ARSAG

AERIAL REFUELING SYSTEMS ADVISORY GROUP

Guidance Document

Ground Support Equipment (GSE) for Aerial Refueling Systems

Document Number 45-14-23
Date 07 June 2023

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REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. REPORT DATE *(DD-MM-YYYY)*	2. REPORT TYPE	3. DATES COVERED *(From - To)*
07-06-2023	Technical	2006-2023

4. TITLE AND SUBTITLE
Ground Suppport Equipment (GSE) for Aerial Refueling Systems

5a. CONTRACT NUMBER
N/A

5b. GRANT NUMBER
N/A

5c. PROGRAM ELEMENT NUMBER
N/A

6. AUTHOR(S)
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5d. PROJECT NUMBER
45-14-20WD

5e. TASK NUMBER
N/A

5f. WORK UNIT NUMBER
N/A

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ARSAG 45-14-23

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11. SPONSOR/MONITOR'S REPORT NUMBER(S)
ARSAG 45-14-23

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for release in the public domain, distribution unlimited

13. SUPPLEMENTARY NOTES
ARSAG International is chartered by the US DOD as the Joint Standardization Board (JSB) for Aerial Refueling Systems

14. ABSTRACT

This document is intended to establish a reference document of commonly used ground support equipment (GSE) for system checks on tanker and receiver aircraft aerial refueling equipment. It is appplicable for both boom/receptacle and probe/drogue methods of aerial refueling. It may be applied to test and maintenance equipment as well as operational aircraft.

The scope of this document is intended to establish a reference document of commonly used Ground Support Equipment (GSE) that may be necessary to maintain and perform system checks on Aerial Refueling (AR) systems. Primarily, this document will encompass GSE used to support operational aircraft, however, it's use could extend to back shop maintenance support as well. While it is not necessary to identify GSE that is unique to specific platforms, since those maintainers already know what they have; it would be beneficial to have a document that catalogs items of GSE that are common to several tanker and/or receiver platforms, as well as joint-deployed units.

15. SUBJECT TERMS
GSE = Aerial Refueling Ground Support Equipment
BDA - Boom-to=Drogue Adapter Kit

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			Farhad Choudhury
U	U	U	UU	46	19b. TELEPHONE NUMBER *(Include area code)* 732-323-7121

RECORD OF REVISIONS

REVISION	*DATE*	*REASON FOR REVISION*
N/A	N/A	Original Version

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1.0 EXECUTIVE SUMMARY

The scope of this document is intended to establish a reference document of commonly used Ground Support Equipment (GSE) that may be necessary to maintain and perform system checks on Aerial Refueling (AR) systems. Primarily, this document will encompass GSE used to support operational aircraft, however, it's use could extend to back shop maintenance support as well. While it is not necessary to identify GSE that is unique to specific platforms, since those maintainers already know what they have; it would be beneficial to have a document that catalogs items of GSE that are common to several tanker and/or receiver platforms, as well as joint-deployed units. This document serves to group that universal GSE by AR equipment type and lists the identifying data, United States Government (USG) National Stock Number (NSN), and select general descriptive information, as necessary or readily available.

This document can be used by maintenance planners to identify what commonly used GSE may be available from other sources such as deployed military units, industries, or manufacturers. It can also be used by future system developers as a reference source of what common GSE is currently available and may provide instructions for required system checks. Please be aware that this is not an exhaustive list of all available equipment – some known equipment was intentionally omitted from this document because not enough information was available at the time of print to include at this time. Additional equipment may be added in future revisions.

It should be noted that ARSAG is a recommending body that only generates ARSAG's documents and, therefore, cannot dictate equipment and procedural requirements. The eventual use of this document by other organizations is not under ARSAG's control.

ARSAG Workshop / DOD Joint Standardization Board (JSB) for Aerial Refueling Systems

PROJECT INITIATION FORM (PIF)

Items 1 through 3 to be Completed by Requester					
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Project Purpose and Scope	Establish a reference document of commonly used Ground Support Equipment (GSE) required to maintain Aerial Refueling (AR) systems. While it is not necessary to identify GSE that is unique to specific platforms, since those maintainers already know what they have; it would be beneficial to have a document that catalogs items of GSE that are common to joint-deployed units. The document should group universal GSE by AR equipment type (i.e. tanker and receiver) and list the identifying data, USG NSN, and general descriptive information.				
Proposed Project Title:	Ground Support Equipment for Common Aerial Refueling Systems				

Proposed Product Outcome: (Mark with X)					
ARSAG Document:	Guide Document	Recommended Requirements			
	X				
Input to DoD Standardization Document:	Specification	Standard	JSSG	Other	
		X			
Input to NATO Document:	ATP/ STANAG	STANREC	SRD	Allied Publications	
		X			
Input to Industry Document:	Standard	Other			
	X				

Would you be willing to participate as a Document Manager for your proposed project?	Yes	X	No	

3. PROJECT TIMELINE		
Project Request Submittal Date:	Date	11 Sep 2019
Requested Completion Date:	Date	30 April 2020

Item 4 to be Completed by ARSAG

4. PROJECT DISPOSITION			
Project Request Receipt Date	12 SEP 2019, REVISION TO PREVIOUS ISSUES		
	JSB Chair	JSB Deputy Chair	
Approved as ARSAG Project: Initial & Date	F.H.C. 12SEP 2019	D.A.B. 12 SEP 2019	
Declined as ARSAG Project: Initial & Date			
	ARSAG Executive Director (ED)		
Approved as ARSAG Project: Initial & Date	D.H.K. 12 SEP 2019		
Declined as ARSAG Project: Initial & Date			
Priority Assessment	2	Project Number Assignment:	45-14-20WD
Working Group Assignment	GP.4, LEAD/MANAGER Greg Twyford, Jim Turner		
If project is declined, provide rationale			
ARSAG Response to Sponsor/Initiating Agency: ED initial & Date	DHK, 12 Sep 2019		
Transfer to ARSAG/JSB Working Group: ED Initial & Date	DHK 12 Sep 2019		

Version: 30 January 2019

ARSAG Document Name and Number	
Need for Project	
Background	
Changes to Original Project Purpose and Scope	The word “manufacturer” was changed to “USG NSN”, which spelled out is: United States Government National Stock Number, because other manufacturers’ equipment, of which we are not aware, may be used for similar purposes. We also try to avoid advertising by not listing or referencing a manufacturer.

2.0 ACKNOWLEDGEMENTS

Many thanks are extended to all of the Military and Industry representatives from across the world who have participated in the development of this ARSAG Guide Document. Specifically, this document could not have been developed without the help of the following individuals:

Greg Twyford	Boeing
Ken McCain	Northrop Grumman
John Gomez	Pratt & Whitney
Steven Browne	Boeing
Mark Lane	Eaton Mission Systems
Scott Yerxa	Boeing
Jim Turner	Products Support, Inc.
Matt Latham	Parker Hannifin

3.0 REFERENCES

N°	TITLE	REFERENCE	ISSUE	DATE	SOURCE
1.	Military Specification: Adapter, Pressure Fuel Servicing, Nominal 2.5-inch diameter	MS24484	J	Feb 83	Open
2.	Detailed Specification for Aircraft pressure Refueling Nozzle	SAE AS5877	B	Nov 2016	Open
3.	Boom Nozzle with Independent Disconnect Capability	DTIC AD1090244		12 Sep 2019	Open
4.	Boom Nozzle without Independent Disconnect Capability	MS27604	A	Aug 71	Open

4.0 ASSOCIATED DOCUMENTS

TITLE	*REFERENCE*	*DATE*	*SOURCE*
Aerial Refueling Boom/Receptacle Guidance Document	DTIC AD1048313	28 Jul 2017	ARSAG Document 20-08-17
Aerial Refueling Probe/Drogue System Guidance Document	DTIC AD1064517	15 Oct 2018	ARSAG Document 04-06-18
Aerial Refueling Pressure Definitions and Terms, Design and Verification Guidance	DTIC AD1025801	12 Dec 2010	ARSAG Document 03-00-03R
Aerial Refueling Systems Incident Investigation Guide	DTIC AD1076311	27 Jun 2019	ARSAG Document 50-17-19
Aerial Refueling Boom Receptacle System and Interface Recommended Requirements	DTIC AD1090244	12 Sep 2019	ARSAG Document 02-88-12R2
Air-to-Air (Aerial) Refueling Equipment Probe Drogue Interface Characteristics	NATO ATP 3.3.4.6 STANAG 3447	28 June 2016 Ed 5	NATO/ ARSAG Document 01-98-14R2

5.0 ABBREVIATIONS AND TERMINOLOGY

AR	Aerial Refueling
ARSAG	Aerial Refueling Systems Advisory Group
Assy	Assembly
ATP	Allied Tactical Publication
BDA	Boom Drogue Adapter, a kit for ground conversion from the boom / receptacle method to the probe / drogue method
Boom	A rigid housing that can maneuver in both the lateral and vertical axis, which encompasses a telescoping tube that an operator on the tanker can extend and insert into a receptacle for transfer of fuel to the receiver aircraft.
CDS	Centerline Drogue System
CHG	Charge (as in OFF/CHG switch position)
DISC	Disconnect (switch position)
DoD	Department of Defense
Drogue	Part of the aerial refueling system that stabilizes the hose coupling in flight and provides a funnel coupling shape to aid insertion of the receiver aircraft probe into the hose coupling.
DTIC	Defense Technical Information Center
GFA	Ground Fuel Adapter
GSE	Ground Support Equipment
IDS	Independent Disconnect System (boom nozzle applicable only)
JAPCC	Joint Air Power Competence Center
JSB	DoD Joint Standardization Board for Aerial Refueling Systems
NATO	North Atlantic Treaty Organization
NSN	National Stock Number
PIF	Project Initiation Form
POC	Point of Contact
Probe	Method on which a receiver aircraft may receive fuel from a hose coupling and drogue or BDA -equipped tanker.
PSIG	Pounds per square gauge, which is a pressure measurement relative to ambient atmospheric pressure
Receptacle	Receiver aircraft method for receiving fuel in flight from a boom nozzle-equipped tanker
SPR	Single Point Refueling
STANAG	Standardized Agreement
UARRSI	Universal Aerial Refueling Receptacle Slipway Installation
USG	United States Government
VAC	Volts Alternating Current
VDC	Volts Direct Current

6.0 INTRODUCTION

Ground Support Equipment (GSE) is used by aircraft maintenance personnel to troubleshoot and/or verify the proper operation of aerial refueling systems during maintenance and check activities. The Aerial Refueling Systems Advisory Group (ARSAG) recognizes the need to standardize universal GSE to ensure the efficiency and integrity of maintenance systems checks for effective aerial refueling mission accomplishment.

As such, this document serves to provide a reference for industry, service agencies, and other users to identify commonly available GSE. To achieve this goal, Group 4 of the ARSAG/Joint Standardization Board (JSB) Workshop, the Maintenance and Ground Support Equipment working group, has listed these available GSE by Equipment Type, GSE Nomenclature, Purpose, and USG NSN. It should be noted that other manufacturers may provide similar GSE capabilities and/or equipment, therefore, any reference to vendor or manufacturer product information has been specifically omitted from this document. This practice of not listing or referencing a manufacturer or vendor also serves to avoid any advertising on our part. This list is neither all-inclusive nor proscriptive (i.e. procuring GSE not contained in this document is an acceptable practice). For any AR system maintenance or operational checks on specific aircraft (tanker and/or receiver), please refer to appropriate technical manuals for GSE operating procedures.

The GSE described in the follow-on 4 sections of this document include GSE equipment for Aerial Refueling (AR) System Verification of Operation for both AR Methods (Boom/Receptacle and Probe/Drogue).

7.1 Tanker Aircraft Boom Nozzle GSE Section

7.2 Receiver Aircraft Aerial Refueling Receptacle GSE Section

7.3 Tanker Aircraft Hose Coupling and Drogue GSE Section

7.4 Receiver Aircraft Probe Nozzle GSE Section

Each section of this document describes both the common system capability and the peculiar GSE capability of other system testers.

A list of common system tests and capabilities are provided, where available, in the four GSE sections for testers and auxiliary test kits for fault isolation. These include the following:

1. Functional Operation
2. Leakage Detection
3. Pressure regulation devices, including MA Couplings with 1 or 2 regulators
4. Tanker/receiver electric signals, to include induction coil
5. Voice Communications (Boom/Receptacle Method only)
6. Latching Functions and Disconnect Force Functions
7. Fuel Transfer via SPR Adapter to external sources
    a. To fuel containment tanks

b. For reverse flow, if applicable

c. To tanker or receiver receptacles and probe nozzles

6.1 Types of Aerial Refueling Equipment to be Tested for both Aerial Refueling Tanker and Receiver Methods

Examples of Tanker Aircraft Boom Nozzles

Figure 6.1 KC-135 Boom Nozzle w/o Independent Disconnect System (IDS)

Figure 6.2 KC-10 Boom Nozzle with IDS

Figure 6.3 KC-46 Boom Nozzle with IDS

Figure 6.4 A330 MRTT Boom Nozzle with IDS

Examples of Receiver Aircraft Inflight Refueling Receptacles

Figure 6.5 B-1 UARRSI Receptacle

Figure 6.6 F-35A Receptacle

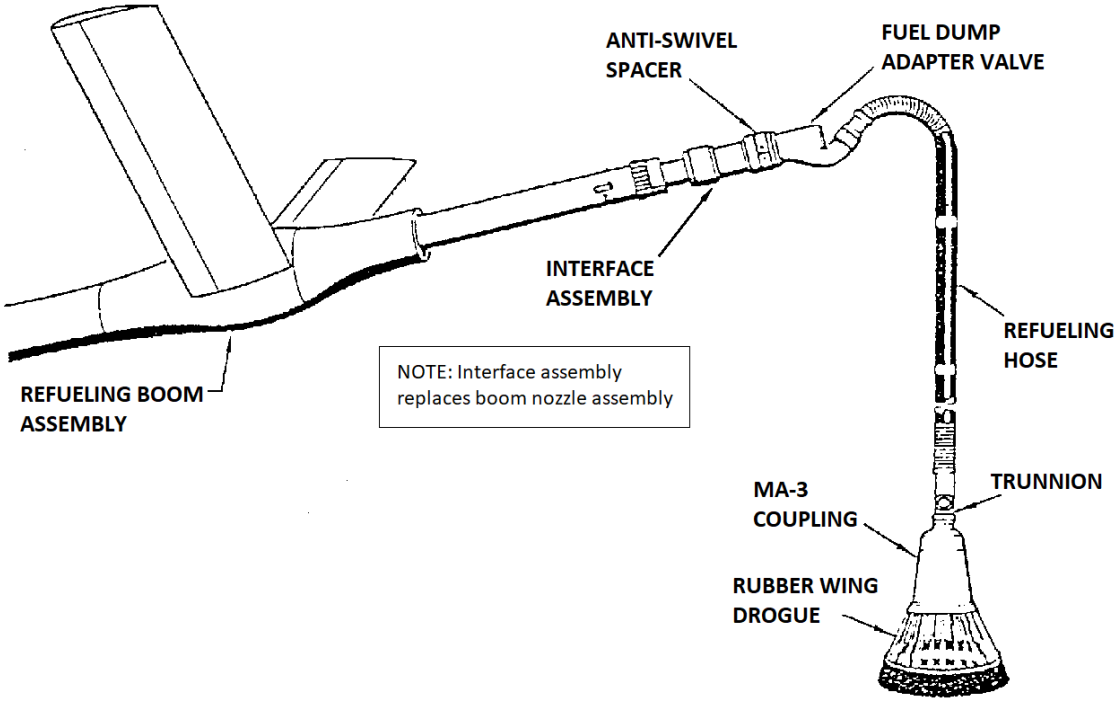


Figure 6.7 Boom-to-Drogue Adapter (BDA) Conversion Kit

Figure 6.8 BDA Installed on KC-135 Boom

Figure 6.9 BDA Refueling a Probe-Equipped Receiver

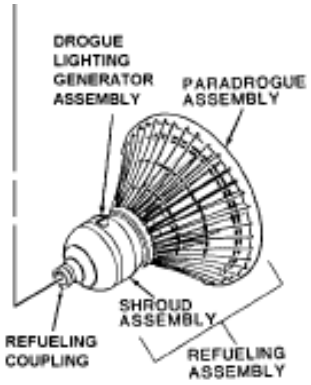


Figure 6.10 Coupling & Drogue Assembly

Figure 6.11 Hose Coupling and Drogue Refueling a Receiver

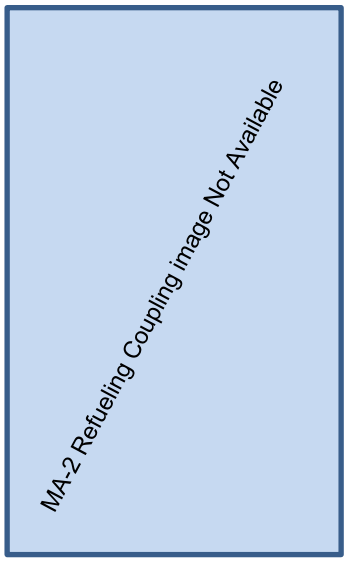


Figure 6.12 Refueling Coupling Assemblies

Figure 6.13 Receiver Aircraft Probe Nozzle

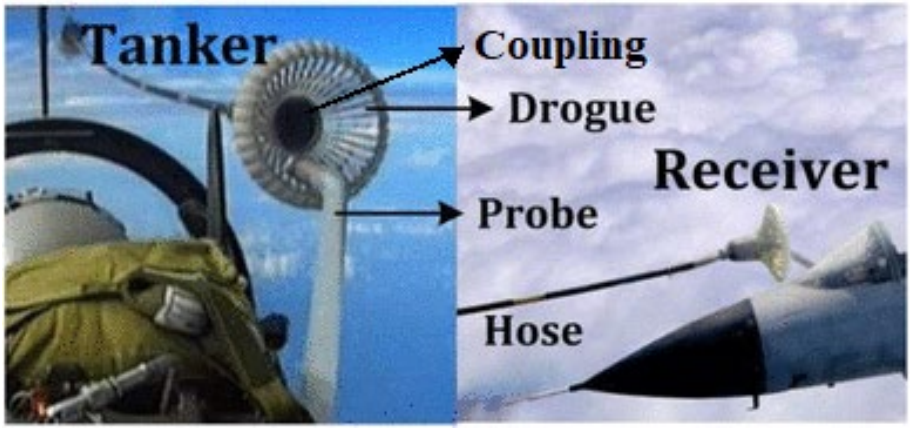


Figure 6.14 Probe with Hose Coupling and Drogue Refueling System

The D-1 and D-2 SPR nozzles are compatible with all four system testers.

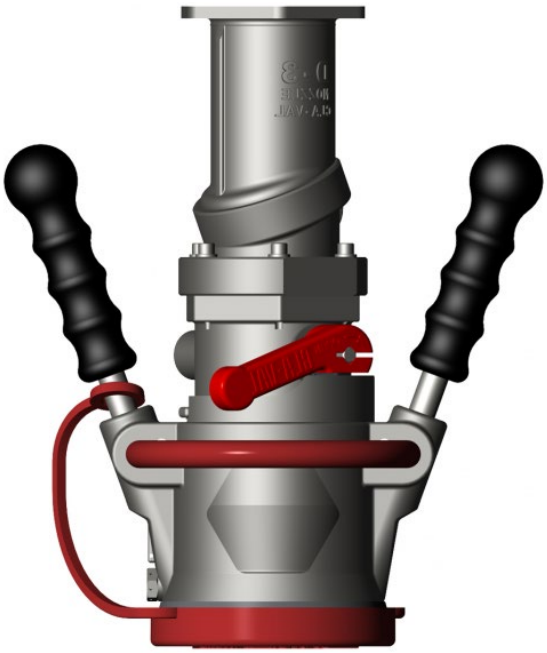


Figure 6.15 D-1 Underwing SPR Nozzle

(Can be configured either straight or angled)

7.0 GSE MATRIX

Equipment Type	GSE Nomenclature	Purpose	USG NSN
Boom Nozzle Tanker	Universal AR Boom Nozzle Test Set	Used to test the overall performance of the AR boom nozzle used during normal AR operations.	4920-01-183-3039
Boom Nozzle Tanker	Tanker Rotational and Indexing Boom Nozzle Test Kit	Used to measure torque required to produce specific amounts of rotation (about the boom axis) and deflection (about the ball joint) on the aerial refueling boom nozzle.	Not Available
Receptacle Receiver	AR Receptacle Electrical System Test Set	Tests contact switch, hydraulic toggles, toggle switches, amplifier, coil polarity, signal circuit continuity, and signal system sensitivity in the AR Receptacle system of the receiver airplane.	4920-01-006-5709
Receptacle Receiver	Universal AR Test Set	Used to check the overall performance of the Universal Aerial Refueling Receptacle Slipway Installation (UARRSI at three levels of maintenance: organizational, intermediate, and depot.	4920-01-038-0984 4920-01-135-8554
Receptacle Receiver	Universal Receptacle AR Tester TTU 308A/E	A tester fitted with a specially configured aircraft refueling probe that is inserted into the aircraft receptacle to check the overall performance of an aerial refueling control system.	4920-01-293-4315 4920-01-486-1026
Hose Coupling and Drogue Tanker	Drogue AR Coupling Tester	Used with Type MA-2, MA-3, MA-3-1 and MA-4 Reception Couplings, to measure the latch toggle breakaway force and pressure regulator(s) function.	4920-01-186-5820 4920-01-483-2490
Hose Coupling and Drogue Tanker	Breakaway Force Tester	Used with Type MA-2, MA-3, MA3-1, and MA-4 Reception Couplings, to measure the latch toggle breakaway force.	4920-00-631-7148 4920-01-505-2533
Hose Coupling and Drogue Tanker	Harness Kit-Trail Rewind	Connects to MA-3 and MA-4 style couplings to assist maintainers in extending the hose coupling and drogue assemblies for maintenance purposes	4920-99-230-9501
Hose Coupling and Drogue Tanker	Hose Puller (Steering Wheel)	Used for personnel to guide the hose coupling and drogue to its extended position for maintenance checks and repairs. Connects to MA-3 and MA-4 style couplings.	5120-01-633-0908

Equipment Type	GSE Nomenclature	Purpose	USG NSN
Probe Receiver	Ground Fueling Adapter	Connects to the Type MA-2 Aerial Refueling Probe and allows for ground refueling and testing of the receiving aircraft aerial refueling system. May also be used for 'Hot Refueling' (engines running) of the aircraft for fast turn-around.	4930-00-671-8086

Table 7.1 GSE Matrix

7.1 Tanker Aircraft Boom Nozzle GSE Section

This section identifies GSE that can be used to test, service, and/or maintain tanker Boom Nozzle-equipped AR systems.

7.1.1 Universal AR Boom Nozzle Test Set

The Universal Aerial Refueling Boom Nozzle Test Set (tester) is used to test overall performance of the aerial refueling boom nozzle used during normal aerial refueling operations. The test set consists of a tester assembly, restraining clamps (applicable to each aircraft), cable assemblies, sliding seal removal tool, drain hose, charging cable assembly, intercommunication adapter cable assembly, reel-cable assembly, and anti-swivel clamp. The reel-cable assembly consists of two grounding cables, one eight feet in length and the other 100 feet in length. All parts are stowed and transported in the transit case.

The tester is a specially configured refueling receptacle and electrical control system designed to engage with an aerial refueling boom nozzle. When connected, the tester is used to test operation of the refueling control system. The major tests performed by the tester are: (1) refueling nozzle contact, (2) refueling nozzle disconnect, (3) refueling boom nozzle leakage (mated), (4) aerial refueling control system ready state, (5) intercommunication system between tanker aircraft and fuel recipient aircraft via the boom nozzle, (6) fuel seal leakage, and (7) boom delivery pressure regulation. The tester incorporates a type MS24484 SPR adapter to permit connection to a fuel supply hose fitted with an SPR nozzle.

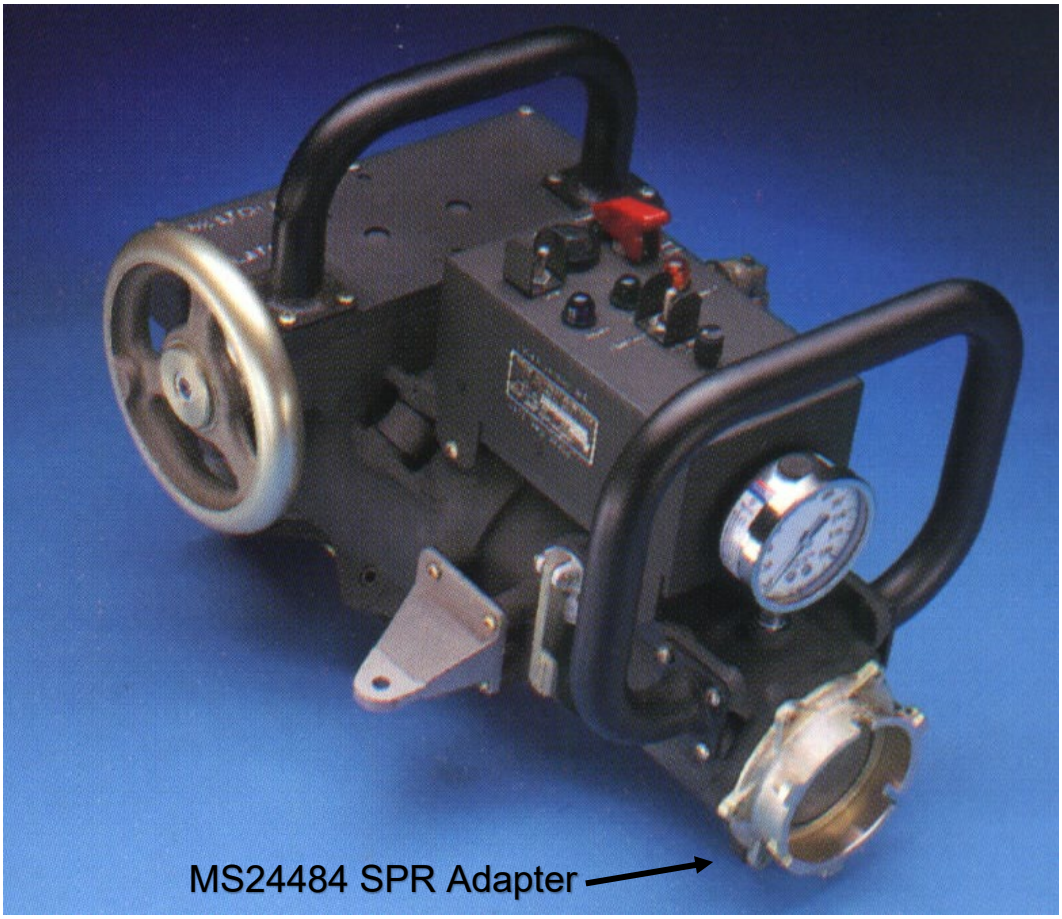


Figure 7.1 Boom Nozzle Test Set Illustration

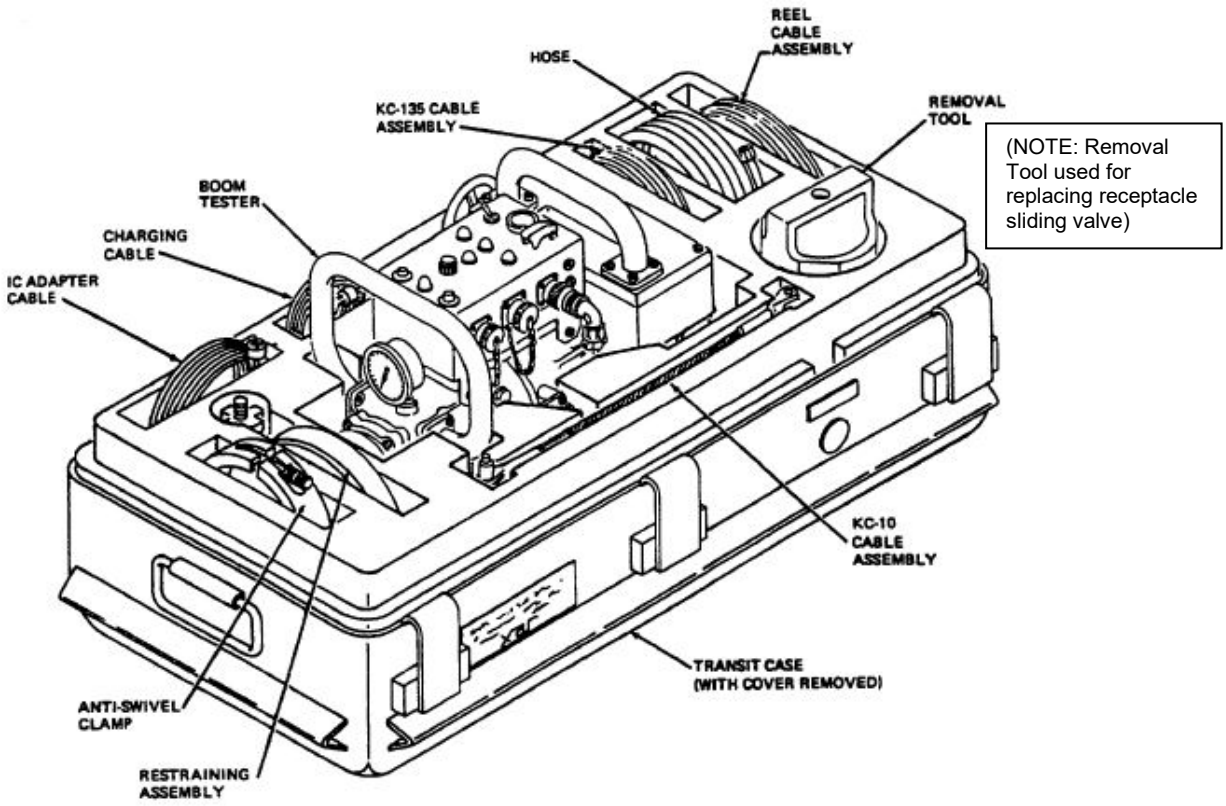


Figure 7.2 Universal Aerial Refueling Boom Nozzle Test Set

7.1.1.1 Aircraft Applicability

This test set is applicable boom nozzle-equipped aircraft, such as the KC-135, KC-10, KC-767, KC-46 and KC-30 aircraft.

7.1.2 Tanker Rotational and Indexing Boom Nozzle Test Kit

The Boom Nozzle Rotation and Deflection Tester Kit is designed for ground use to measure torque required to produce specific amounts of rotation (about the boom axis) and deflection (about the ball joint) on the aerial refueling boom nozzle of the KC-10 or KC-135 aircraft.

The tester consists of:

- Boom nozzle rotation tester
- Deflection position indicators (KC-10 & KC-135)
- Rotation position indicators (KC-10 & KC-135)
- Torqometer (torque wrench)
- Anti-swivel clamp
- Transit case

The tester is used to verify compliance of the following:

- The torque vs. deflection relationship through the boom nozzle ball joint (deflection lateral to boom)
- Boom nozzle ball joint returns to center, within tolerances, when loading is removed
- The torque vs. rotation relationship through the boom nozzle rotational centering unit (deflection rotational/torsional to boom)
- Boom nozzle rotational centering unit returns to center, within tolerances, when torsional loading is removed

Figure 7.3 Nozzle Rotation and Deflection Test Kit

7.1.2.1 Aircraft Applicability

This test set is applicable to boom nozzle-equipped tankers, such as KC-135 and KC-10 aircraft. However, USAF maintenance procedures do not reference this tester in any boom or nozzle maintenance manuals, nor inspection technical orders. Other tanker aircraft (KC-767, KC-46, Airbus A330-derative tankers) may be able to use this GSE but should check aircraft technical manuals for compatibility first. Most technicians have reported they use their hands to check the springs to make sure the nozzle rotates back to center.

7.2 Receiver Aircraft Receptacle GSE Section

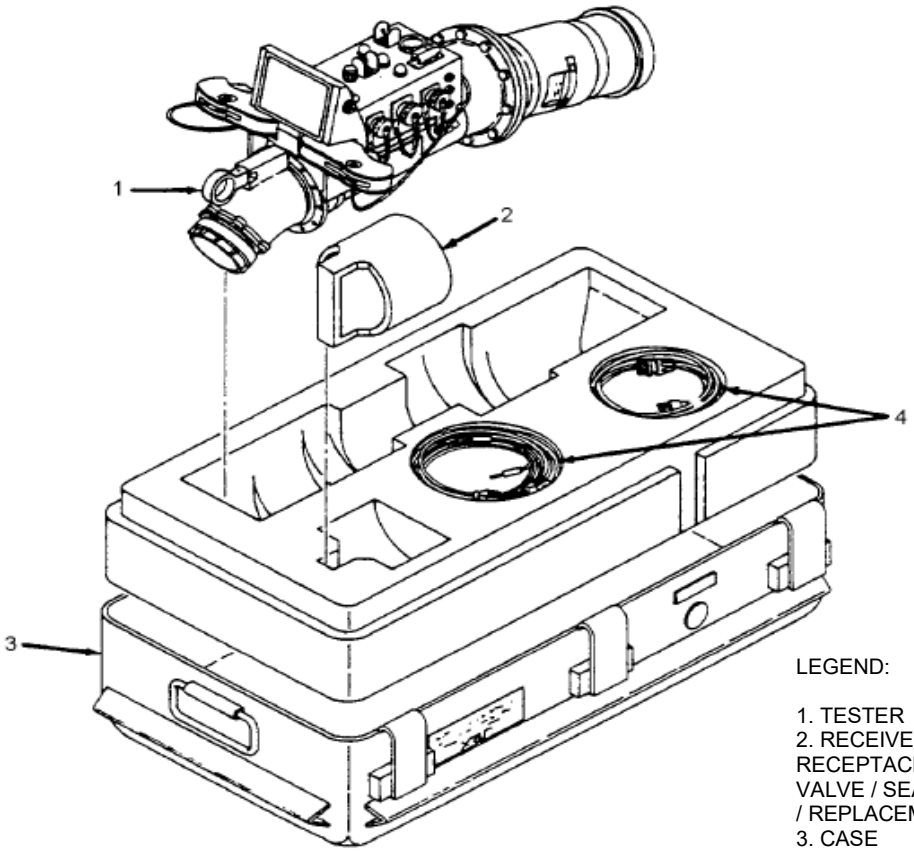
This section identifies GSE that can be used to test, service, and/or maintain receptacle-equipped AR systems.

7.2.1 Receiver Aircraft Universal Receptacle AR Tester TTU 308A/E

The tester (see Figure 7.4) is a portable, battery powered, intermediate- and organizational-level maintenance test device used to check the overall performance of the aerial refueling control system. The tester is fitted with a specially configured aircraft tanker refueling nozzle that is inserted into the receiver aircraft for ground testing. While inserted into the aircraft, the tester checks the aircraft aerial refueling control fuel system. The major tests performed by the tester are:

1. Refueling nozzle contact and lock
2. Refueling nozzle disconnect
3. Aerial refueling control system ready state
4. Through-the-Boom Intercommunication system between applicable tanker and aerial refueling receptacle-equipped aircraft
5. Fuel seal leakage interface
6. Leakage tests (See Item Fig. 7.5, Item 2 for tool for removing the main contact seal of the UARRSI and other type equipped receptacles).
7. Fuel transfer and transfer tests. The tester incorporates an MS24484 SPR adapter to permit connection to a fuel supply hose fitted with an SPR nozzle.

Figure 7.4 Receptacle Test Kit Illustration



LEGEND:

1. TESTER
2. RECEIVER RECEPTACLE SLIDING VALVE / SEAL REMOVAL / REPLACEMENT TOOL
3. CASE

Figure 7.5 Universal Receptacle Aerial Refueling Tester Kit

The operator selects the particular test using control switches on the tester. The tester is supplied with a separate Alternating Current power cable that interfaces the tester with an external 115 Volts Alternating Current (VAC), 60-Hertz (Hz) power source used to recharge the replaceable battery module. All controls, indicators, and connectors necessary to test the aerial refueling control system, as well as the tester itself, are mounted on the outside panel surfaces of the tester electrical box.

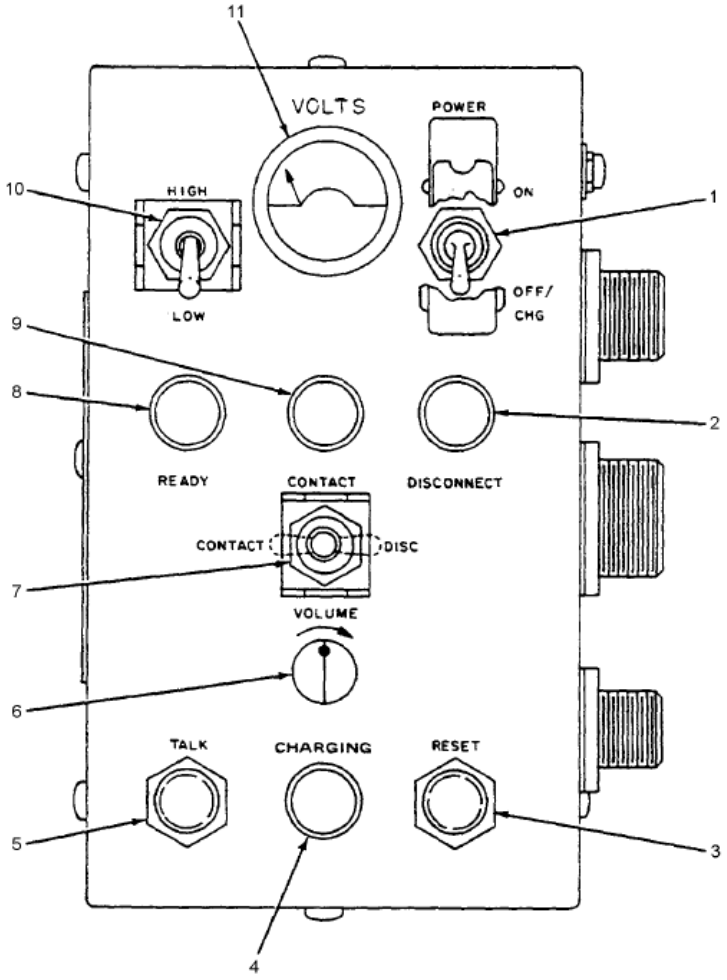


Figure 7.6 Tester Operating Controls and Indicators

7.2.1.1 Operating Controls and Indicators

Operating controls and indicators are shown in Figure 7.6. Table 7.2 lists the function of each.

Index	Controls/Indicators	Purpose and Use
1	POWER switch S1 positions: ON	Connects +28 VDC operating power from battery pack module to tester circuitry
	OFF/CHG	Connects external 115 VAC, 60-Hz power source across rectifier circuit and battery pack module to recharge the batteries.
2	DISCONNECT indicator DS2	Indicates tester probe has been disconnected from receptacle.
3	RESET switch S4	Removes VDC power from test set to permit circuits to be reset.

4	CHARGING indicator DS1	Indicates external power is available to charge the battery module
5	TALK switch S3	Press this switch when speaking into external microphone.
6	VOLUME control R31	Adjusts audio signal to external headsets.
7	CONTACT/DISC switch S5 positions: CONTACT	Activates and checks circuits to advance the control sequence from READY to CONTACT
	DISC	Activates and checks circuits that advance the control sequence from CONTACT to DISC. If the tester is engaged with an active receptacle, this will send a disconnect command to the receptacle.
8	READY indicator DS4	Indicates tester is in a ready state; i.e., batteries are charged, all circuits have been reset.
9	CONTACT indicator DS3	Indicates tester has been successfully engaged in receptacle.
10	HIGH/LOW switch S2 positions: HIGH	Used to check tester circuit operations within upper limits (above +20 VDC) of operating power range.
	LOW	Used to check tester circuit operations within lower (+16 to +20 VDC) limits of operating power range.
11	VOLTS meter M1	Indicates VDC output of tester battery pack module.

Table 7.2 Operating Controls and Indicators

7.2.1.2 Aircraft Applicability

This test set is applicable to all receptacle-equipped receiver aircraft, although some may require an extension to be able to use this tester in its receptacle (i.e. F-22).

7.2.2 Receiver Universal AR Test Set

The test sets are used to check the overall performance of the UARRSI and other AR receptacles at three levels of maintenance: organizational, intermediate, and depot. The test sets can operate on 28 VDC or 115 VAC at 50 to 400 Hz. The test sets are contained in a waterproof carrying case which has a removable cover.

To be used in conjunction with previous tester Paragraph 7.2.1 engaged for fault isolation of UARRSI and other receptacles.

Figure 7.7 Universal Aerial Refueling Test Set Illustration

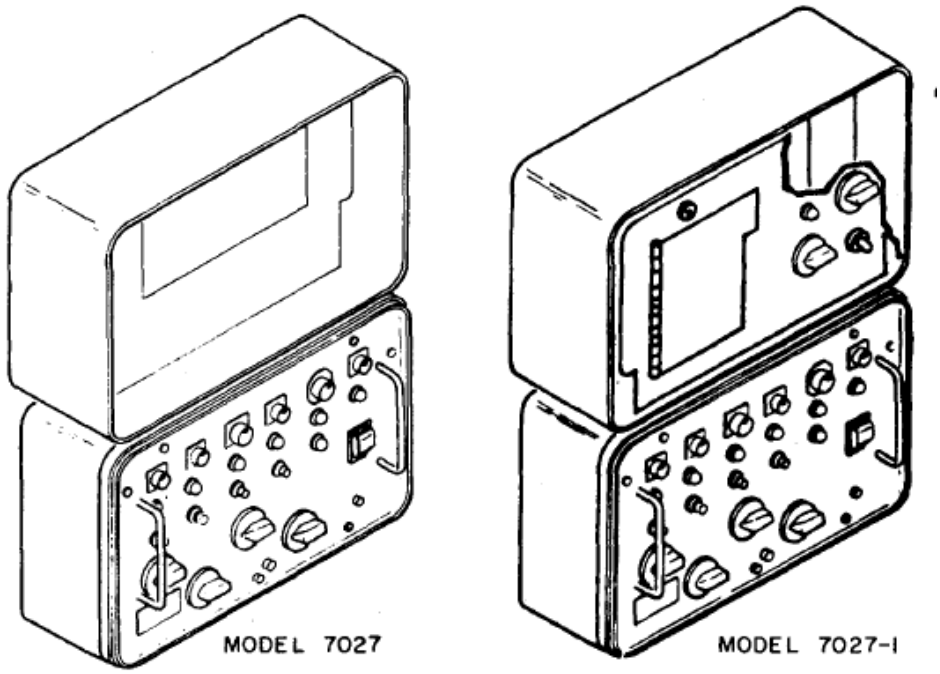


Figure 7.8 Universal Aerial Refueling Test Set, Models 7027 and 7027-1

7.2.2.1 Operating Equipment

Seven cables are supplied with the test set for use with different types of receiver receptacle-equipped aircraft. The cables are stored in the removable cover.

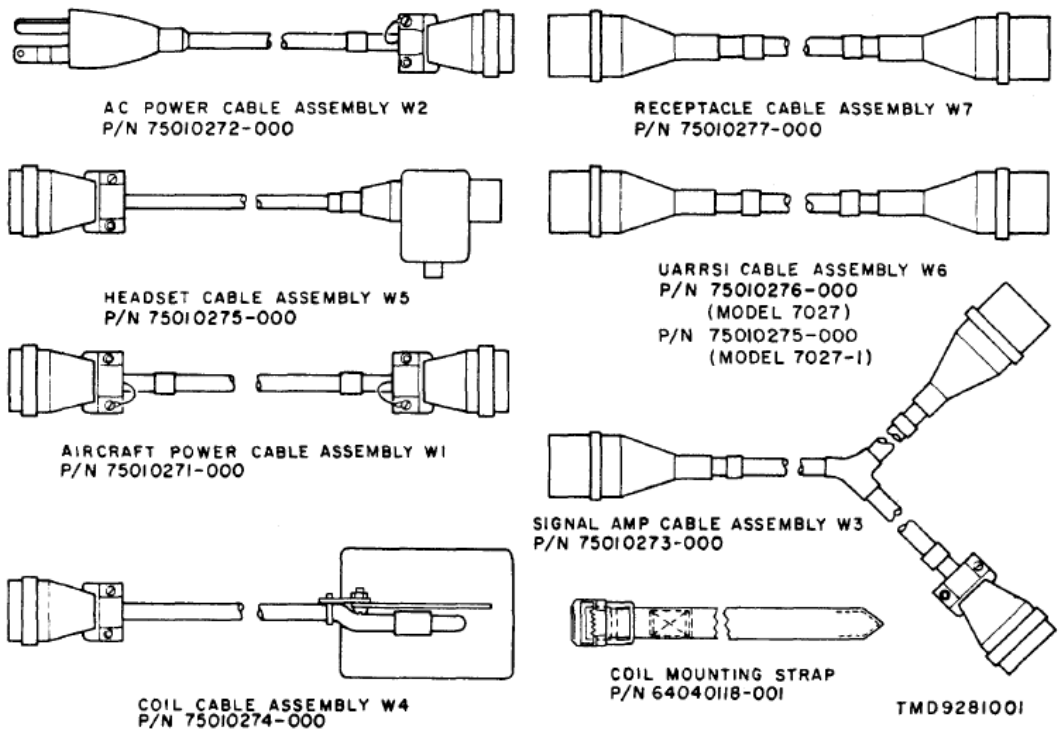


Figure 7.9 Universal Aerial Refueling Test Set Cables

7.2.2.2 Aircraft Applicability

The model 7027 test set is applicable to all types of receptacle-equipped receiver aircraft except the F-16. The model 7027-1 has the added capability of performing F-16 amplifier test and replaces the UARRSI cable with one of 20 feet in length.

7.2.3. AR Receiver System Test Set

The AR Receiver System Test Set is used to perform the following: Test contact switch, hydraulic toggle switches, amplifier, coil polarity, signal circuit continuity, and signal system sensitivity in the receptacle system of the receiver airplane.

When the test set nozzle is seated and the receiver's AR Receptacle system is operating properly, the contact switch must operate, toggles must close and hold test set nozzle, toggle switches must operate, amplifier must operate, and "CONTACT MADE" indicator light on the aircraft's AR panel must be ON.

When the test signal is initiated and the receiver's AR Receptacle system is operating properly the voltage of correct polarity and magnitude will be induced in the receptacle induction coil; amplifier will operate; toggles will release and test set nozzle will be ejected: "DISCONNECT" indicator light on aircraft's AR Receptacle panel will be ON.

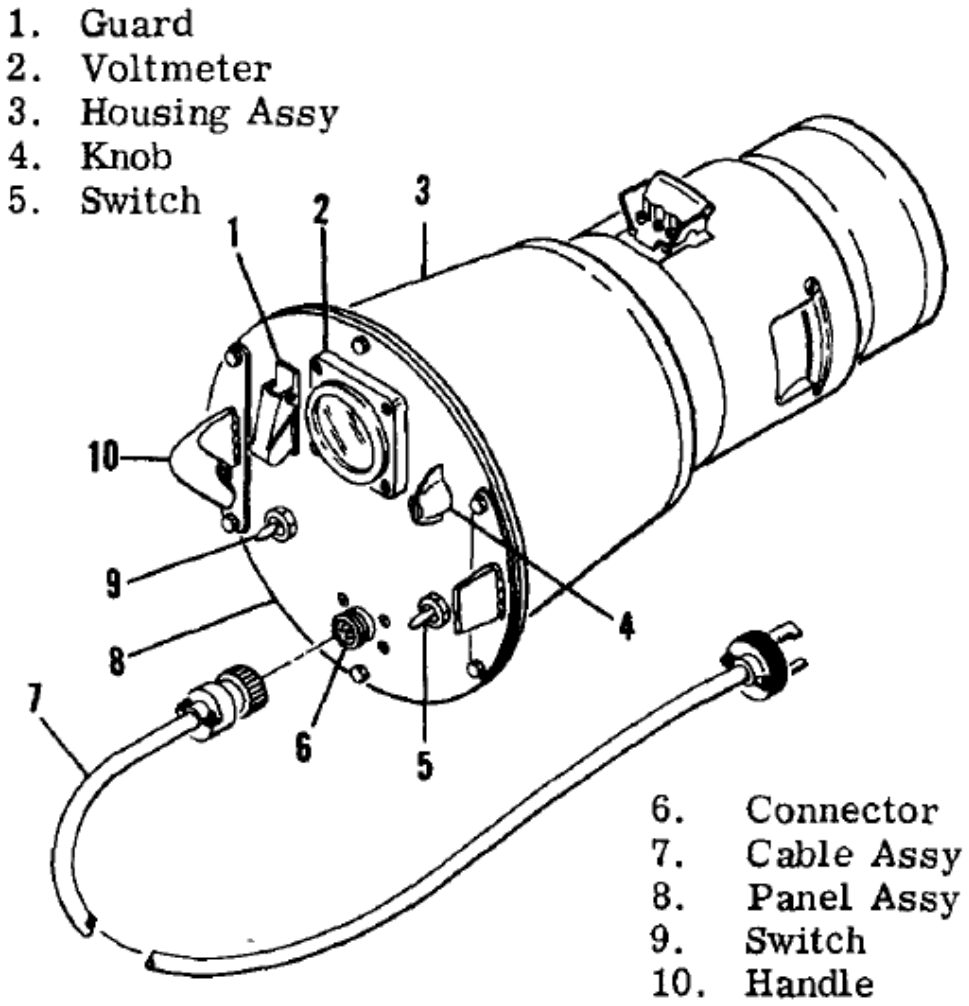


Figure 7.10 AR Receptacle Electrical System

7.3 Tanker Aircraft Hose Coupling and Drogue GSE Section

This section identifies GSE that can be used to test, service, and/or maintain tanker Hose Coupling and Drogue -equipped AR systems.

7.3.1 Drogue AR Coupling Tester

The Aerial Refueling Coupling Tester is used to test operation of the MA-2, MA-3, and MA-4 drogue coupling used during normal aerial refueling operations. The tester consists of tester assembly, two hoses, plug assembly, reel-cable assembly, and test cap assembly. The reel cable assembly consist of two grounding cables, one eight feet in length and the other 100 feet in length. These parts are stowed and transported in the transit case.

The tester provides capabilities for testing for fuel seal leakage, drogue coupling latch toggle breakaway forces, proper function of pressure regulator(s) in the hose coupling and drogue refueling system, and permits fuel to be off loaded through the hose coupling and drogue system during ground operations. A type MS24484 SPR adapter permits connection of the tester to a fuel supply hose fitted with a compatible SPR nozzle.

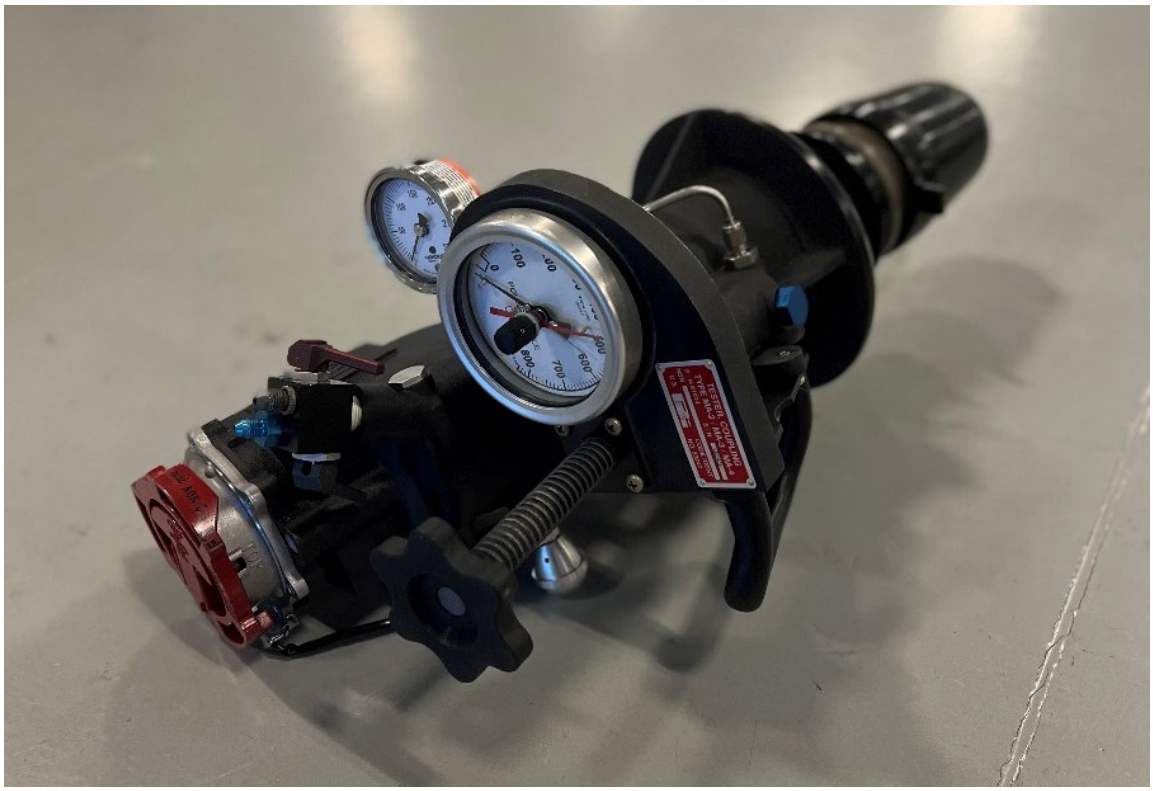


Figure 7.11 Aerial Refueling Coupling Tester Illustration

The tester component of the 4920-01-186-5820 test kit incorporates a probe nozzle, which permits checking of the total latch toggle breakaway force. The tester component of the 4920-01-483-2490 test kit incorporates a probe nozzle, which is slotted to permit checking of the individual latch toggle breakaway force, as well as the total breakaway force.

The test kit is equipped with a test cap assembly (see Fig. 7.12) that is used when testing the fuel pressure regulator of the MA-3 coupling. The test cap assembly

consists of a fluid line cap, a plug, and a warning streamer held together with a lanyard. The cap assembly is installed in the aircraft plumbing to disable the tanker regulator, in order to raise the refueling pressure sufficiently, to check for proper functioning of the MA-3 coupling regulator, such as when testing the coupling on the BDA.

The kit contains a test plug assembly that is used with both the MA-3 and MA-4 couplings. The test plug assembly consists of four test pins installed on a cable. One of the plugs is hollow, to allow fuel pressure, and three are solid to block fluid pressure. The four pins are installed in the four coupling vent ports, and are held in place by the cable. One of the hose assemblies is used to connect the regulator test lever port to the hollow test pin. With fuel pressure available, operating the regulator test lever allows fluid pressure into the coupling regulator vent cavity, forcing the regulator to a fully open position. With the MA-3 coupling, this permits the verification of the aircraft regulator pressure.

In a similar manner to the MA-3, the test plug assembly can be used to test each of the two regulators of the MA-4 coupling. Each MA-4 regulator is independently tested by disabling the other regulator. This is accomplished by installing the test plug assembly in the associated vent ports. Once the first regulator has been tested, the vent plugs are transferred to the vent ports of that regulator and the test procedure repeated on the second regulator.

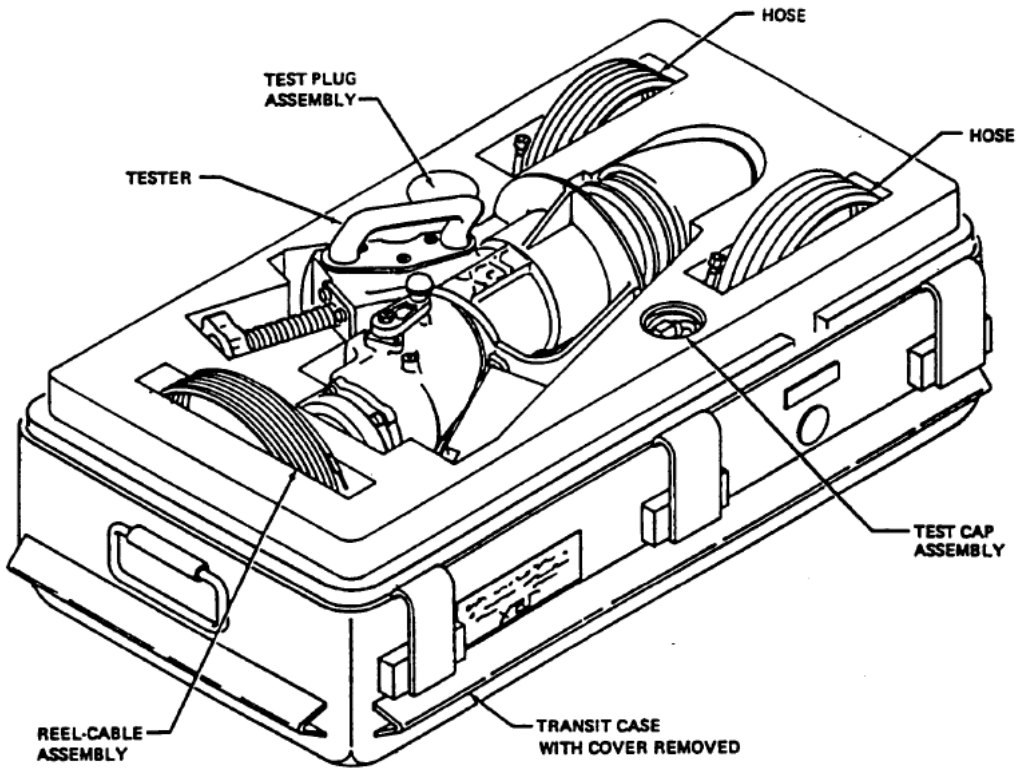


Figure 7.12 Aerial Refueling Coupling Test Set

7.3.1.1 Operating Controls and Indicators

Operating controls and indicators are shown in Figure 7.13, Table 3 lists the function of each.

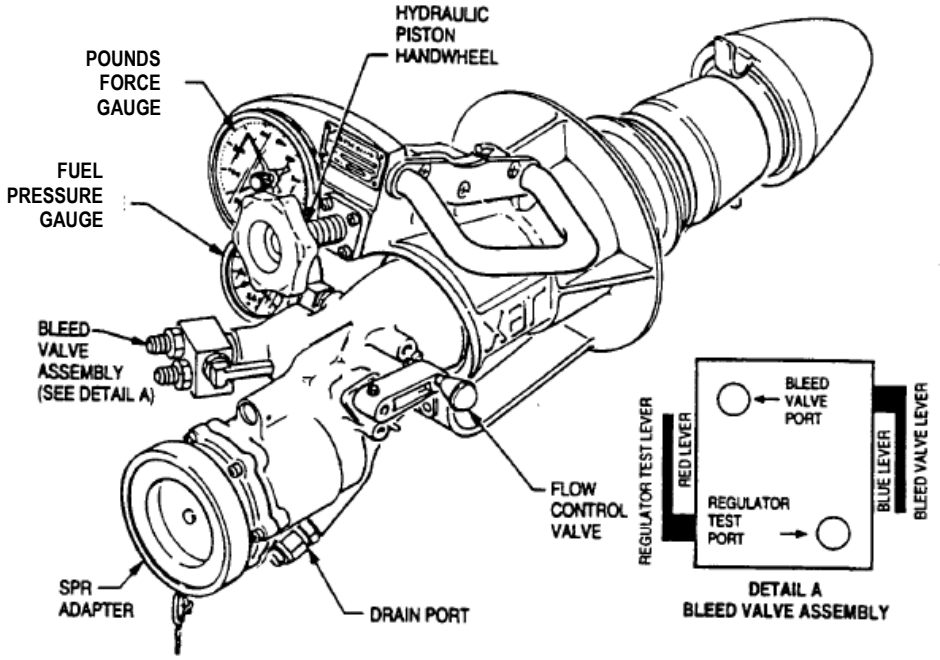


Figure 7.13 Tester Operating Controls and Indicators

Name	Function
Pounds force gauge	This hydraulic gauge indicates, in PSIG, the force applied to disengage the tester from the drogue coupling.
Hydraulic piston handwheel	This control increases or decreases hydraulic pressure used to test drogue coupling.
Bleed valve lever	Provides means of bleeding air and fuel from fuel system portion of tester and fuel regulator pressure testing.
Fuel pressure gauge	This gauge indicates the pressure of fuel contained in tester assembly.
Coupling regulator test lever port	The regulator test lever port provides a means of diverting pressure/flow from the tester to a vent plug assembly for regulator testing.
SPR adapter	Provides means for connecting the SPR nozzle to the tester assembly to allow fuel flow.
Bleed valve assembly	Houses the bleed valve lever and regulator test lever.

Table 7.3 Operating Controls and Indicators

7.3.1.2 Aircraft Applicability

The Drogue AR Coupling Tester is applicable to all Hose Coupling and Drogue - equipped tanker aircraft that utilize the Type MA-2, MA-3, MA3-1, and MA-4 Aerial Refueling Reception Couplings.

7.3.2 Tanker Couplings Breakaway Force Tester

The breakaway force tester is used with Type MA-2, MA-3, MA3-1, and MA-4. Aerial Refueling Reception Couplings, to measure the latch toggle breakaway force necessary to disengage the type MA-2 nozzle from the aerial refueling coupling.

The tester is capable of checking the reception coupling total breakaway force and the individual latch toggle force. The hydraulically actuated force gauge displays the breakaway force in pounds and is calibrated from 100 to 1000 Lbs. The force gauge lens assembly incorporates a red follower pointer that holds the maximum force measurement.

The check unit is designed for one technician to operate.

Figure 7.14 Breakaway Force Tester Illustration

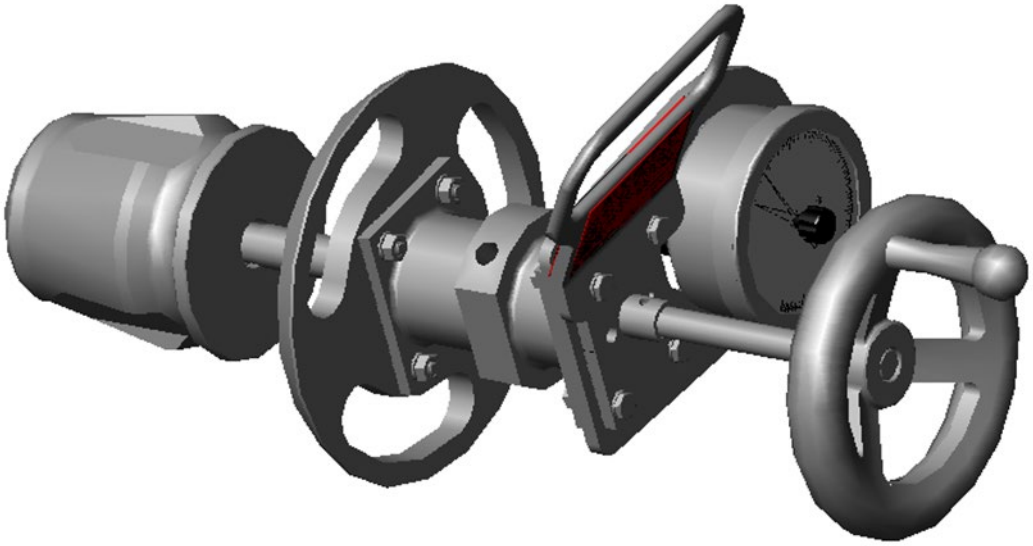


Figure 7.15 Breakaway Force Tester Illustration

7.3.2.1 Aircraft Applicability

The Breakaway Force Tester is applicable to all Hose Coupling and Drogue -equipped tanker aircraft that utilize the Type MA-2, MA-3, MA3-1, and MA-4 Aerial Refueling Reception Couplings.

7.3.3 Tanker Hose Coupling and Drogue Harness/Puller Assemblies

The Hose Coupling and Drogue Puller Assembly (aka steering wheel tool) is used for maintenance personnel to guide the hose coupling and drogue to its extended position for maintenance checks and repairs. While mainly used for the centerline drogue system (CDS), the puller can also be used for the wing tip pod hose coupling and drogue assembly. The Harness Assembly is a newer hose coupling and drogue guidance tool, to assist maintainers with extending the hose coupling and drogue for maintenance purposes. Both tools should be compatible with MA-2, MA-3, MA3-1, and MA-4 style couplings.

Figure 7.16 Hose Coupling and Drogue Puller Illustration

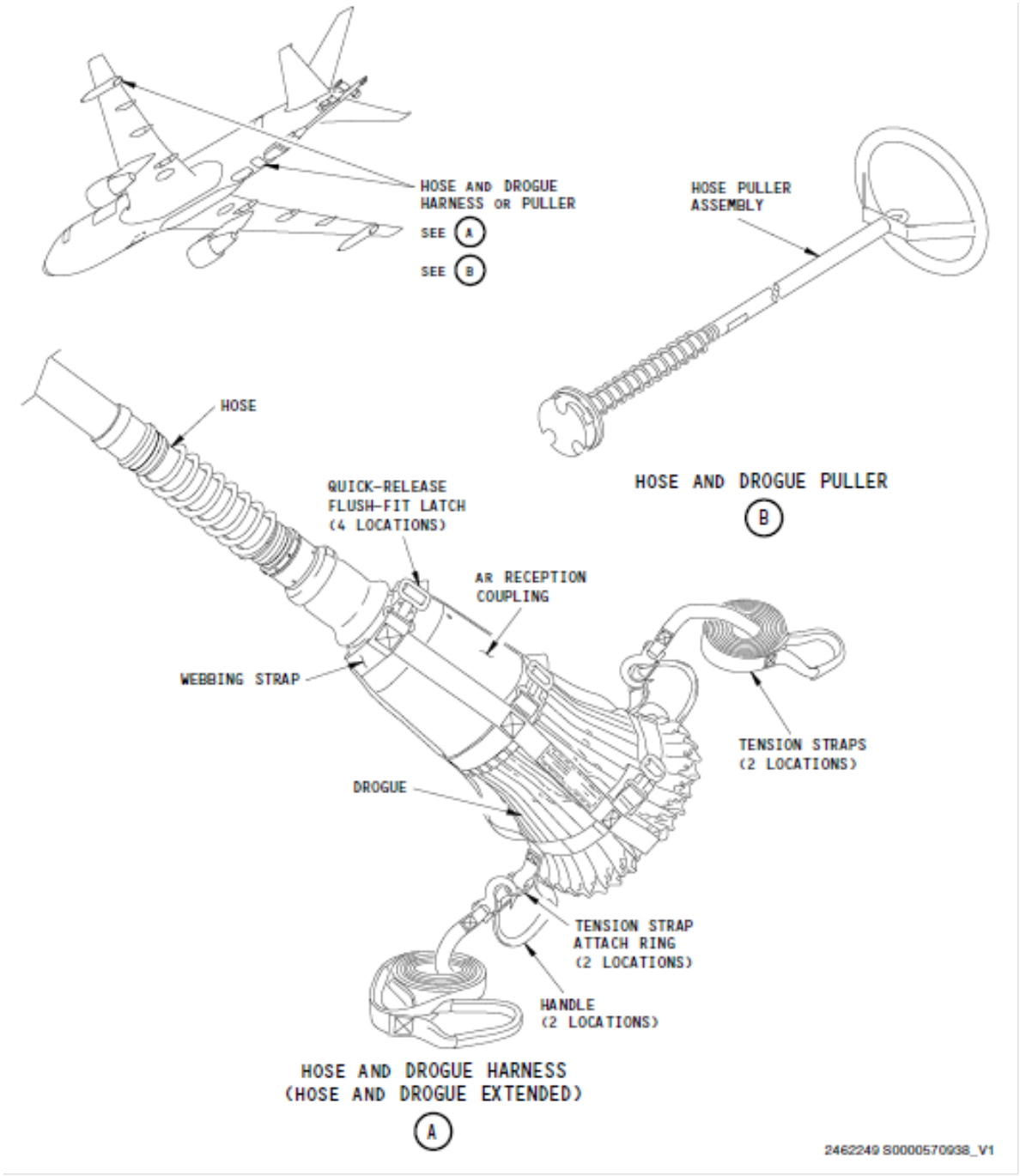


Figure 7.17 Hose Coupling and Drogue Harness and/or Puller Assemblies

Figure 7.18 Coupling Harness in Box

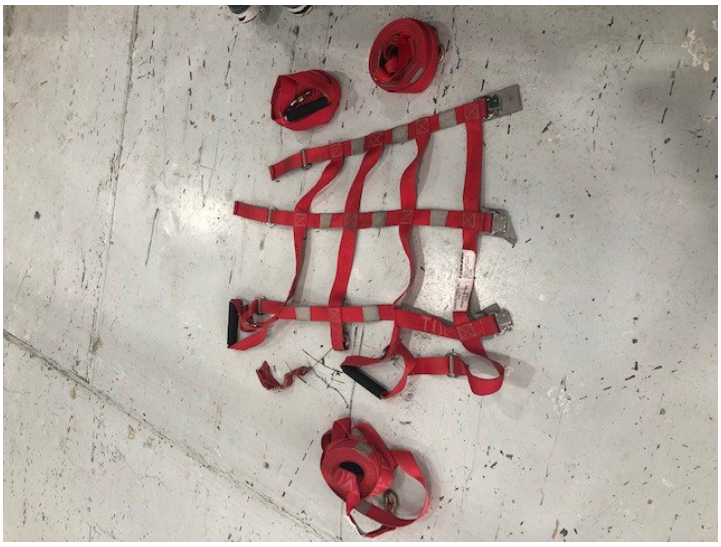


Figure 7.19 Coupling Harness out of Box

7.4 Receiver Aircraft Probe Nozzle GSE Section

This section identifies the tester applicable to all probe equipped receiver aircraft.

7.4.1 Ground Fuel Adapter Receiver Probe Nozzle Tester

The Ground Fuel Adapter (GFA) connects to the Type MA-2 Aerial Refueling Probe Nozzle, by squeezing the two handles together, and allows for ground testing of the receiving aircraft aerial refueling system, including probe nozzle seal leakage. The Single Point Refueling (SPR) Adapter, conforming to specification MS24484, allows connection of a pressure fueling supply hose, equipped with an appropriate SPR nozzle, for refueling some probe equipped receiver aircraft that do not have a SPR adapter for ground refueling. The GFA may also be used for 'Hot Refueling' (refueling with engines running) of the aircraft for fast turn-around.

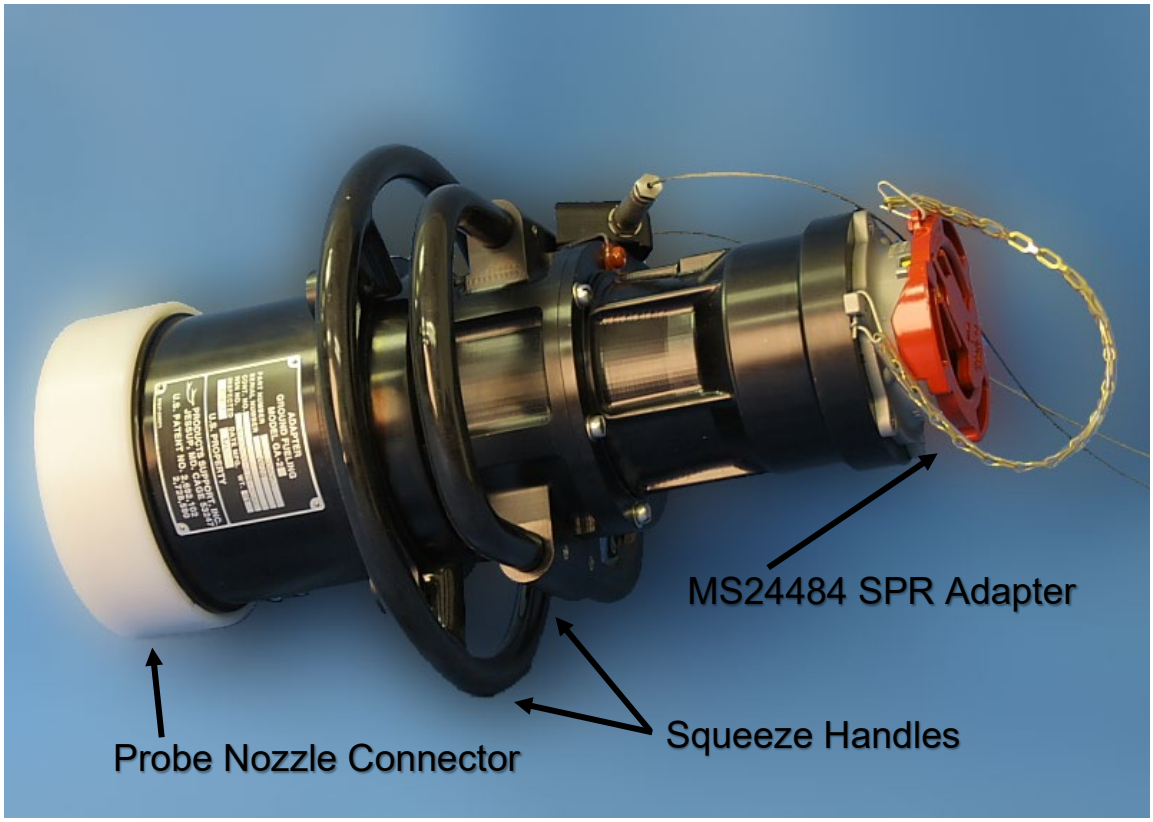


Figure 7.20 Ground Fueling Adapter Illustration

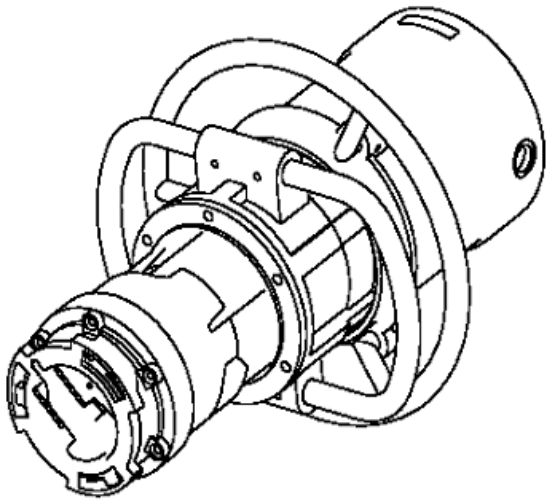


Figure 7.21 Ground Fueling Adapter

7.4.1.1 Aircraft Applicability

This GFA is applicable to all type MA-2 Aerial Refueling Probe Nozzle-equipped receiver aircraft.

8.0 APPENDIX / AUXILIARY SECTIONS

N/A FOR THE DOCUMENT