
	92863	30 dB Attenuator	1
	(Coupler only) • 22130799 • 22163085	TCAS/Transponder Antenna Coupler • TC201-A • TC201-B	1
	142839	Coax Assembly (50 ft) (TNC Male to TNC Male 90 Deg.)	1
See Table 1-3 for contents	142742	Extension Pole Kit	1

NOTE
VIAVI provides an additional but optional extension pole (91077) to support taller aircraft where the provided pole kit does not suffice.

Table 1-3 Extension Pole Kit (142742) Contents

Item	Part Number	Description	Qty
	142761	Piston Monopole	1
	90179	Monopole Extension, section 2	1
	90178	Monopole Extension, section 3	1
	90177*	Monopole Extension, section 4 * An additional extension can be purchased separately to extend pole height an additional ~19" if required.	2

CAUTION
Do not add more than 1 additional segment to extend overall length of pole assembly.

2

Using the Coupler

This chapter provides task-based instructions for using the TC-201A/B features. Topics discussed in this chapter are as follows:

- General Operating Procedure 2
  - Aircraft Setup 2
  - Connection 2
  - Testing Using TC-201A/B 4
- XPDR Setup (AVX-10K) 6
- TCAS Setup (AVX-10K) 7
  - Transponder Auto Testing 8
  - TCAS Target Test 9
- Storage Instructions 11

General Operating Procedure

The information below when using the TCAS Coupler to verify TCAS power and quadrant accuracy. This procedure is presented as a supplement to the recommended test procedure in the Ramp Test Set Operation Manual. Specific requirements and operation settings for the various TCAS displays, antennas, and Mode S equipment are not addressed in this procedure. Refer to the Ramp Test Set Operation Manual and UUT manual for specific testing guidelines.

Aircraft Setup

A transponder test can be performed with the aircraft in the Airborne or Surface condition. Please refer to aircraft specific information to complete this step. The following are some common required settings:

- Weight off wheels
- Air Data set for altitude of 10,000 ft and airspeed of 300 kts.
- Radar Altimeter Antennas using the VIAVI ALT-8000/9000 Radar Altimeter test set solution or optionally covered with RF Blanket

Connection

The following diagram shows the hardware configuration used during setup:

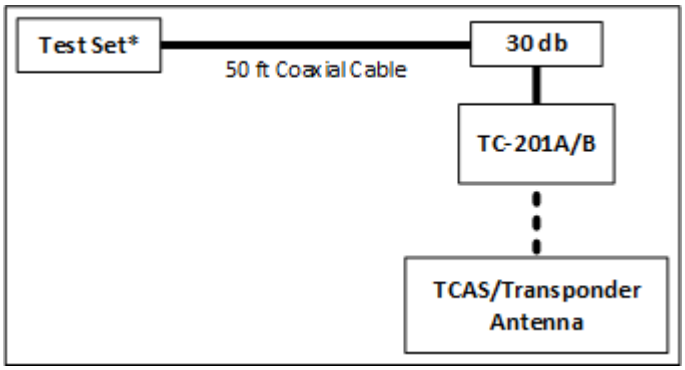
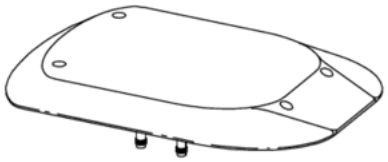


Figure 2-1 Setup Diagram

NOTE

- The TC-201A and TC-201B are designed for compatibility with VIAVI Transponder / TCAS flight line test sets.
- Refer to the Instruction Guide for Antenna Compatibility details.

Table 2-1 Model-specific Detail

Supported Equipment	TC-201A	TC-201B
 Collins TSA-4100 and Similar	✓	✓
 Honeywell/ACSS AT-910 and Similar	✓	
Minimum Recommended Fuselage Size	106”	92”

Testing Using TC-201A/B

STEP	PROCEDURE

1. Connect the TC-201A/B to the Test Sets Antenna Port using the supplied cable and the 30dB attenuator.
2. Set the TC-201A/B to Quadrant 1.
3. Set XPDR parameters as indicated in Table 2-2.

Table 2-2 XPDR Setup (IFR6000/6015)

Parameter	Setting
RF PORT	Antenna
ANTENNA	Top
ANT RANGE	See coupler loss placard
ANT CABLE LEN	Length of cable used
ANT Cable Loss	See cable loss placard
Coupler Loss	0.0 dB
UUT ADDRESS	AUTO
ANT HEIGHT	See coupler loss placard
ANT GAIN (dBi)	
0.96 GHz	0.0
1.03 GHz 0.0 ‡	0.0
1.09 GHz	0.0

STEP	PROCEDURE

4. Set TCAS parameters as indicated in Table 2-3.

- For the 1.03 GHz value, see Antenna Gain table ‡ ; Refer to Table 2-4.

Table 2-3 TCAS Setup (IFR6000/6015)

Parameter	Setting
RF PORT	Antenna
ANT RANGE	See coupler loss placard.
ANT HEIGHT	See Coupler loss placard
ANT CABLE LEN	Length of cable used.
ANT CABLE LOSS	See cable loss placard.
UUT ADDRESS	AUTO
SQUITTERS	ON
ALT REPORTING	ON
ANT GAIN (dBi)	
1.03 GHz 0.0 ‡	0.0
1.09 GHz	0.0

Table 2-4 Antenna Gain

Antenna Gain ‡ Value	Condition
1.03 GHz: 0.0	For most cases
1.03 GHz: 2.0	For smaller diameter planes using a TSA-4100 antenna that is not mounted flush against the aircraft.

XPDR Setup (AVX-10K)

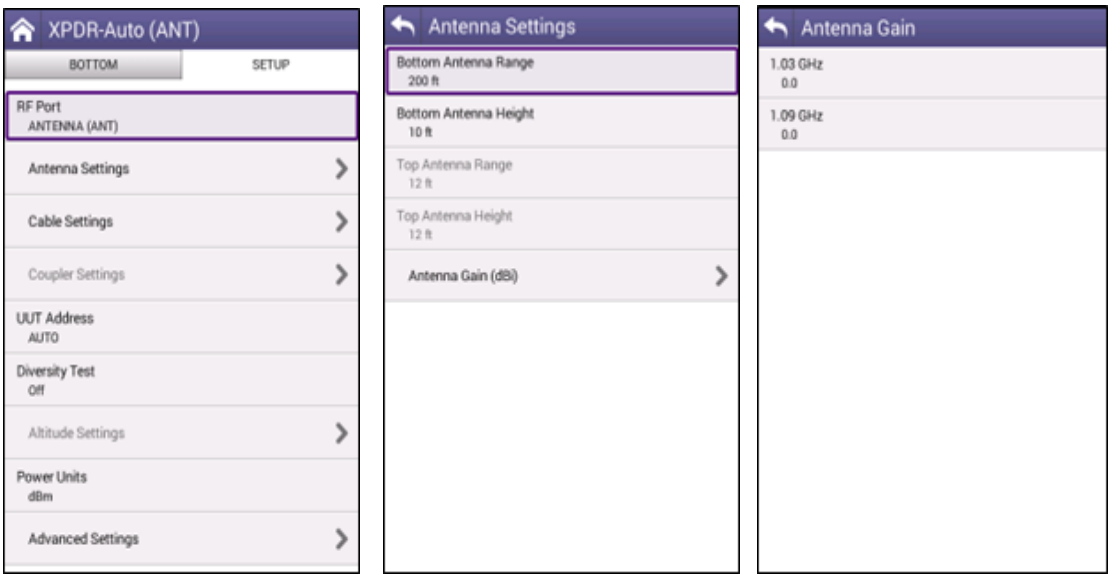


Figure 2-2 XPDR Setup (AVX-10K)

RF Port: ANTENNA (ANT)
Antenna Settings > Bottom Antenna Range: See coupler label
Antenna Settings > Bottom Antenna Height: See coupler label
Antenna Settings > Antenna Gain (dBi) > 1.03 GHz: 0.0
Antenna Settings > Antenna Gain (dBi) > 1.09 GHz: 0.0
Cable Settings > Bottom Antenna Cable Length: length of cable used
Cable Settings > Bottom Antenna Cable Loss: see cable loss label
UUT Address: AUTO
Diversity Test: Off

TCAS Setup (AVX-10K)

NOTE
TCAS Setup screens are similar to XPDR_AUTO screens (See Figure 2-2)

RF Port: ANTENNA (ANT)
Antenna Settings > Antenna Range: See coupler label
Antenna Settings > Antenna Height: See coupler label
Antenna Settings > Antenna Gain (dBi) > 1.03 GHz: 0.0
Antenna Settings > Antenna Gain (dBi) > 1.09 GHz: 0.0
Cable Settings > Antenna Cable Length: length of cable used
Cable Settings > Antenna Cable Loss: see cable loss label
UUT Address: AUTO
Squitters: ON
Altitude Reporting: ON

Transponder Auto Testing

Config: Generic Mode S

STEP	PROCEDURE

1. After the coupler is placed on the TCAS/Transponder antenna, press the **Run Test** softkey.
2. Allow the Test Set to complete the testing and review the screen for a pass or fail indication.

NOTE
If a fail indication is present then press the Test List softkey (IFR 6000/6015) or view the individual test ribbons (AVX-10K) to determine which test has failures.

3. Switch the TC-201A/B coupler to quadrant 1, 2, 3 and 4 and record data into Table 2-5.

NOTE
These setup instructions are for reference only. Please refer to appropriate Test Set *Operation Manual* for specific instructions.

Table 2-5 Quadrant 1 Data Table

Quadrant 1							
REPLIES	_____%	**FREQ**	_____MHz	**ERP**	_____dBm	**MTL**	_____dBm
Quadrant 2							
REPLIES	_____%	**FREQ**	_____MHz	**ERP**	_____dBm	**MTL**	_____dBm
Quadrant 3							
REPLIES	_____%	**FREQ**	_____MHz	**ERP**	_____dBm	**MTL**	_____dBm
Quadrant 4							
REPLIES	_____%	**FREQ**	_____MHz	**ERP**	_____dBm	**MTL**	_____dBm

NOTES:_____
_____
_____

TCAS Target Test

STEP	PROCEDURE

1. Select the type of scenario. (most generally begin with a canned scenario e.g. -200 FT COLLISION and the test set will switch to Custom Scenario if the operator changes any parameter.).
2. Choose the TCAS Type: TCAS II (as appropriate).
3. Choose REPLY (%): 100.
4. Choose INTRUDER TYPE: MODE S (or as appropriate).
5. Set CONVERGE: ON.
6. Set the target start range: 10 nmRANGE START(nm): 10.
7. Set RANGE STOP(nm): 0.00.
8. Set RANGE RANGE(kts): 300.
9. Set ALTITUDE START(ft): 1000.
10. Set ALTITUDE STOP(ft): 0.
11. Set ALTITUDE RATE(fpm): 500.
12. Set ALTITUDE DETECT: OFF.
13. Enter AIRCRAFT BARO TEST ALTITUDE(ft): (as observed on UUT altimeter).
14. Record results in Table 2-6.

NOTE
These setup instructions are for reference only. Please refer to the appropriate Test Sets Operator's Manual for detailed instructions.

Table 2-6 TCAS Data Table

Quadrant 1			
FREQ	_____MHz	**ERP**	_____dBm
Quadrant 2			
FREQ	_____MHz	**ERP**	_____dBm
Quadrant 3			
FREQ	_____MHz	**ERP**	_____dBm
Quadrant 4			
FREQ	_____MHz	**ERP**	_____dBm

15. Record the bearing of the target for each quadrant in the chart below.

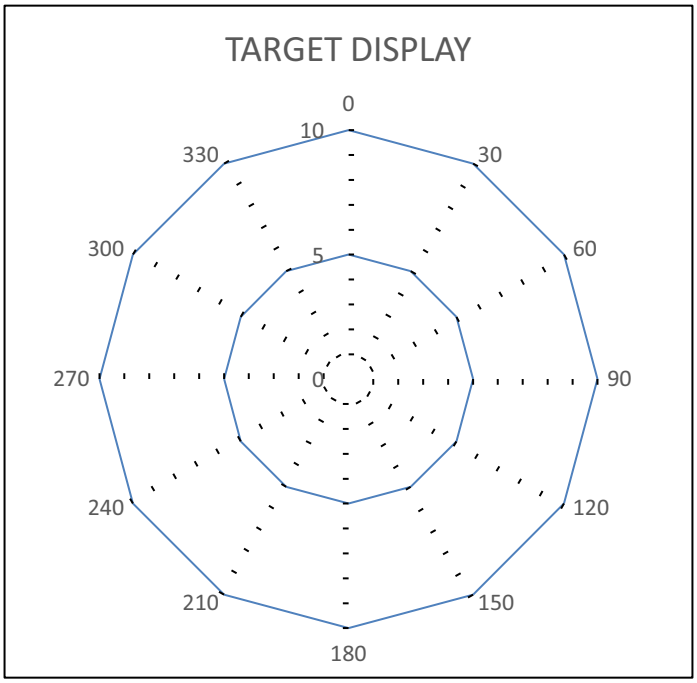


Figure 2-3 Target Display

NOTES:_____

Storage Instructions

The transit case is designed with special inserts for proper storage of hardware and accessories. Store case away from dampness and temperature extremes.

Contents should be stored in the transit case as follows (see Figure 2-4).

- Store coax cable, coiled inside dome of Coupler.
- Store TCAS Coupler as shown.
- Store one Extension Pole in each side slot.

NOTE
The transit case provies sufficient room to fit all segments for a total of 2 complete Extension Pole Kits (P/N 142742) and 1 additional (optional) segment (P/N 90177).

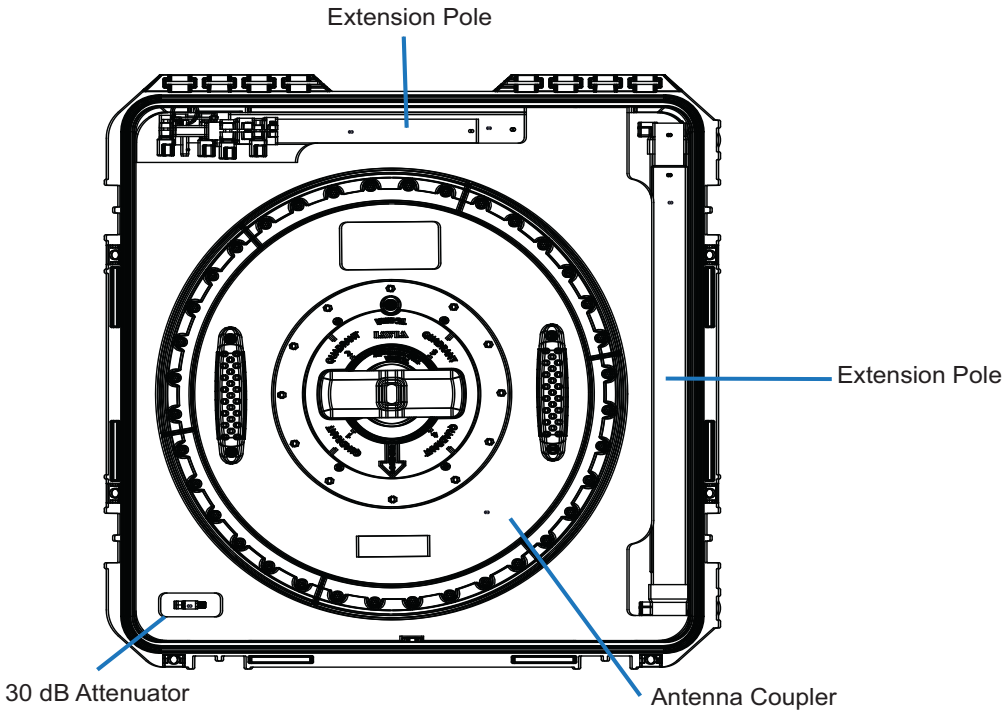


Figure 2-4 Transit Case Content Storage

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A

Specifications

Topics discussed in this appendix are as follows:

- Unit specifications 2

Unit specifications

Table A-1 Physical Specifications

Parameter	Specification
Height	8.38 in (21.29 cm)
Diameter	18.84 in (47.85 cm)
Weight	11 lbs (4.9 kg)

Table A-2 Coupler Specifications

Parameter	Specification
Quadrant	Range: 45 - 315 Deg. Increments: 90 Deg. Accuracy: ± 10 Deg. Typical ± 18 Deg. Max
Return Loss	> 9 dB
Insertion Loss	15 dB typical
Repeatability	< 1 dB
Isolation	> 20 dB
VSWR (Coupler Port to UUT Antenna)	2.5:1
Frequency	1030 MHz, 1090 MHz
Connector	TNC Female

Table A-3 Airframe Fuselage

	TC-201A	TC-201B
Minimum Recommended Fuselage Size	110 in	92 in.

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TC-201A/B
TCAS/Transponder Antenna Coupler
Operation Manual

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English

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