

Space Program Operations Contract

In-Flight Maintenance Tool Catalog

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In Flight Maintenance Tool Catalog

Prepared by

Original approval obtained

Victor Badillo, Book Manager
Mechanical and In-Flight Maintenance Group Lead

Approved by

Original approval obtained

Tony Quandt, Manager
Mechanical and In-Flight Maintenance Group

REVISION LOG

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INTRODUCTION

This document should be beneficial to anyone in need of information regarding space shuttle In-Flight Maintenance (IFM) tools and equipment. It is designed to supplement the In-Flight Maintenance Checklist and Console Handbook. Crews, flight controllers, or contract support personnel can use it to answer questions or to get better acquainted with the IFM tools and equipment. IFM instructors and console operators can also use this document as a reference source and training aid.

This catalog contains photographs, applicable drawings, comments, and technical information for the tools and equipment stored in

1. IFM contingency hose and cable kit
2. IFM tool locker
3. Vacuum cleaner locker
4. IFM breakout box locker

A miscellaneous section for a few IFM-related pieces of equipment not stowed in one of these four areas is also included.

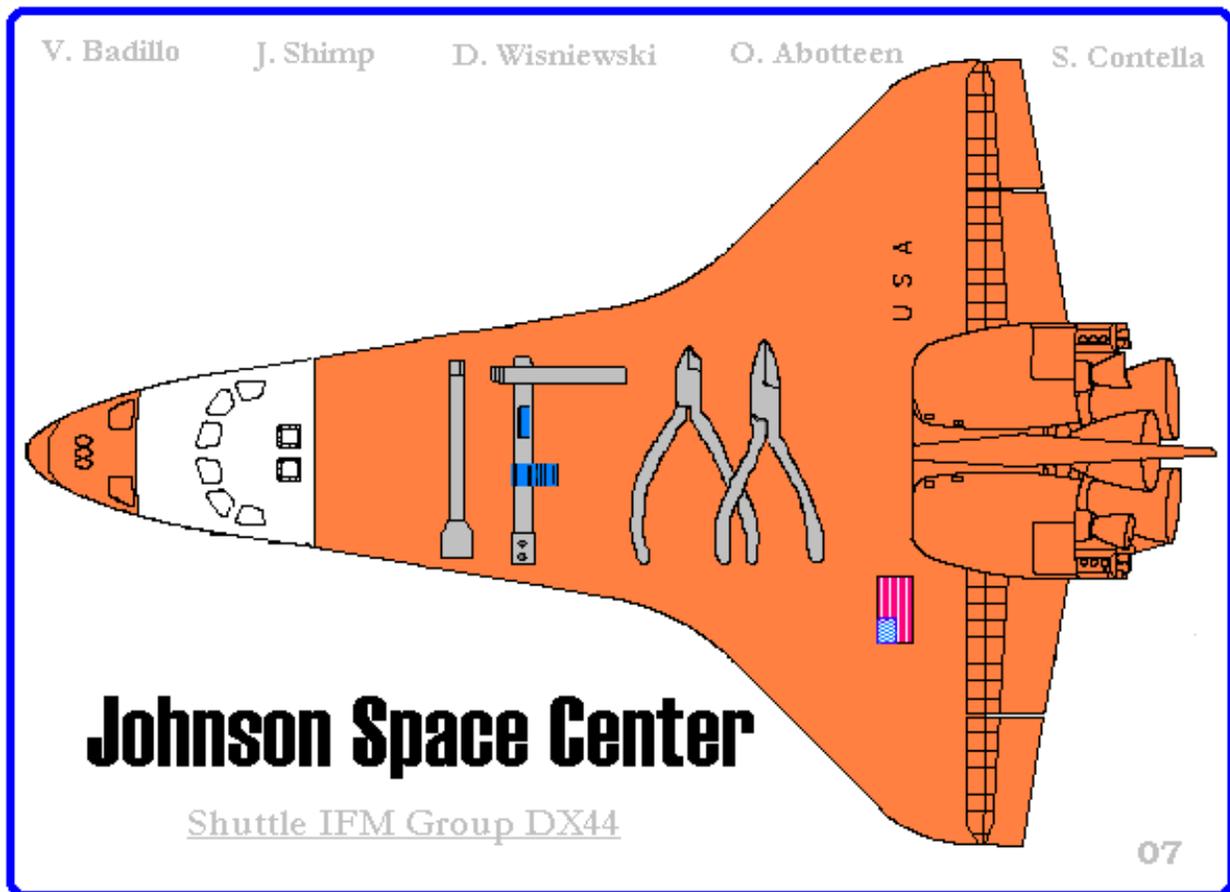
Although the information in this catalog is not flight specific, it will normally not change unless hardware is upgraded. Additional information can be obtained by contacting the appropriate National Aeronautics and Space Administration (NASA) subsystem managers or the In-Flight Maintenance Group in building 4N, room 286A, NASA Lyndon B. Johnson Space Center (JSC), (281) 483-3763.

PREFACE

This is the third publication of this document. It is the result of a combined effort of the IFM instructors/console operators of the Mechanical and In-Flight Maintenance Group under the authority of the Mechanical, Booster, Maintenance, and Crew Systems Branch, Systems Division, NASA JSC.

Special assistance has been obtained from Boeing-Aerospace Company, Snap-On Tools Corporation, and Hernandez Engineering, Inc., Space Flight Operations Contract (HEI-SFOC).

This document should not be reproduced without the approvals of the Supervisor/ Mechanical and In-Flight Maintenance Group and the Book Manager of the IFM Tool Catalog.



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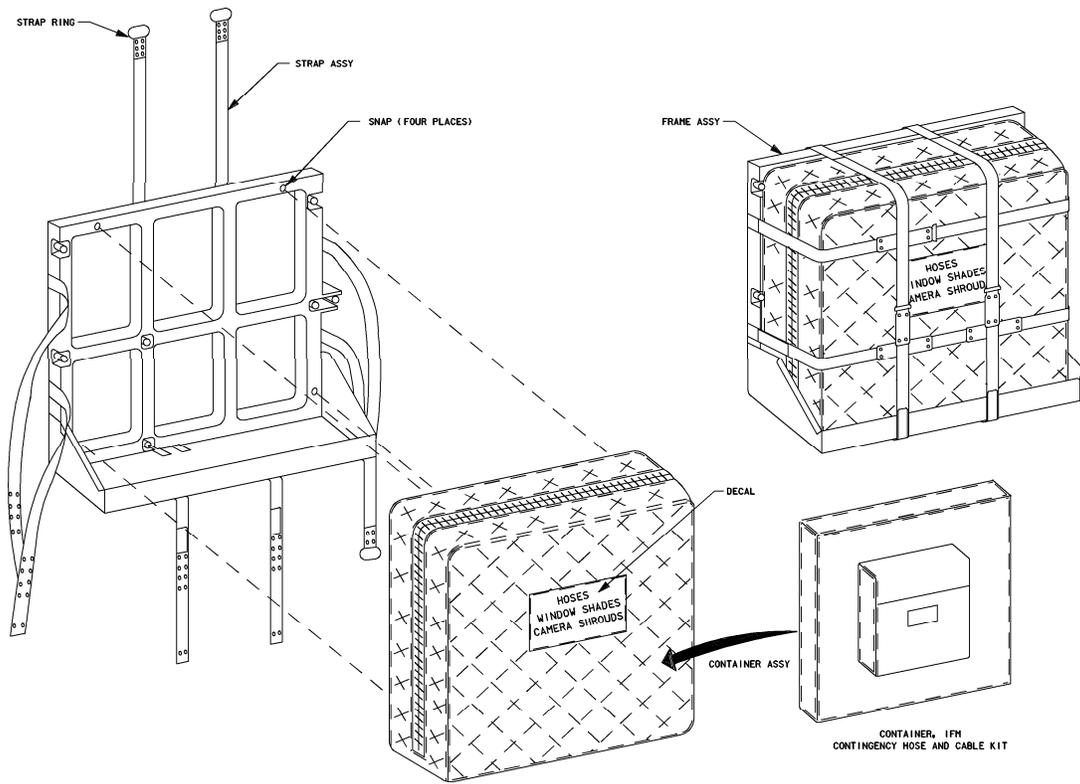
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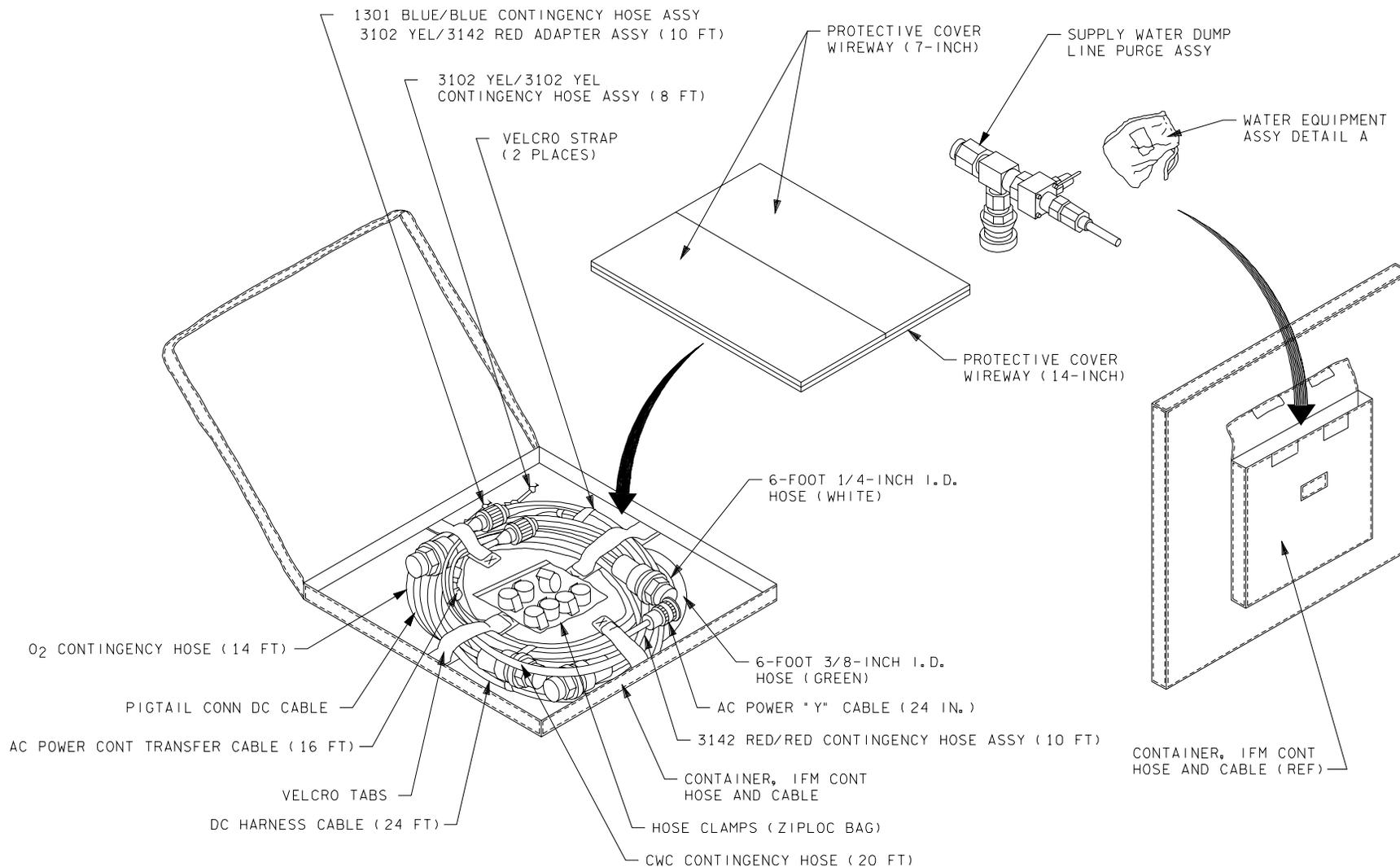
IFM CONTINGENCY HOSE AND CABLE KIT

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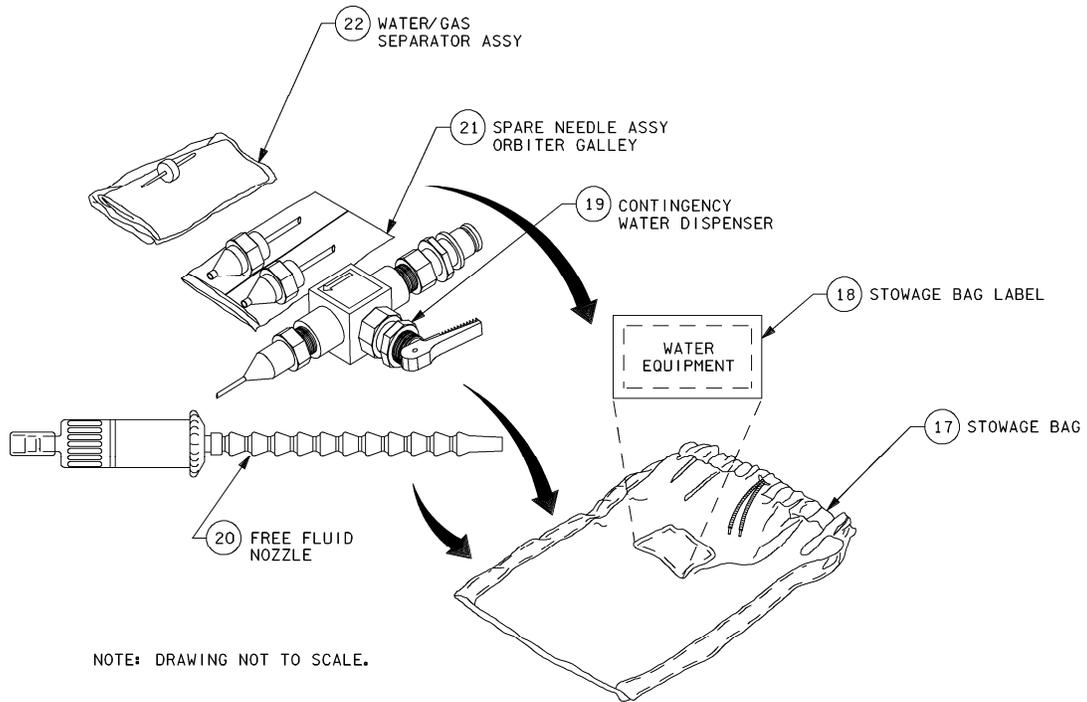
Container, IFM contingency hose and cable kit

0033528, ART. 1



0033531. ART 3

IFM contingency hose and cable kit



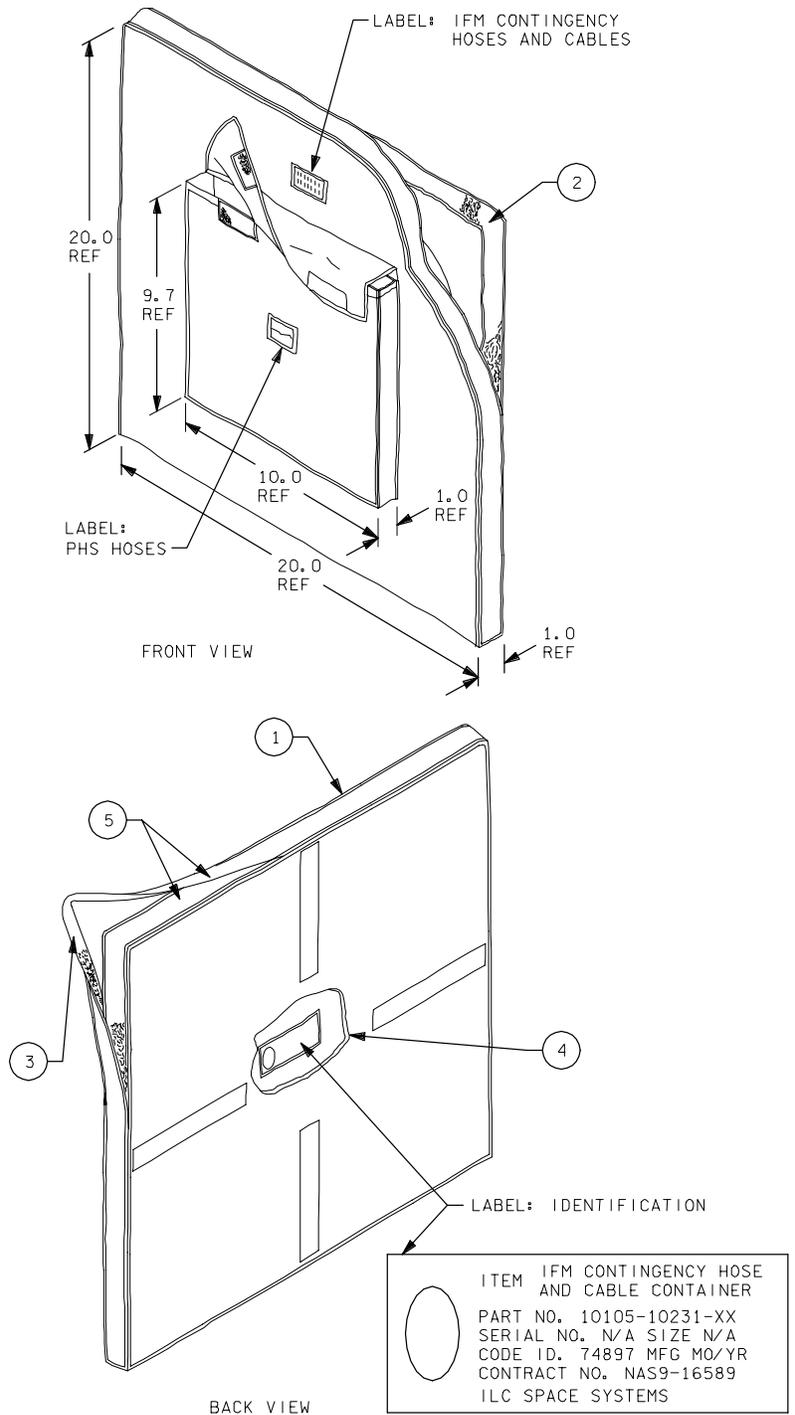
0033544. ART. 1

**Water equipment assembly
-001 assembly detail A**

CONTAINER, IFM CONTINGENCY HOSE AND CABLE



Item 1 Technical Information	
Location	IFM contingency hose and cable kit
CCCD part number	10105-10231-01
CCCD drawing	SED32104259
Other drawings	10105-10231-01 (container, IFM contingency hose and cable/ one sheet)
Manufacturer	Boeing (responsibility transferred from ILC)
Weight	1.62 lb
Quantity flown	One



234460104. ART: 2

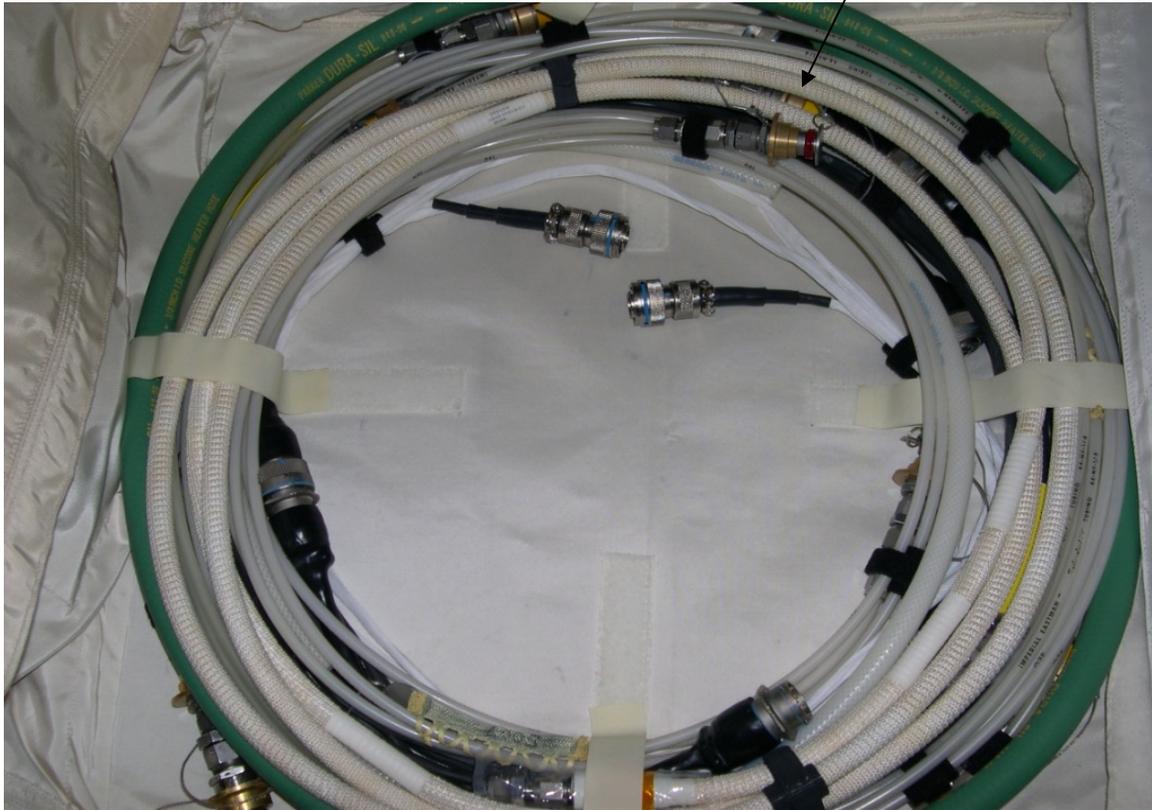
Container, IFM contingency hose and cable

Qty per assembly	Item	Description	Part number/ specification	Manufacturer part number	Manufacturer	Material
-01		Container, IFM contingency hose and cable	10105-10231-01		Boeing (responsibility transferred to)/ ILC (original)	
A/R	①	Multicord thread size "E" (natural cord)	ST15N814-02		Synthetic Thread Co.	Nomex, natural
A/R	②	Velcro, loop tape	ST13L818-07	1000-001-012-0199	Velcro USA, Inc.	Nylon
A/R	③	Velcro, hook tape	ST13L819-02	1000-065-010-0199-AA	Velcro USA, Inc.	Nylon
A/R	④	Container (side flaps)	ST11A830-01	10415	Chemical Fabrication	Armalon, premium 14 (Teflon-coated fiberglass)
A/R	⑤	Container (border)	ST11N1198-01	HT-90-40	Stern & Stern	Nomex

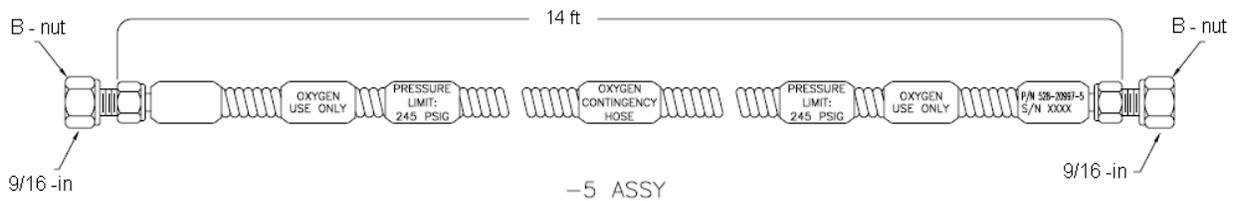
COMMENTS

The IFM contingency hose and cable container is normally stowed in the window shade bag.

O2 CONTINGENCY HOSE (14 FEET)



Item 2 Technical Information	
Location	IFM contingency hose and cable kit
CCCD part number	528-20977
CCCD drawing	SED32104259
Other drawings	N/A
Manufacturer	GFE (Responsible Group, EC Chhipwadia, Ketan S.)
Weight/length	1.4 lbs/14 ft
Quantity flown	One



COMMENTS:

This hose is for contingency use only, mitigating a failure that could potentially put the crew in danger in the event of cabin smoke, toxic gas release, or cabin depressurization. Proper controls are in place to allow the safe handling and installation of the hose on-orbit. The hose is stowed when not in use in the Contingency Hose and Cable Kit, the fittings are covered, and the crew is instructed to wear the dedicated Clean Room gloves when installing the hose to avoid contamination and to ensure a safe installation. The O2 contingency hose consists of 14 feet of hose connected between two O2 Test Ports (MO10W and C7 panel). The O2 Contingency Hose was created as a dedicated hose for this application. It is pressure tested to handle a maximum pressure of 245psig, and it is marked "O2 Use Only". Maximum design pressure is equal to maximum rated pressure, 245psig. Sufficient redundancy exists such that two independent failures do not result in an increased pressure beyond 245 psig. There is a relief valve and a pressure regulator in both the O2 Supply system and the LEH manifold. The pressure regulators maintain pressure at 100 psig and the relief valves relieve if the pressure reaches 245 psig.

**Background:**

The previous hose was a 10-ft, 1/4-in Nylon tubing with 1/4-in Dynatube fittings on either end (identical to the red/red hose), which was never designed to be used in an oxygen system. A catastrophic failure could have occurred if the Red/Red Hose was used in the O2 Sys 1(2) Failed Xover Vlv Bypass IFM procedure. During comprehensive flight procedure review as part of Aging Vehicle Assessment (AVA) in 2005, it was discovered that existing IFM procedure allowed the crew to utilize a water

hose to recover an Orbiter cross over valve failure mode (100% O2 application). The red/red hose was not cleaned properly nor maintained for safe use in the 100% O2 application. For STS-114, -121, -115, a dedicated "red/red" hose was provided specially for this Orbiter xover failure mode. Special open flame flammability testing as WSTF determined optimal survivability is achievable by the existing Shuttle Crew Escape Equipment (CEE) O2 hose. MV5 requested configuration change from existing Nylon-based hose to Shuttle CEE silicone-based O2 hose to support remainder of program. All the Certification documents, drawings and flight crew procedures have to be updated to reflect the changes. Victor Badillo supported this effort. STS-116 was the first flight to carry this O2 Hose.

References:

CEE Oxygen Supply Hose Assembly Drawing number 528-20977.

CCCD drawing SED32104259.

STS-117 Modular Locker Layout.

SSP CR OPR Change Request # S050417FG (07/28/2006)

COMMENTS

Velcro straps are used for the following hoses and cables in the IFM contingency hose and cable kit:

1. The ac power contingency transfer cable (two)
2. Pigtail connector and dc harness cables (two)
3. Y/Y contingency hose (two)
4. R/R contingency hose (two)
5. B/B contingency hose and Y/R QD adapter (two)
6. Contingency hoses R/R, Y/Y, B/B (two)

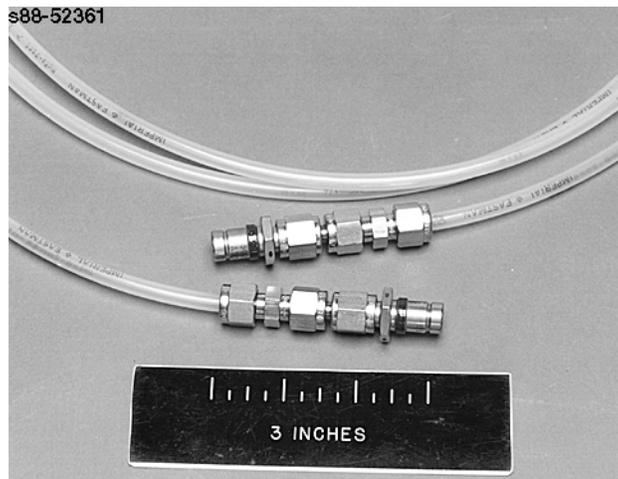
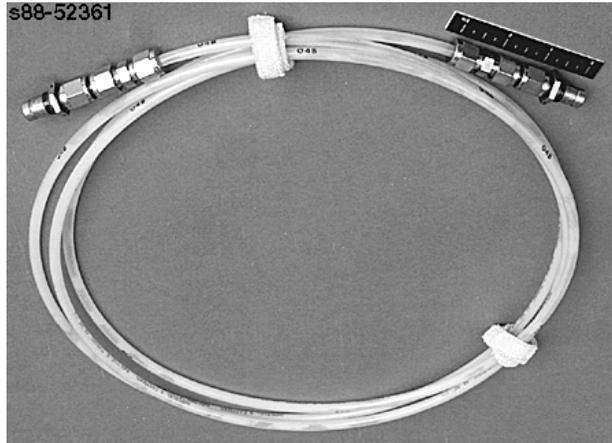
Each individual hose is wrapped with two Velcro straps, and the three contingency hoses are bundled together by two Velcro straps.

The same type of Velcro strap is flown in the following places:

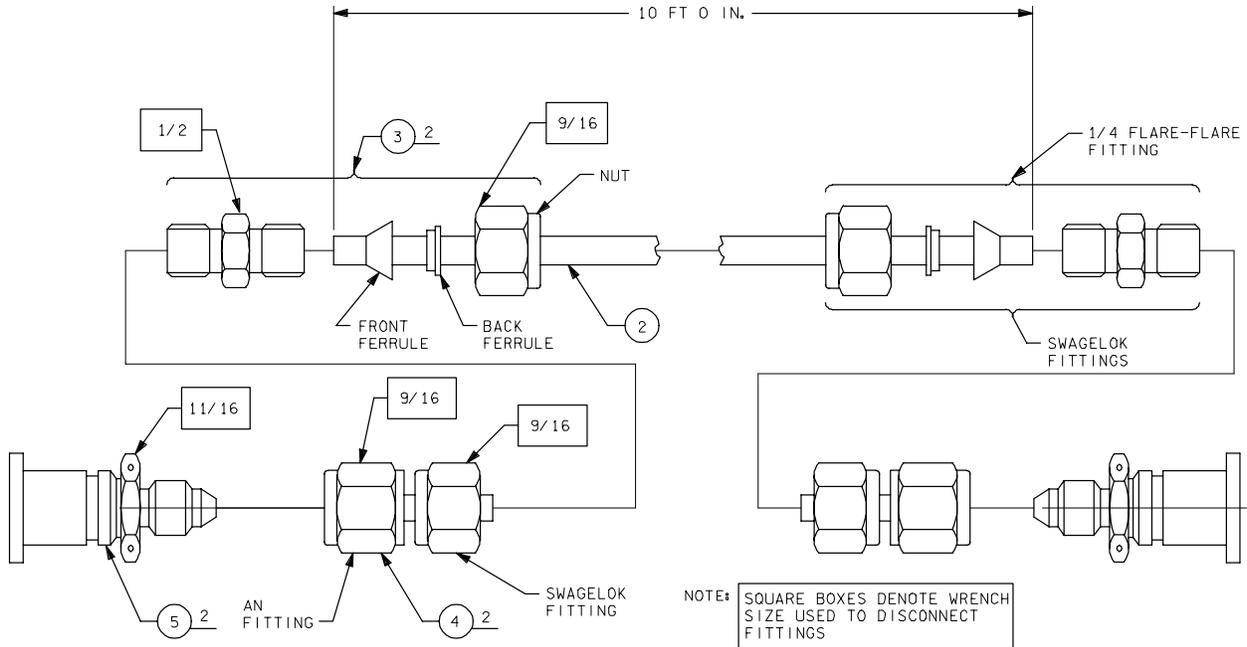
1. The IFM tool locker drawer 1 for the Velcro strap kit (see item 37)	50 flown
The CWS contingency power cables	6 flown
The PBI braided cord	1 flown
2. The IFM tool locker drawer 4 to secure the flexible handsaw	2 flown
3. The vacuum cleaner locker to secure the vacuum cleaner power cord	2 flown

Note: These Nomex Velcro straps (CCCD part number V627-650631-001/10105-10059-01) are gradually being replaced by Velcro cable straps (CCCD part number 528-43074-1) in all vehicles. Refer to item 38, page 2-76.

BLUE/BLE HOSE (MALE/MALE) 10 FEET



Item 3 Technical Information	
Location	IFM contingency hose and cable kit
CCCD part number	10108-20043-01
CCCD drawing	SED32104259
Other drawings	10108-20043 (1301 Blue/Blue (B/B assembly, Vacuum Attachment and Contingency Hose System (VACHS))/one sheet)
Manufacturer	Boeing (responsibility transferred from ILC)
Weight/length	0.42 lb/10 ft
Quantity flown	One



NOTE: DIMENSIONS ARE IN INCHES.

23446103A, ART 4

Blue/blue hose

The blue/blue hose has a 1/4-inch flare-flare fitting that can be used to connect the blue/blue hose (with its fitting removed) to either the yellow/yellow hose or the red/red hose (with their fittings removed).

Qty per assembly	Item	Description	Part number/specification	Manufacturer part number	Manufacturer	Material
-01	①	1301 blue/blue assembly	10108-20043-01		Boeing (responsibility transferred to)/ILC (original)	
1	②	1/4-in. natural tubing 10 ft long	ST18N1037-02	44NF	Imperial-Eastman Kodak	Nylo-seal
2	③	Union, 1/4 to 1/4 tube	ST20M1040-04	SS-400-6-4AN	Swagelok	Stainless steel
2	④	Adapter, 1/4 to 1/4 "AN" flare	ST20M1040-03	SS-400-A-4ANF	Swagelok	Stainless steel
2	⑤	Coupling 1301 assembly (1/4-in. male QD)	10108-20046-01 (MC276-0020-1301)	502040-1301	ILC/Symetrics, Inc.	

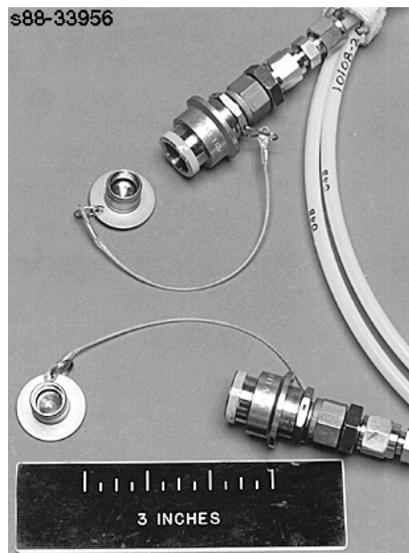
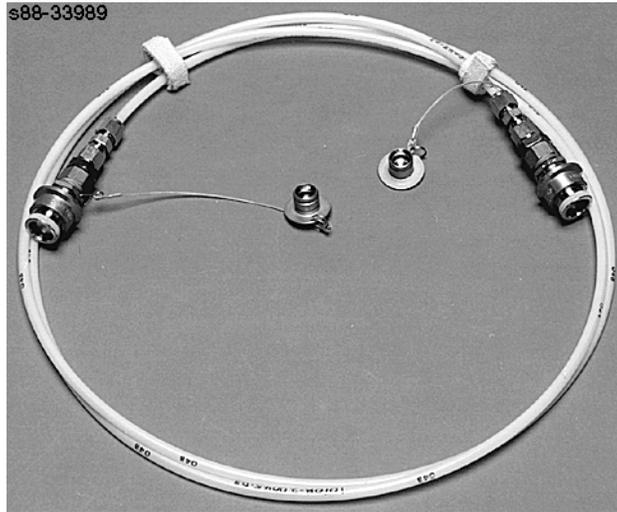
COMMENTS

The blue/blue contingency hose consists of 10 feet of hose connected between two male 1/4-inch 1301 blue quick disconnects. The 1301 blue QD connects to

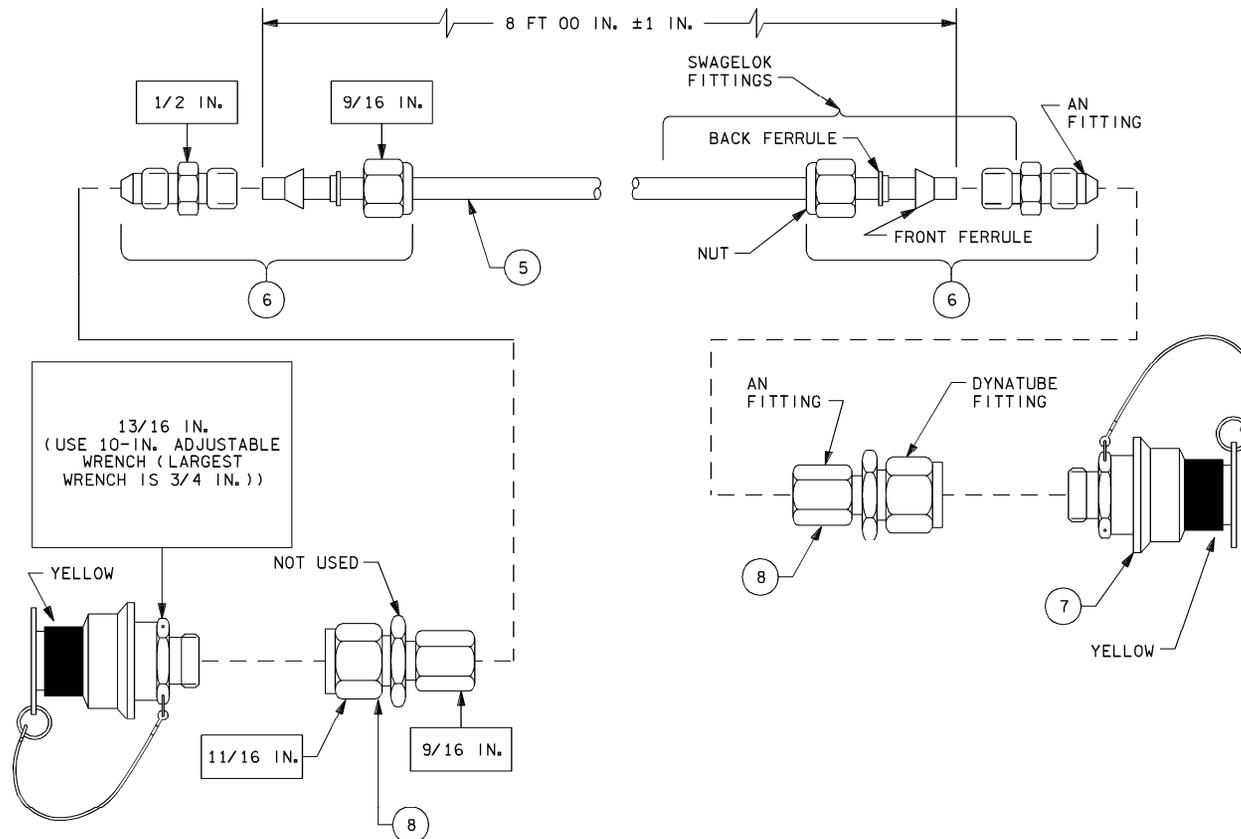
1. Red/red Contingency hose assembly (see item 6)
2. Yellow/red QD adapter (see item 7)
3. Personal Hygiene Station (PHS) hose (-3302)
4. Galley ambient water line (on galley, -3202)
5. Galley chilled water line (on galley, -3202)

Note: The maximum working pressure for all contingency water hoses is rated at 250 psi; the burst pressure is 1000 psi (information provided by Oceaneering Space Systems, Houston, Texas).

YELLOW/YELLOW HOSE (FEMALE/FEMALE) 8 FEET



Item 4 Technical Information	
Location	IFM contingency hose and cable kit
CCCD part number	10108-20045-04
CCCD drawing	SED32104259
Other drawings	10108-20045 (3102 yel/3102 yel (y/y) assembly, Vacuum Attachment and Contingency Hose System (VACHS)/one sheet)
Manufacturer	Boeing (responsibility transferred from ILC)
Weight/length	0.735 lb/8 ft
Quantity flown	One



NOTE: SQUARE BOXES DENOTE WRENCH SIZE TO DISCONNECT FITTINGS.
TORQUE IN FITTINGS AND COUPLINGS IS 100 ± 10 IN./LBS.

0033524. ART; 1

IFM contingency hose

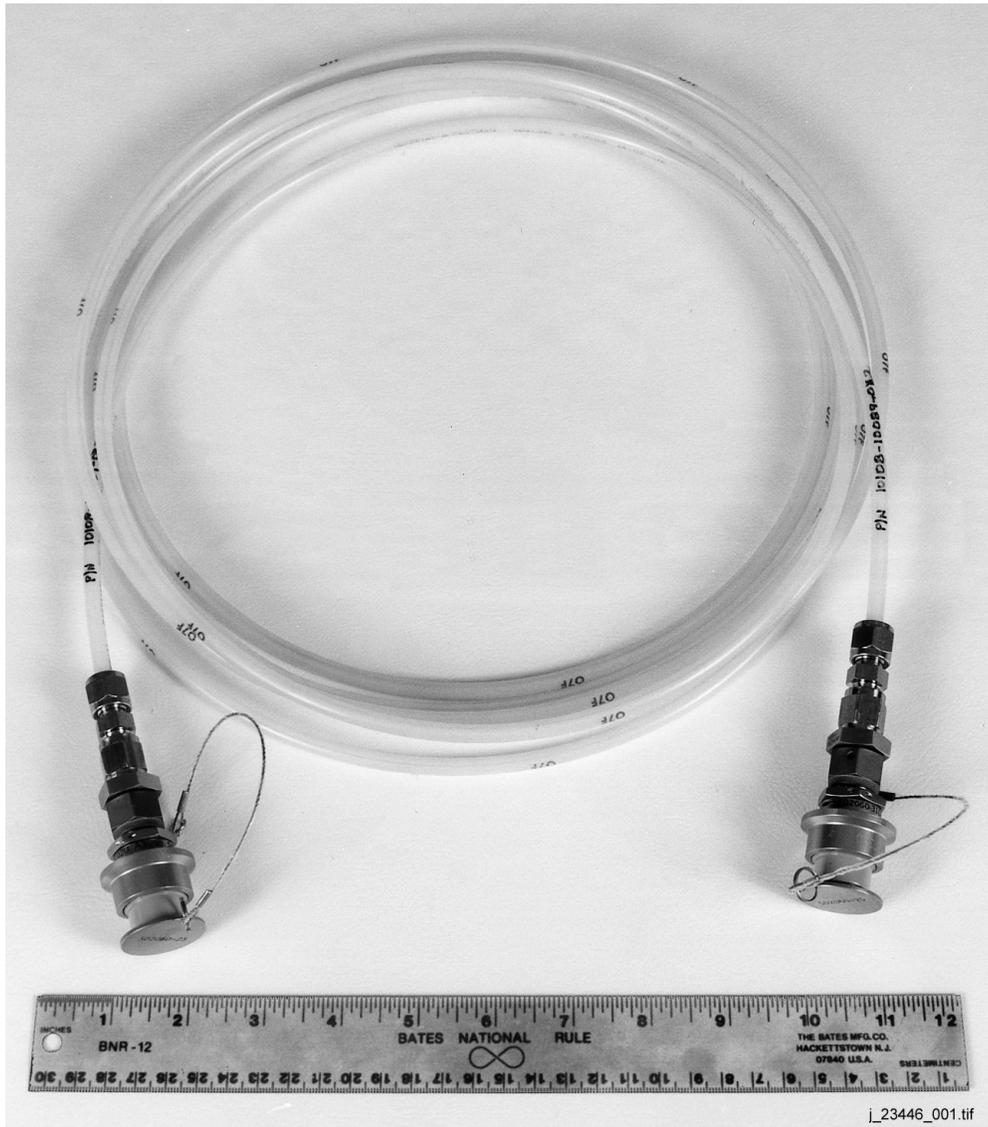
Qty per assembly -01	Item	Description	Part number/ specification	Manufacturer part number	Manufacturer	Material
	~	3102 yellow/yellow assembly	10108-20045-04		Boeing (responsibility transferred to)/ILC (original)	
1	⑤	1/4-in. natural tubing (20 ft long)	ST18N1037-02	44NF	Imperial-Eastman Kodak	Nylo-seal
2	⑥	Union 1/4 tube to 1/4 "AN" flare	528-41040-1	SS-400-6-4AN	Swagelok	Stainless steel
2	⑦	Coupling 3102 assembly (3/8-in. female QD)	10108-20054-02 MC276-0020-3102)	502060-3102	ILC/Symetrics, Inc.	
2	⑧	Dynatube female to "AN" female fitting (threads: 0.4375-2OUNJS-3B Dynatube fitting: 0.5625-2OUNJS-3B)	528-41039-4 (ST20F1039-4)	R4438P-0604 AP316P0604	Resistoflex, Roseland, NJ Airdrome Parts, Long Beach, CA	

COMMENTS

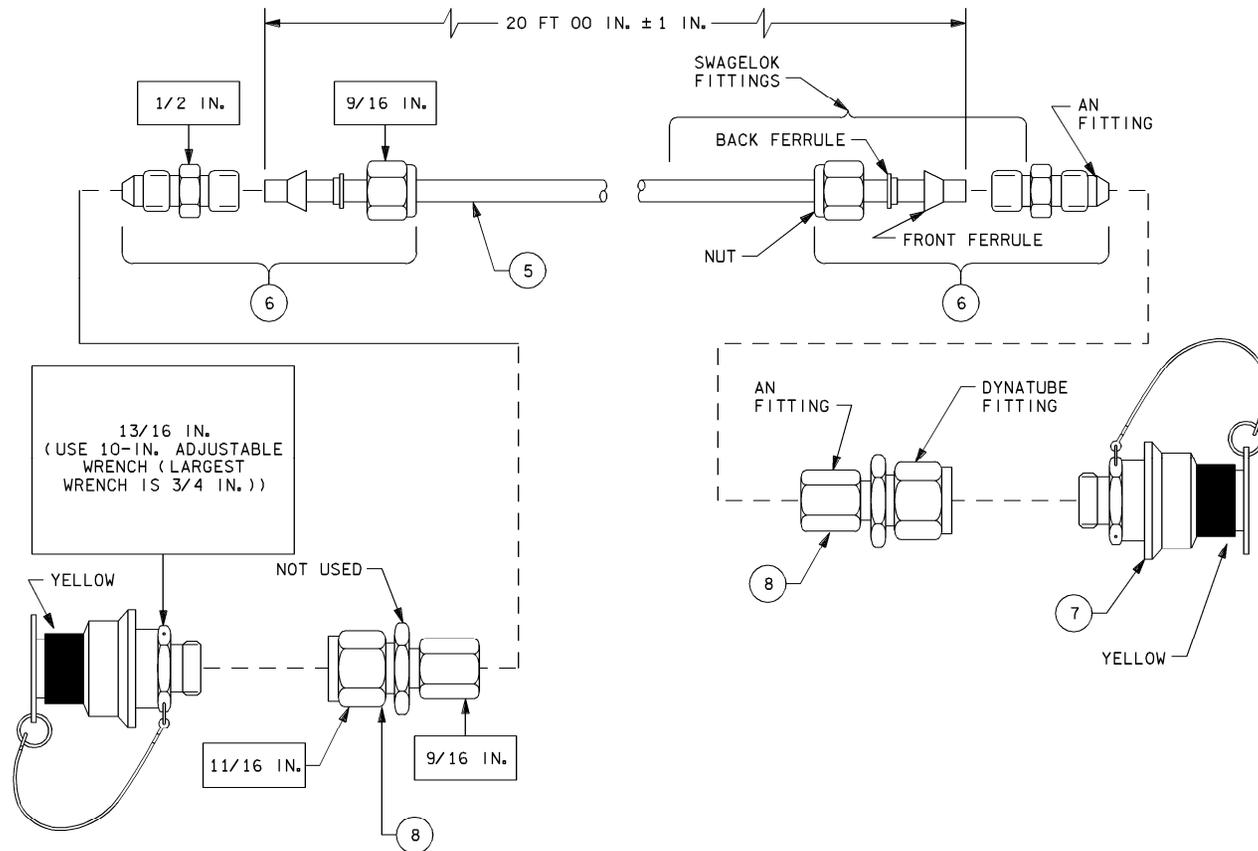
The yellow/yellow contingency hose consists of 8 feet of hose connected between two female 3/8-inch 3102 yellow QDs. The 3102 yellow QD connects to

1. Free fluid nozzle (see item 20)
2. Contingency H₂O x-tie pot QD (at WCS outboard wall, -1101)
3. Contingency H₂O x-tie waste QD (at WCS outboard wall, -1101)
4. WCS vacuum vent QD (on front panel of WCS, -1101)
5. P/L supply QD (on middeck floor at MD24K, -1101)
6. EMU drain QD (at front of WCS on the middeck floor, -1101)
7. Urine QD adapter (-1191) (see item 127)
8. Urine dump line (behind WCS kickplate on middeck floor, -1103)
9. Waste water dump filter (WWDF) (in IFM BOB locker, -1191)
10. Urine solids filter (beneath WCS and middeck floor, -1191)
11. P/L return QD (on middeck floor at MD24K, -1103)

CWC CONTINGENCY HOSE ASSEMBLY 20 FEET



Item 5 Technical Information	
Location	IFM contingency hose and cable kit
CCCD part number	10108-10089-02
CCCD drawing	SED32104259
Other drawings	
Manufacturer	Boeing
Length	20 ft
Quantity flown	One



0033525. ART: 1

CWC contingency hose assembly

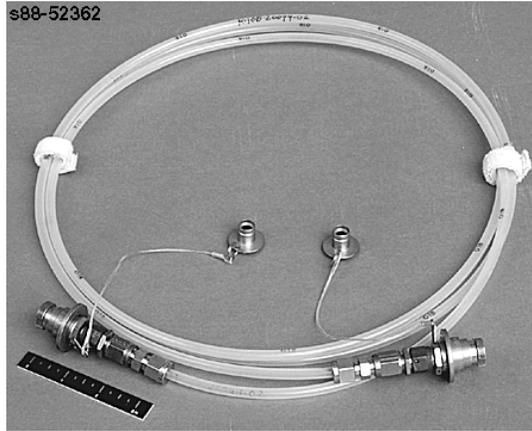
Qty per assembly -01	Item	Description	Part number/ specification	Manufacturer part number	Manufacturer	Material
	~	3102 yellow/yellow assembly	10108-20045-04		Boeing (responsibility transferred to)/ILC (original)	
1	⑤	1/4-in. natural tubing (20 ft long)	ST18N1037-02	44NF	Imperial-Eastman Kodak	Nylo-seal
2	⑥	Union 1/4 tube to 1/4 "AN" flare	528-41040-1	SS-400-6-4AN	Swagelok	Stainless steel
2	⑦	Coupling 3102 assembly (3/8-in. female QD)	10108-20054-02 (MC276-0020-3102)	502060-3102	ILC/Symetrics, Inc.	
2	⑧	Dynatube female to "AN" female fitting (threads: 0.4375-2OUNJS-3B Dynatube fitting: 0.5625-2OUNJS-3B)	528-41039-4 (ST20F1039-4)	R4438P-0604 AP316P0604	Resistoflex, Roseland, NJ Airdrome Parts, Long Beach, CA	

COMMENTS

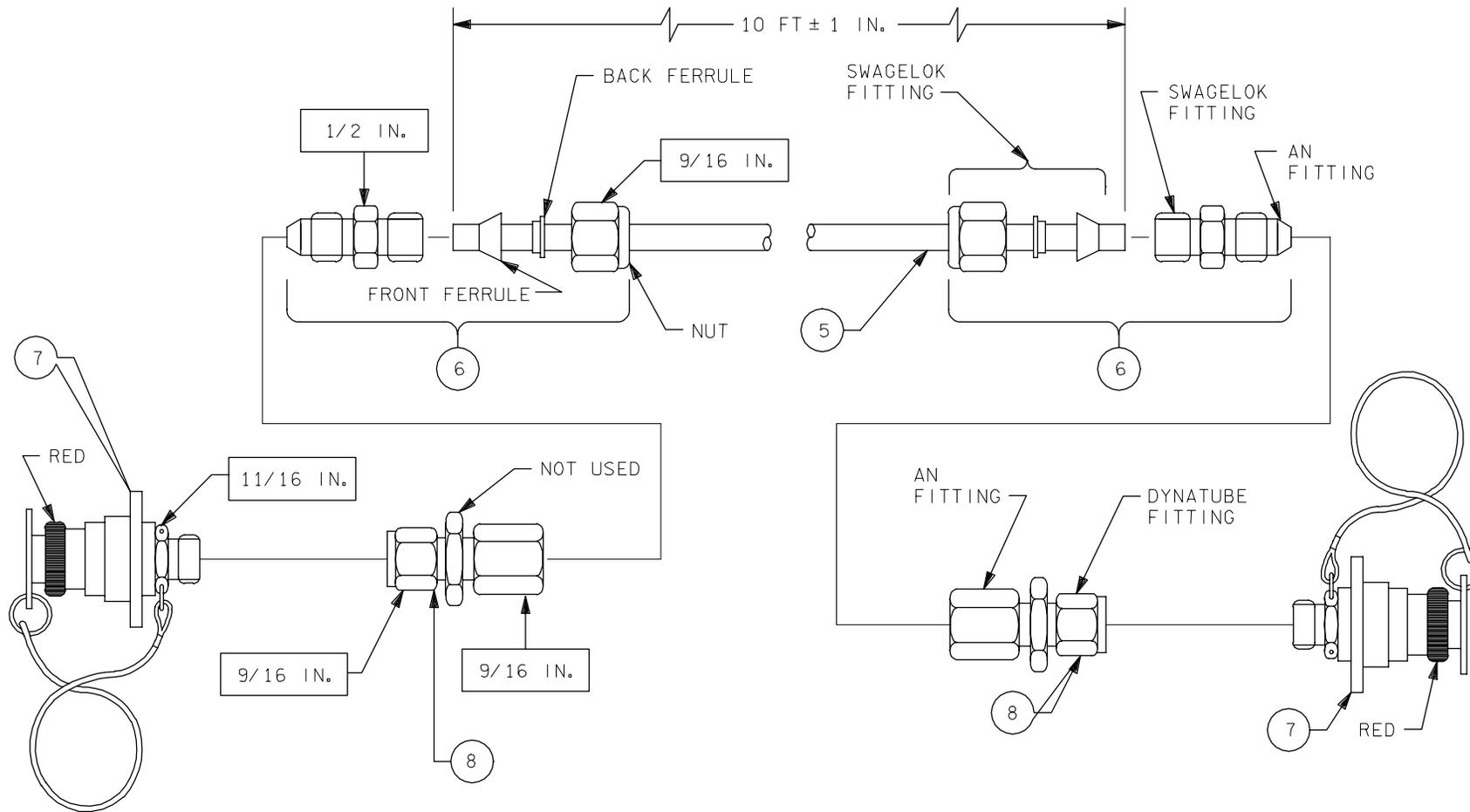
The yellow/yellow contingency hose consists of 20 feet of hose connected between two female 3/8-inch 3102 yellow QDs. This hose is primarily used during CWC operations. However, it can also be connected to

1. Contingency H₂O x-tie pot QD (at WCS outboard wall, -1101)
2. Contingency H₂O x-tie waste QD (at WCS outboard wall, -1101)
3. WCS vacuum vent QD (on front panel of WCS, -1101)
4. P/L supply QD (on middeck floor at MD24K, -1101)
5. EMU drain QD (at front of WCS on the middeck floor, -1101)
6. Urine QD adapter (-1191) (see item 127)
7. Urine dump line (behind WCS kickplate on middeck floor, -1103)
8. Waste Water Dump Filter (WWDF) (in IFM BOB locker, -1191)
9. Urine solids filter (beneath WCS and middeck floor, -1191)
10. P/L return QD (on middeck floor at MD24K, -1103)
11. Free fluid nozzle (see item 20)

RED/RED HOSE (FEMALE/FEMALE) 10 FEET



Item 6 Technical Information	
Location	IFM contingency hose and cable kit
CCCD part number	10108-20044-02
CCCD drawing	SED32104259
Other drawings	10108-20044 (3142 Red/Red (R/R) assembly, VACHS/ one sheet)
Manufacturer	Boeing (responsibility transferred from ILC)
Weight/length	0.555 lb/10 ft
Quantity flown	One



NOTE: SQUARE BOXES DENOTE WRENCH SIZE USED TO DISCONNECT FITTINGS.

234460107. ART; 6

Red/red hose

Qty per assembly -01	Item	Description	Part number/ specification	Manufacturer part number	Manufacturer	Material
	~	3142 red/red assembly	10108-20044-02		Boeing (responsibility transferred to)/ ILC (original)	
1	⑤	1/4-in. natural tubing (10 ft long)	ST18N1037-02	44NF	Imperial-Eastman Kodak	Nylo-seal
2	⑥	Union, 1/4 tube to 1/4 "AN" flare	ST20M1040-01	SS-400-6-4AN	Swagelok	Stainless steel
2	⑦	Coupling 3142 assembly (1/4-in. female QD)	10108-20053-1 (MC276-0020-3142)	502040-3142	ILC/Symetrics, Inc.	
2	⑧	Dynatube female to "AN" fitting (threads: "AN" fitting: 0.4375-2OUNJS-3B Dynatube fitting: 0.4375-24UNJS-3B)	528-41039-5 (ST20F1039-5)	R44238P-0604 AP316P0604	Resistoflex, Roseland, NJ Airdrome Parts, Long Beach, CA	

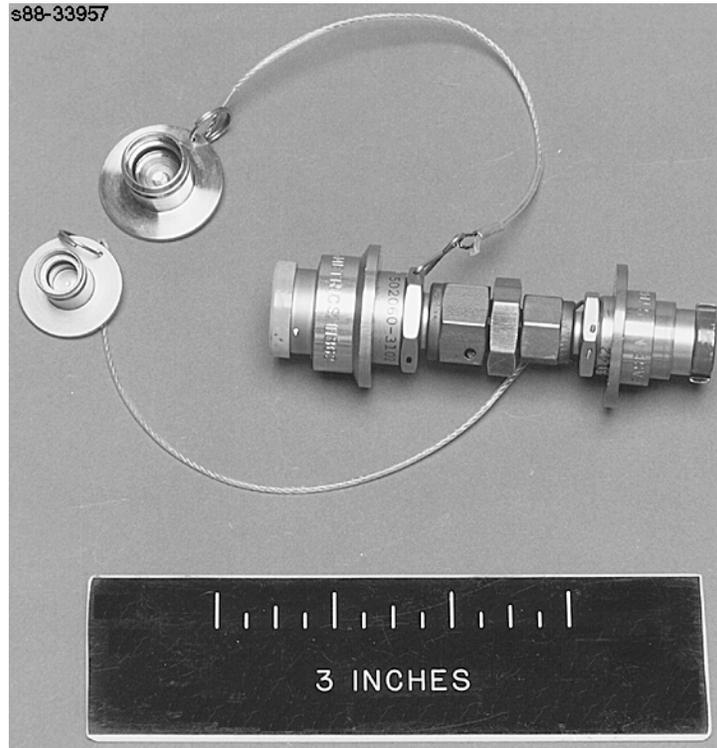
COMMENTS

The red/red contingency hose consists of 10 feet of hose connected between two female 1/4-inch 3142 red QDs. The 3142 red QD connects to

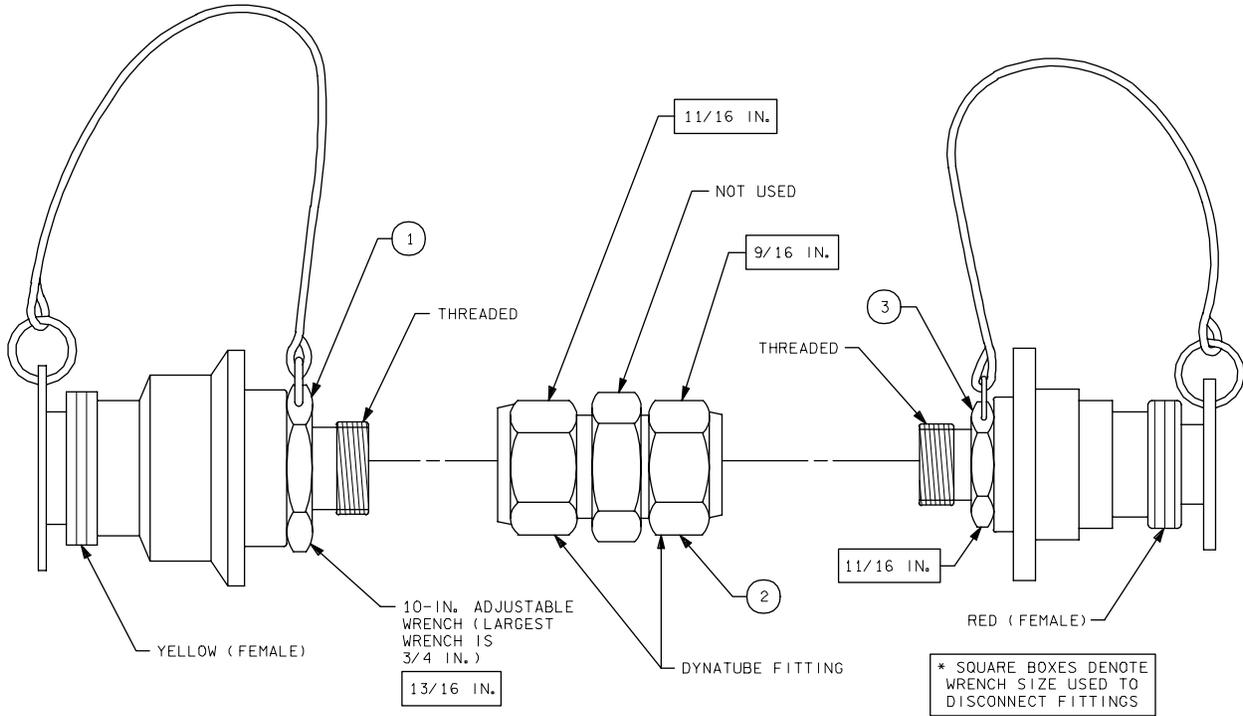
- 1301 blue/blue Contingency hose assembly (-1301) (see item 3)
- Contingency water dispenser (-1301) (see item 19)
- Galley or OWDA/supply tank A microbial filter lower blue QD (below middeck floor at MD25K accessed through LEB access panel (MD24I) (-1301))
- Ambient water QD (on middeck floor at MD24K) (-1201)
- Chilled water QD (on middeck floor at MD24K) (-1201)
- Galley auxiliary port potable water QD (-1141, modified)
- Galley H₂O flush test port #4 (TP4) (-1141, modified)

The galley auxiliary port potable water and galley water flush test port #4 (TP4) are -1141 QDs that have been modified (by removing their key ring), making them equivalent to a -1201 type QD. Consequently, these two -1141 modified QDs are able to mate with -3302, -3202, and -3142 1/4-inch female QDs.

YELLOW/RED QD ADAPTER (FEMALE/FEMALE)



Item 7 Technical Information	
Location	IFM contingency hose and cable kit
CCCD part number	10108-20175-01
CCCD drawing	SED32104259
Other drawings	10108-20175 (3102 yel/3142 red adapter assembly, VACHS/one sheet)
Manufacturer	Boeing (responsibility transferred from ILC)
Weight	0.365 lb
Quantity flown	One



234460108, ART. 8

Yellow/red QD adapter

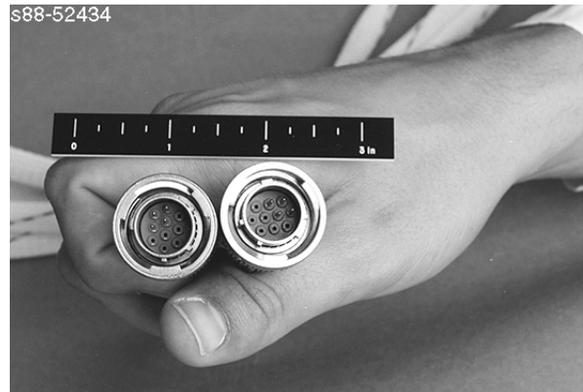
Qty per assembly	Item	Description	Part number/specification	Manufacturer part number	Manufacturer	Material
-01	~	3102 yellow/3142 red quick disconnect adapter assembly	10108-20075-01		Boeing (responsibility transferred to)/ ILC (original)	
1	①	Coupling 3102 assembly (3/8-in. female QD)	10108-20054-01 (MC276-0020-3102)	502060-3102	ILC/Symetrics, Inc.	
1	②	Dynatube fitting	ST20F1039-03 (ST20F1039-5)	R45280P-0406	Resistoflex, Roseland, NJ	
1	③	Coupling 3142 assembly (1/4-in. female QD)	10108-20053-1 (MC276-0020-3142)	502040-3142	ILC/Symetrics, Inc.	

COMMENTS

The yellow/red QD adapter is approximately 4 inches long and consists of two female QDs (one a 3102 yellow (3/8-inch) and the other a 3142 red (1/4-inch)). It allows the blue hose (connected to the 3142 red QD) to mate with the following QDs (which connect to the 3102 yel QD):

1. Contingency H₂O x-tie pot QD (at WCS outboard wall, -1101)
2. Contingency H₂O x-tie waste QD (at WCS outboard wall, -1101)
3. WCS vacuum vent QD (on front panel of WCS, -1101)
4. P/L supply QD (on middeck floor at MD24K, -1101)
5. EMU drain QD (at front of WCS on the middeck floor, -1101)
6. Contingency Water Container (CWC) QD (-1191) (see item 125)
7. Urine QD adapter (-1191) (see item 127)

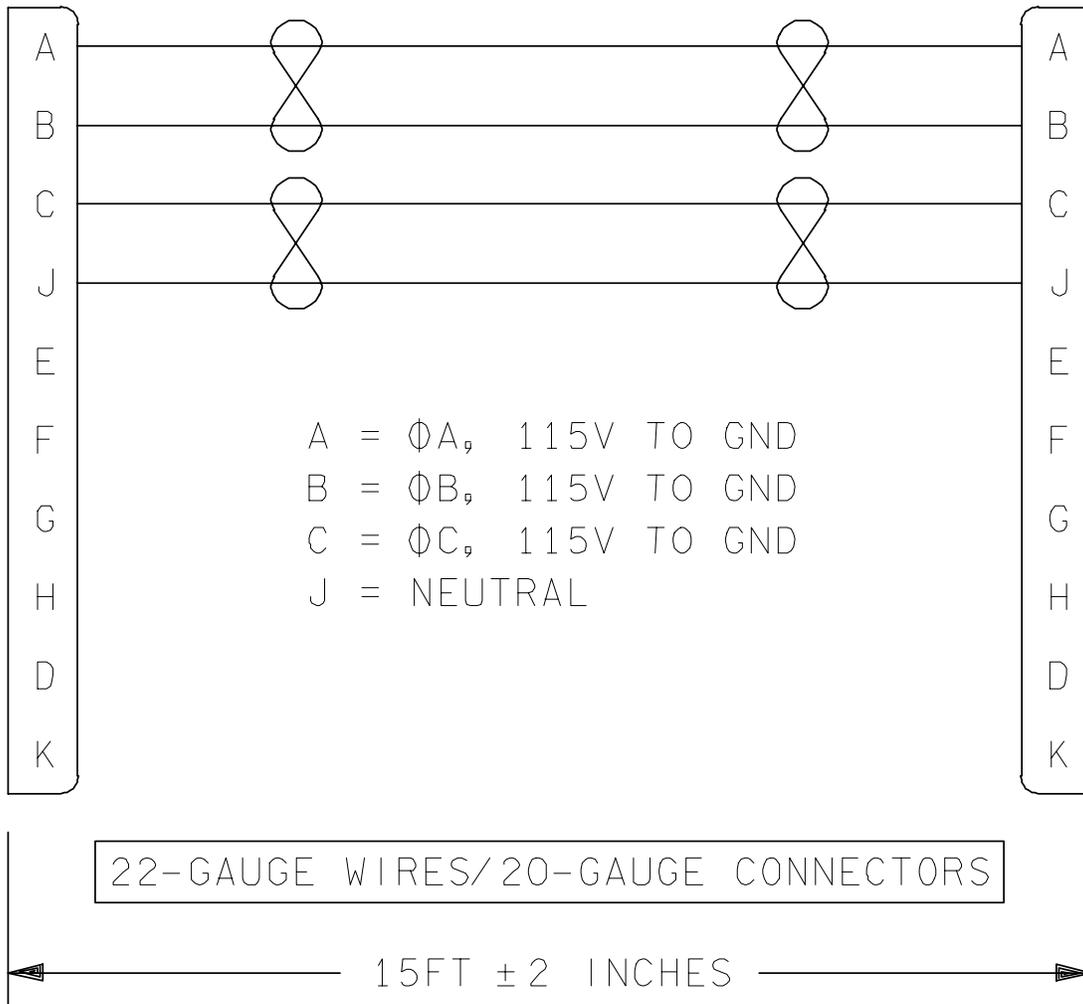
AC POWER TRANSFER CABLE (15 FEET)



Item 8 Technical Information	
Location	IFM contingency hose and cable kit
CCCD part number	SED33101301-301
CCCD drawing	SED32104259
Other drawings	SED33101301 (cable - ac power contingency/one sheet)
Manufacturer	NASA
Weight	0.540 lb
Material	See drawing SED33101301
Quantity flown	One

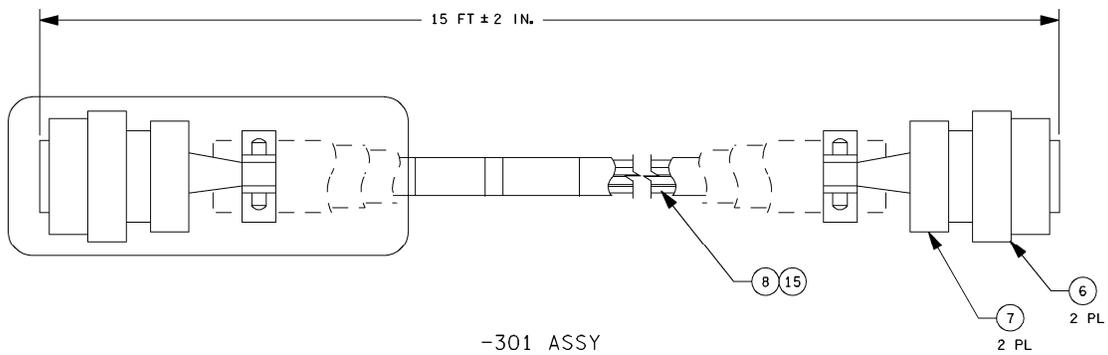
(NB6GE12-10PNT)

(NB6GE12-10PNT)



23446109A. ART; 4

ac power transfer cable



0033529. ART; 1

Qty per assembly -301	Item	Description	Part number/ specification	Manufacturer part number	Manufacturer	Material
		Cable - ac power contingency	SED33101301-301		NASA	
2	(6)	Connector	(40M39569)	NB6GE12-10PNT	ITT Canon	
2	(7)	Backshell	(40M39569)	NB-S-12	ITT Canon	
A/R	(8)	Wire, twisted pair (22 AWG)	(MB0150-048)	MP572-0317-0003		
A/R	(9)	Sleeve, braided (type I, 1/2-in.)	(MB0150-060)			
A/R	(10)	Tubing, shrink (3/32-in. Teflon)	(MB0150-059)			Teflon
A/R	(11)	Mat'l, spot tie (type II, 0.09W)	(MB0135-035)			
A/R	(12)	Shrink sleeve (1/2-in. Teflon)		FP 301		Teflon
A/R	(13)	Sealing plug	(40M39569)	NP-GSP-20		
A/R	(14)	Shrink sleeve (Teflon)	MIL-I-23053/12-221-9			Teflon
A/R	(15)	Tape (Tefglas)	MIL-T-43435			Tefglas

COMMENTS

The ac power transfer cable can be used to repower an ac bus by routing the cable between the ac utility power outlets (for AC1/or AC3) and/or between the payload station patch panel behind panel L17 or mission station patch panel behind panel R17 (for AC2). The ac power transfer cable is a 15-foot cable of four (22-gauge) wires in twisted pair configurations connected between two plugs (NB6GE12-10PNT) (each having four 20-gauge pins).

The ac power transfer cable connects to the ac utility outlets (a jack with four 20-gauge sockets) located at

- 1. Panel F1
 - 2. Panel MO52J
 - 3. Panel A15A1
 - 4. Panel MO13Q
- } For AC1
- } For AC3

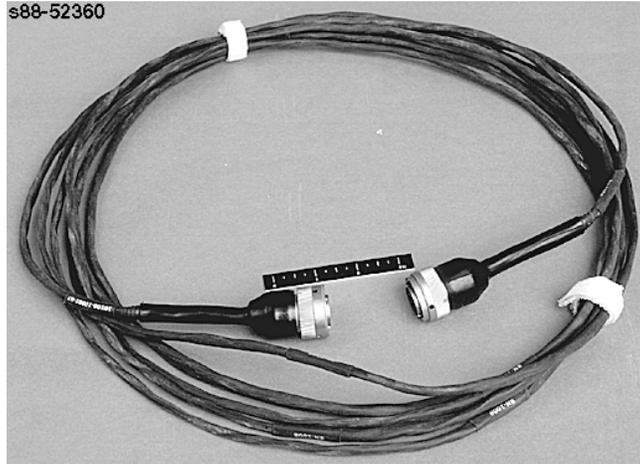
The ac power transfer cable can also be connected to the following jacks (which have four 20-gauge sockets) for AC2:

- 1. J36 on the mission station patch panel (behind panel R17)
 - 2. J37 on the payload station patch panel (behind panel L17)
- } For AC2

This cable is installed using the IFM checklist procedure “AC power transfer cable installation.”

See the Power Cable Summary in Appendix B.

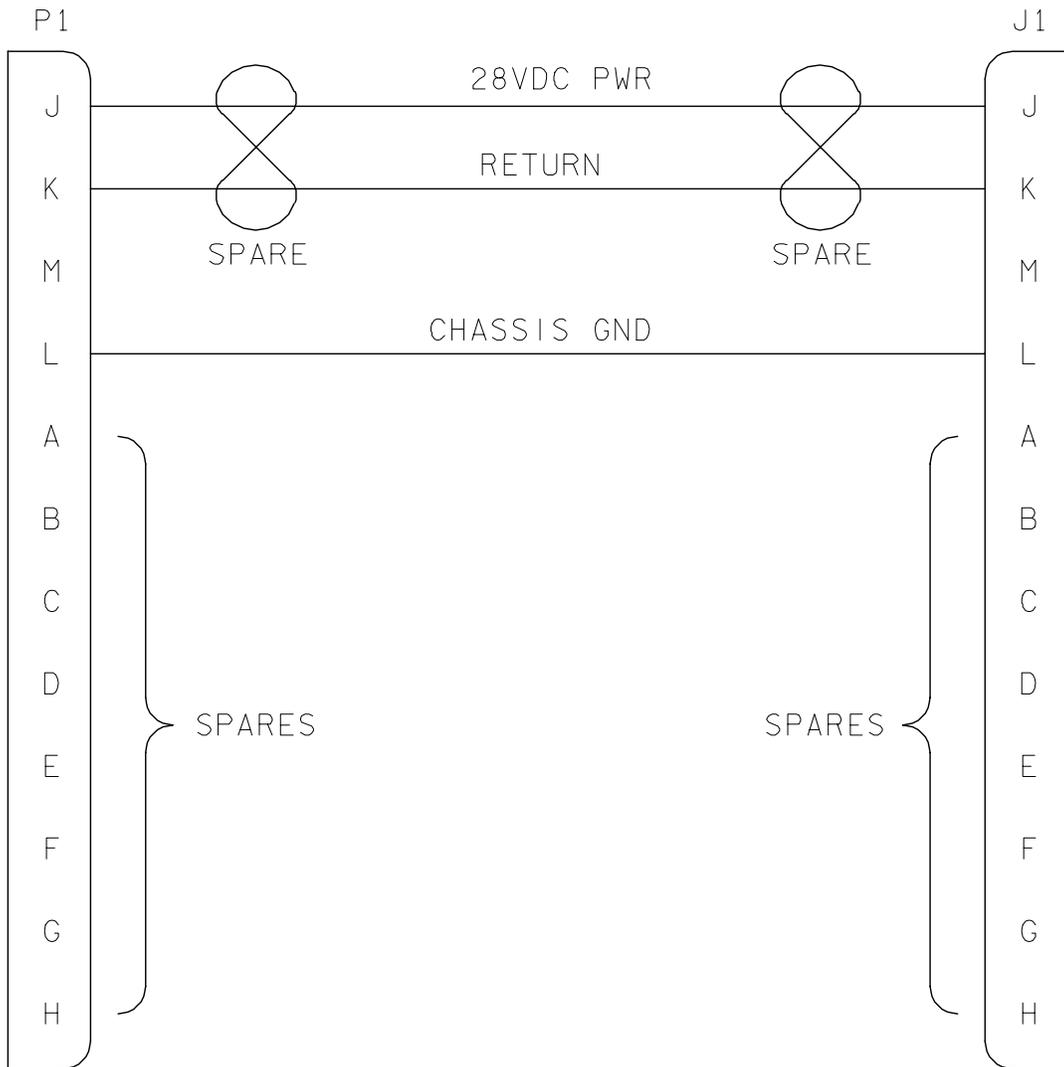
DC HARNESS CABLE (24 FEET)



Item 9 Technical Information	
Location	IFM contingency hose and cable kit
CCCD part number	10108-10082-07
CCCD drawing	SED32104259
Other drawings	10108-10082 (cable assembly, dc harness/one sheet)
Manufacturer	ILC
Weight	1.06 lb
Quantity flown	Two

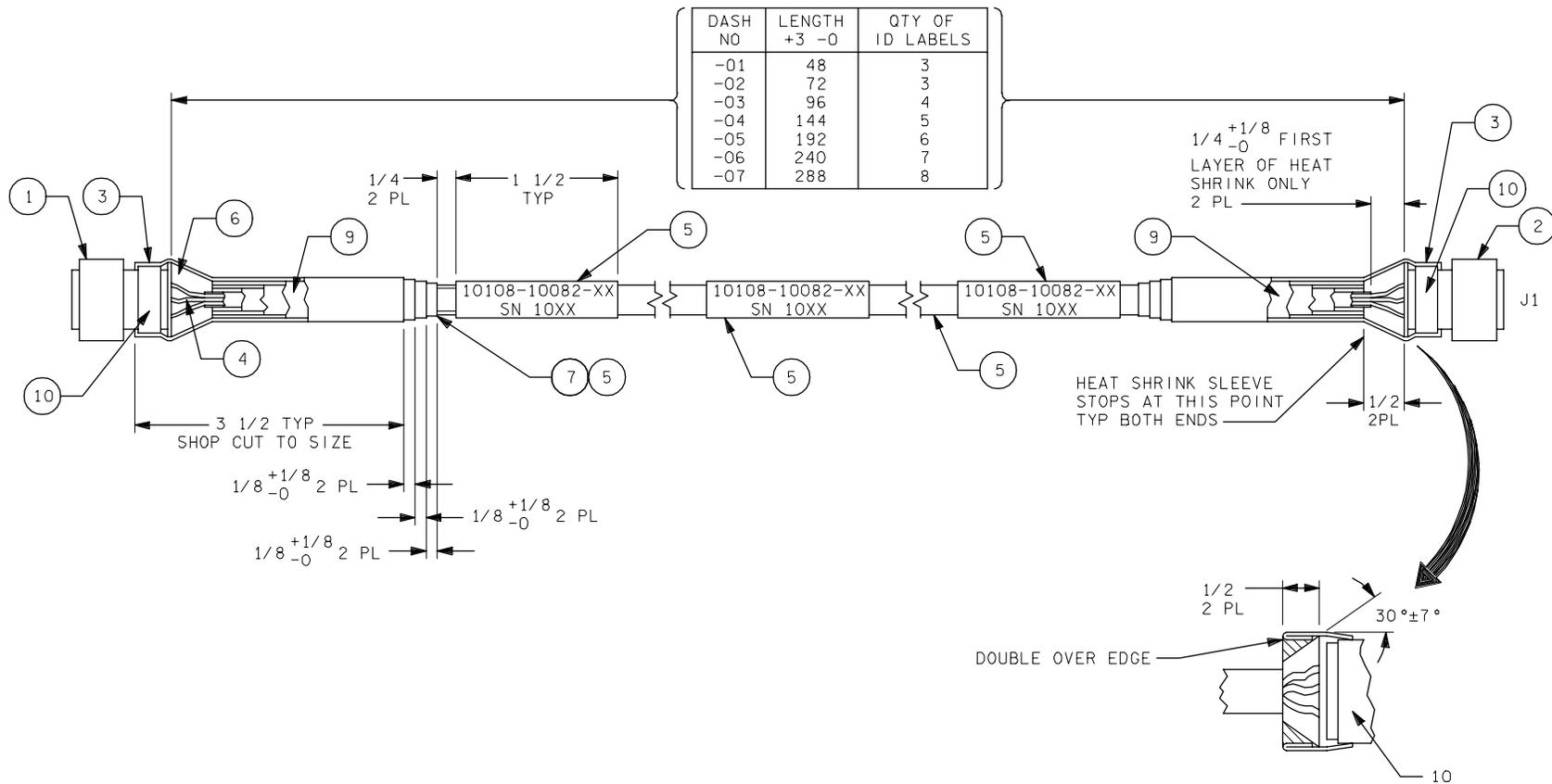
(NB6GE14-12PNT2)
MALE PLUG

(NB6GE14-12SNT2)
FEMALE RECEPTACLE



234460110. ART: 5

dc harness cable



234460109. ART 3

dc harness cable

Qty per assembly -07	Item	Description	Part number/ specification	Manufacturer part number	Manufacturer	Material
		Cable assembly, dc harness	10108-10082-07		ILC	
1	①	Plug, male	ST20C1080-10	NB6GE14-12PNT2	ITT Canon	
1	②	Receptacle, female	ST20C1080-24	NB6GE14-12SNT2	ITT Canon	
2	③	Shrink boot	ST20B1829-02	202D232-12	Raychem	Viton
A/R	④	Wire, 16AWG single conductor strand, 600 V	ST25W1365-12 or M22759/12-16-9	55A0111-16-9	Raychem	
A/R	⑤	Shrink tubing, 1/4 ID (VP8) black	ST29T1812-07	RT1148	Raychem	(VPB) black
A/R	⑥	Potting compound	ST32R1359-02	Scotch cast - 8	3M	
A/R	⑦	Adhesive	ST30R1814-01	S1010	Raychem	Viton
A/R	⑧	Tetra-Etch, etching acid	ST80A1366-01		Cadillac Plastic	
A/R	⑨	Shrink tubing, 3/8 ID (black)	ST29T1812-01	RT1146	Raychem	Viton
2	⑩	Backshell	ST20C1080-02 (38107-14)	NB-C-14	ITT Canon	

COMMENTS

The dc harness cable for the IFM breakout box is a 24-foot cable of three (16-gauge) wires connected between a male plug (NB6GE14-12PNT2) (with four 16-gauge and eight 20-gauge pins) and a female receptacle (NB6GE14-12 SNT2) (with four 16-gauge and eight 20-gauge sockets). (Note that only three 16-gauge pins and three 16-gauge sockets are connected.) See the breakout box/cable configurations and power cable summary in Appendix B.

The dc harness cable's male plug (has pins) fits

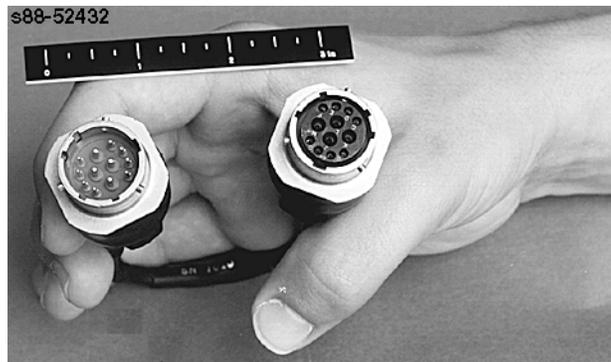
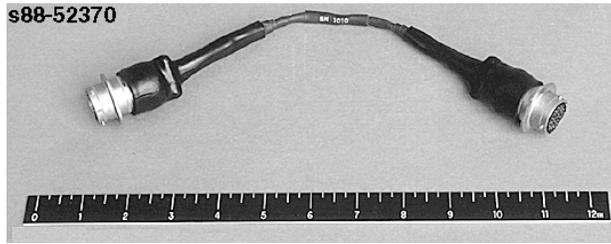
1. dc utility outlet
2. IFM breakout box outlet (see item 119)
3. Pigtail connector socket end

The dc harness cable's female receptacle (has sockets) fits

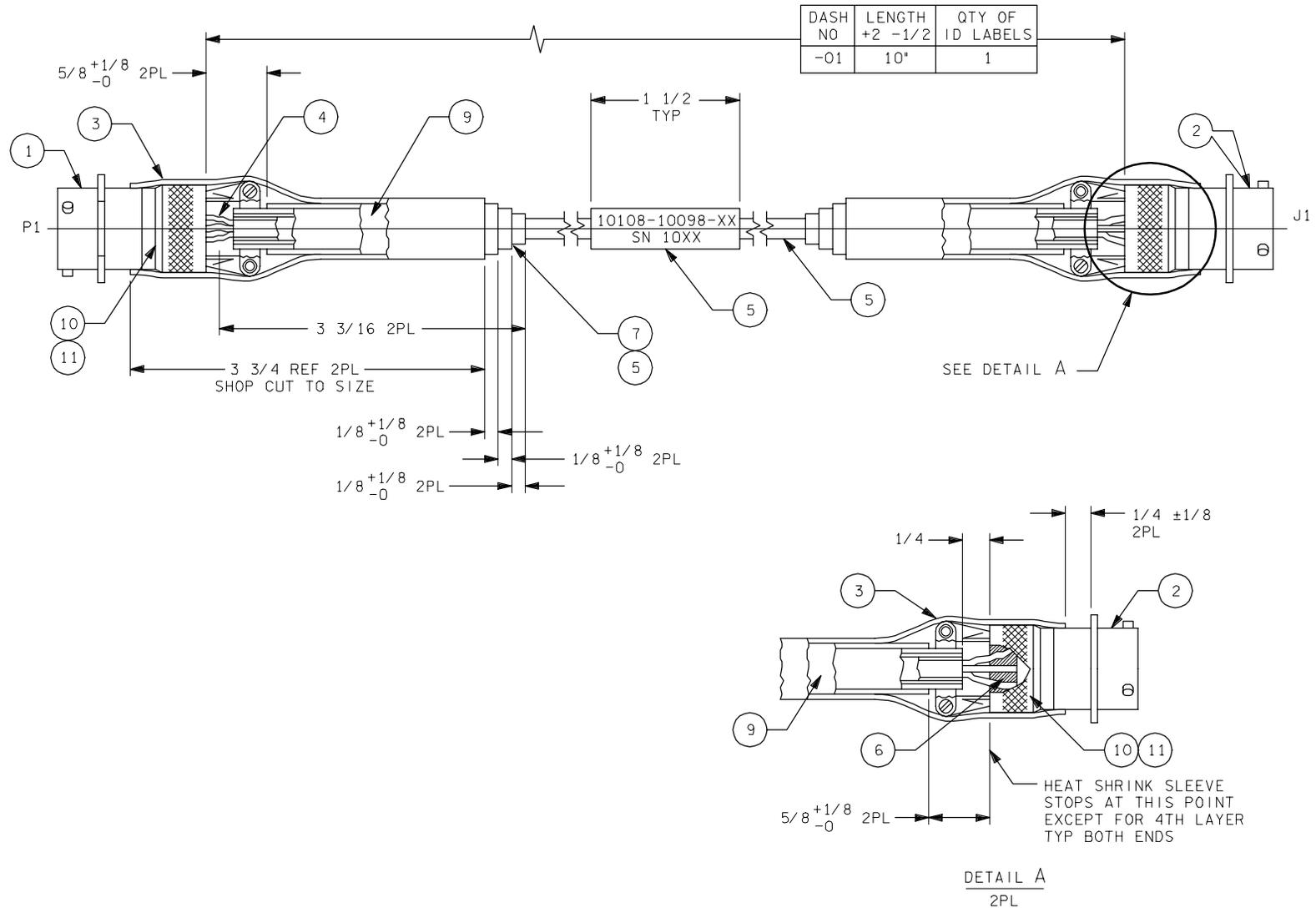
1. IFM breakout box inlet (see item 119)
2. Pigtail connector pin end
3. Any standard dc device (such as P/L experiment or PSVS fans)

The 24-foot dc harness cable (10108-10082-07) has the same type of connectors as the 10108-10082-01, 02, 03, 04, 05, and 06 cables (the only difference is the length of the cable).

PIGTAIL CONNECTOR, DC HARNESS



Item 10 Technical Information	
Location	IFM contingency hose and cable kit
CCCD part number	10108-10098-01
CCCD drawing	SED32104259
Other drawings	10108-10098 (pigtail connector, dc harness/one sheet)
Manufacturer	ILC
Weight	0.26 lb
Quantity flown	Two

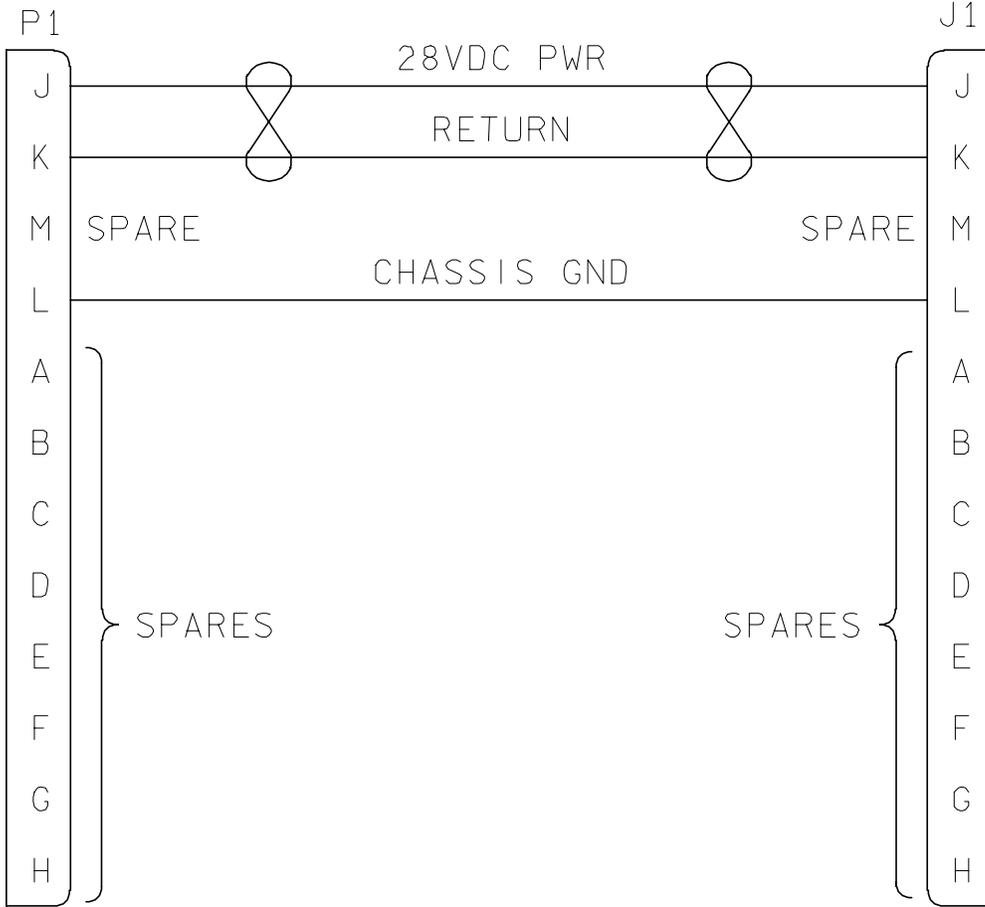


Pigtail connector, dc harness

234460111. ART 3

(NB1E14-12PNS)
MALE PLUG

(NB1E14-12SNS)
FEMALE RECEPTACLE



23446111A. ART# 2

Pigtail connector, dc harness

Qty per assembly	Item	Description	Part number/ specification	Manufacturer part number	Manufacturer	Material
-01	~	Pigtail connector	10108-10098-01		ILC	
1	(1)	Connector, male plug	ST20C1080-38	NB1E14-12PNS	ITT Canon	
1	(2)	Connector, female	ST20C1080-37	NB1E14-12SNS	ITT Canon	
2	(3)	Shrink boot	ST20B1829-02	202D232-12	Raychem	Viton
A/R	(4)	Wire, 16AWG, single conductor strand, 600 V	ST25W1365-12 or M22759/12-16-9	55A0111-16-9	Raychem	
A/R	(5)	Shrink tubing, 1/4 ID (VP8) black	ST29T1812-07	RT1148	Raychem	(VP8) black
A/R	(6)	Potting compound	ST32R1359-12	Scotch cast - 8	3M	
A/R	(7)	Adhesive	ST30R1814-01	S1010	Raychem	Viton
A/R	(8)	Tetra-Etch, etching acid	ST80A1366-01		Cadillac Plastic	
A/R	(9)	Shrink tubing, 3/8 ID (black)	ST29T1812-01	RT1146	Raychem	Viton
2	(10)	Backshell	057-0685-002-8448	NB-S-14	ITT Canon	
A/R	(11)	Loctite, no. 222	ST36L918-01	222	Loctite	

DRAWING NOTE

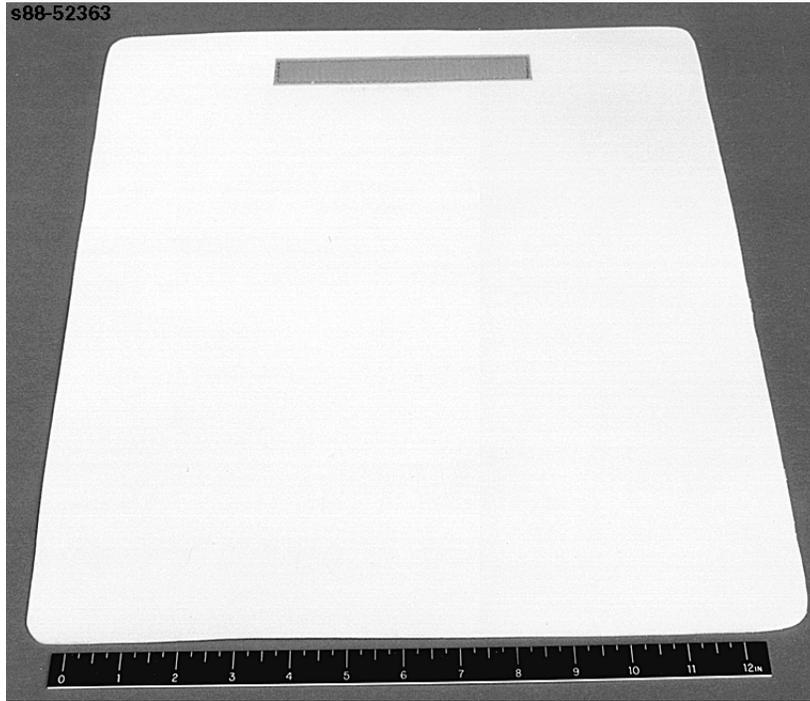
- Item 10 (backshell) is provided as part of ST20C1080-38 and 37 (connectors).

COMMENTS

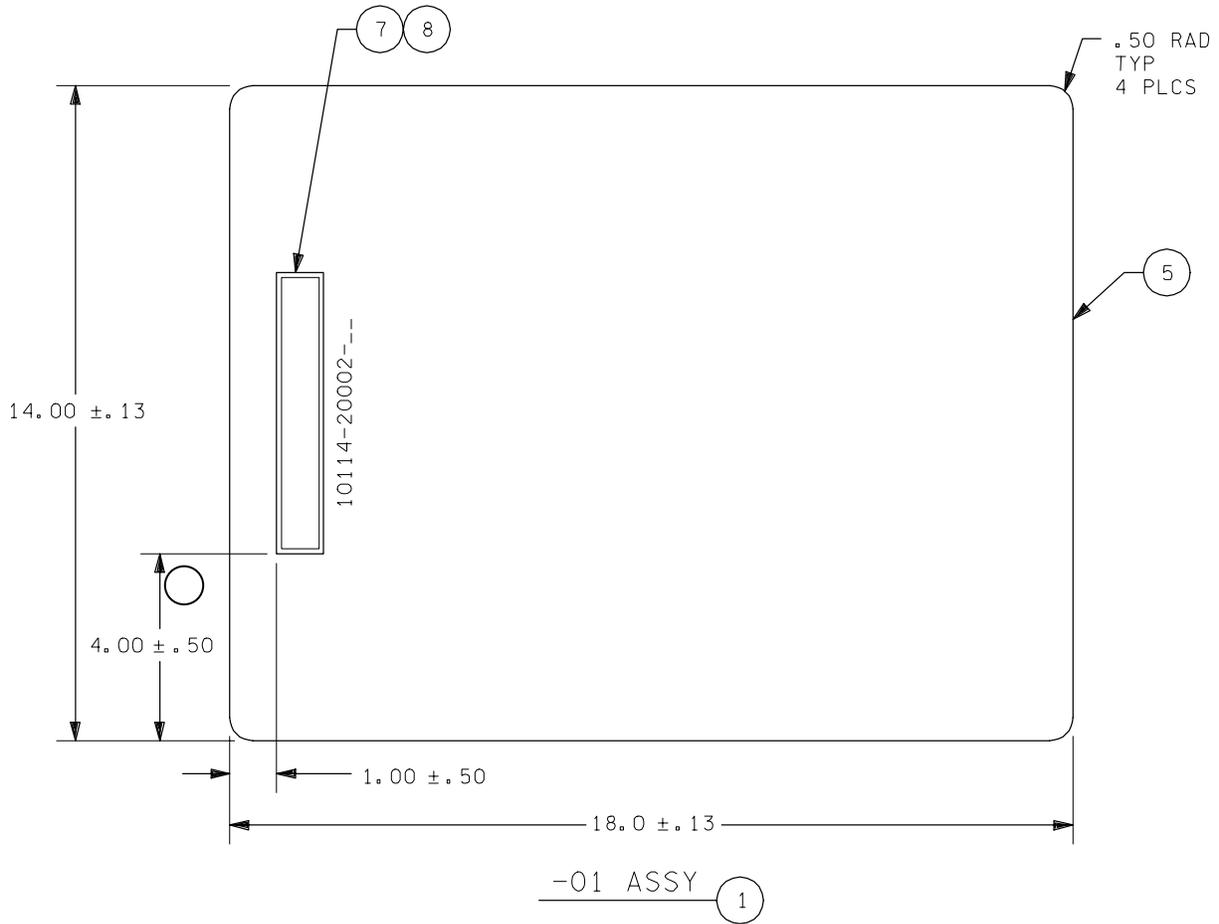
The dc harness pigtail connector is a 10-inch cable of three (16-gauge) wires connected between a male plug (P1) NB1E14-12 PNS with four 16-gauge and eight 20-gauge pins and a female receptacle (J1) NB1E14-12 SNS with four 16-gauge and eight 20-gauge sockets. Note that only three 16-gauge pins and three 16-gauge sockets are connected.

The pigtail connector can be used with the dc harness cable as an extension cord (see breakout box/cable configurations and the power cable summary in Appendix B).

COLDPLATE PROTECTIVE COVER (COOKIE SHEET)



Item 11 Technical Information	
Location	IFM contingency hose and cable kit
CCCD part number	10114-20002-01
CCCD drawing	SED32104259
Other drawings	10114-20002 (wireway protective cover (top)/one sheet)
Manufacturer	ILC
Weight	1.32 lb
Quantity flown	One

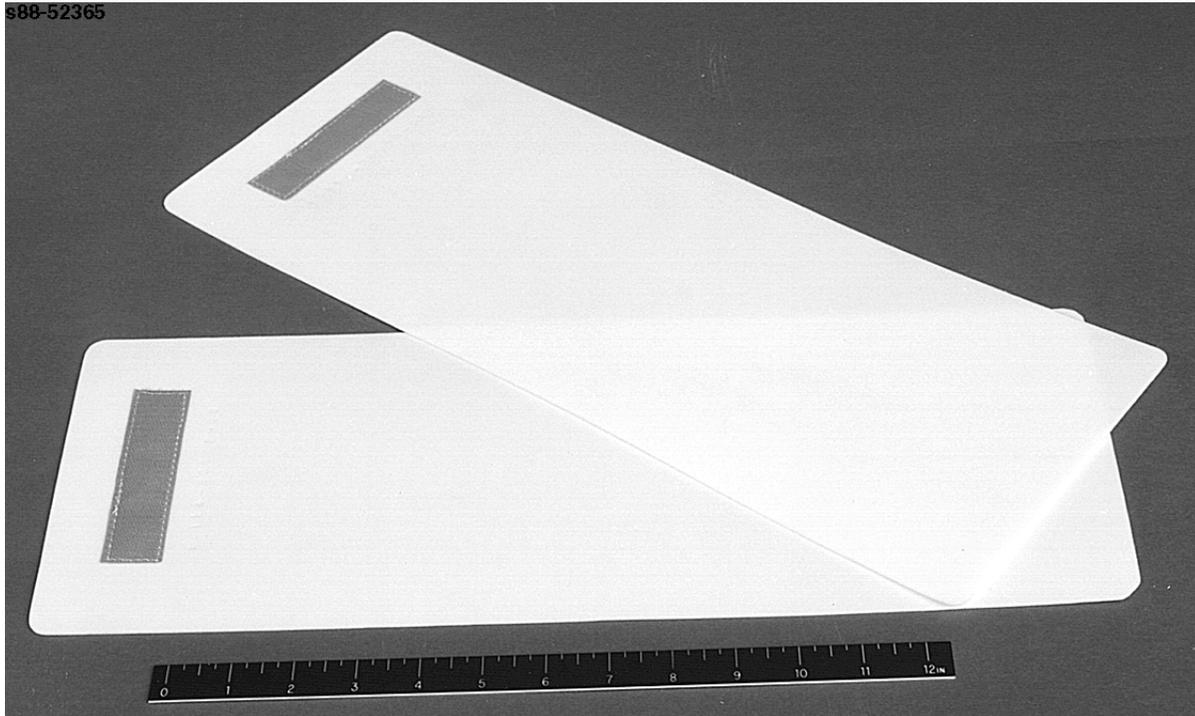


234460112. ART: 4

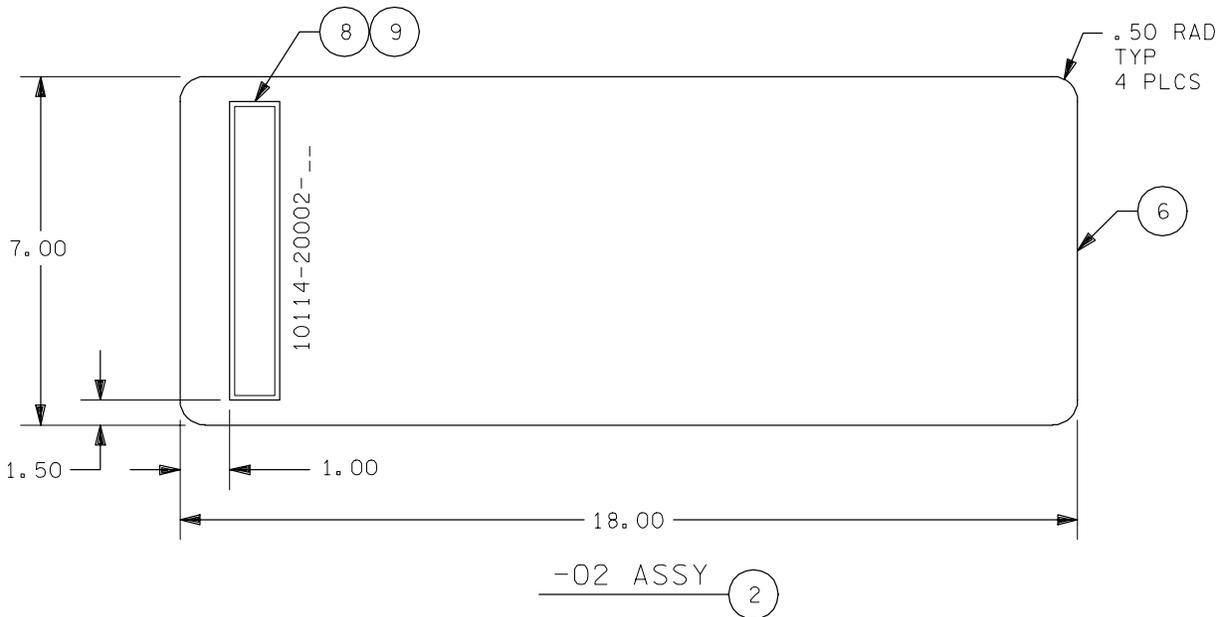
Coldplate protective cover (cookie sheet)

Qty per assembly	Item	Description	Part number/specification	Manufacturer part number	Manufacturer	Material
-01	(1)	Protective cover	10114-20002-01		ILC	
1	(5)	Teflon TFE (0.06 by 14.00 by 18.00)	ST92T837-04 (528-40837-4)			Teflon TFE 48 by 48 by 1/16-in. sheet, 0.75 lb/sq
1	(7)	Tape, hook (color: med. blue; 1.00 by 6.00)	ST13H819-01 (528-40819-01)	1000-065-130-0199	Velcro, USA, Inc.	Nylon
A/R	(8)	Multicord thread, size E (natural color)	ST15N814-02		Synthetic Thread Co.	Nomex, natural

COLDPLATE PROTECTIVE COVER (COOKIE SHEET)



Item 12 Technical Information	
Location	IFM contingency hose and cable kit
CCCD part number	10114-20002-02
CCCD drawing	SED32104259
Other drawings	10114-20002 (wireway protective cover (top)/one sheet)
Manufacturer	ILC
Weight	0.625 lb
Quantity flown	Two



234460113, ART; 4

Coldplate protective cover (cookie sheet)

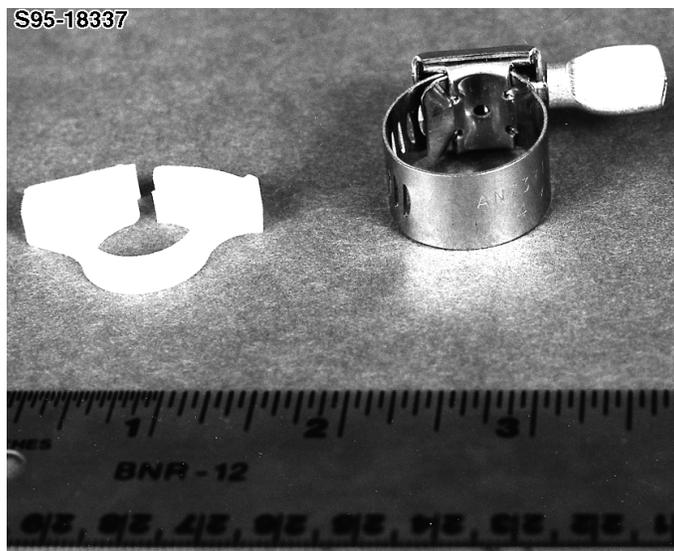
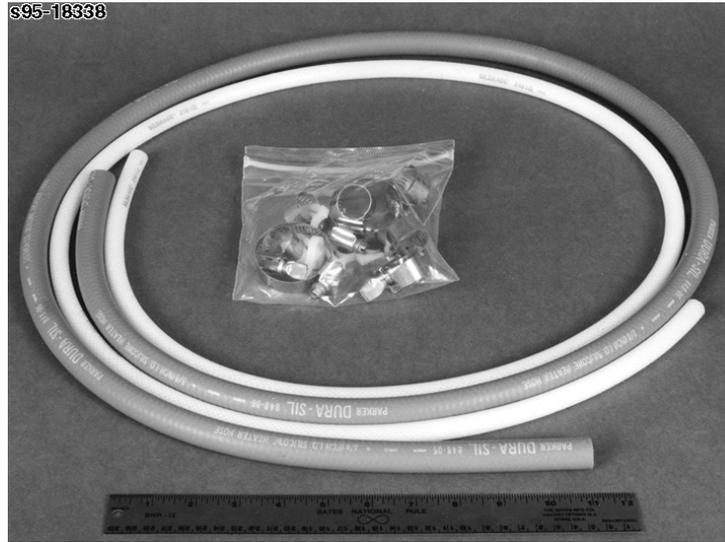
Qty per assembly	Item	Description	Part number/specification	Manufacturer part number	Manufacturer	Material
-02	(2)	Protective cover	10114-20002-02		ILC	
1	(6)	Teflon TFE (0.06 by 7.00 by 18.00)	528-40837-4 (ST92T837-04)		DuPont Co., Wilmington, DE	Teflon TFE 48 by 48 by 1/16-in. sheet, 0.75 lb/sq
A/R	(8)	Multicord thread, size E (natural color)	ST15N814-02		Synthetic Thread Co.	Nomex, natural
1	(9)	Tape, hook color: med. blue; 1.00 by 4.00	528-40819-1 (ST13H819-01)	1000-065-130-0199	Velcro USA, Inc.	Nylon

COMMENTS

The wireway protective covers are used to protect wireways or coldplates when removing or installing line replaceable units in AV bays.

The two small wireway protective covers are 7 inches wide, and the one large wireway protective cover is 14 inches wide (both are 18 inches long).

FLUID LINE REPAIR KIT



Item 13 Technical Information	
Location	IFM contingency hose and cable kit
CCCD part number	H2055 (hose clamps), AN737TW26 (hose clamps), SHC30 clamp, 848-6 (6-foot 3/8-in. ID hose), SILD30 (6-foot 1/4-in. ID hose)
CCCD drawing	SED32104259
Quantity flown	One

COMMENTS

The fluid line repair kit is flown in the contingency hose and cable kit. This hardware is used to address any potential in-cabin water leak within the waste H₂O or potable H₂O systems. The fluid line repair kit consists of the following hardware:

1. Green hose (Parker Corp Dura-Sil)
P/N 848-6 (3/8-in. ID)

ID, in.	OD, in.	Working PSI	Bust pressure, PSI	Temp, F
3/8	1/2	TBD	TBD	TBD

2. White hose (Silbrade)
New Age Corp., P/N SIL 030 (1/4 in. ID)
Braid reinforced silicone tubing

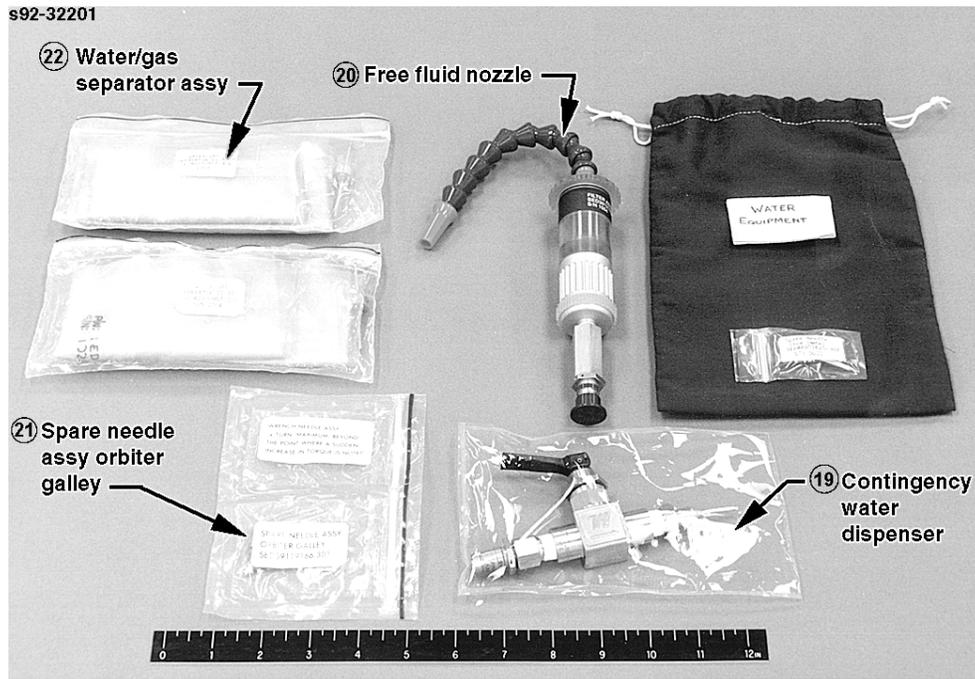
ID, in.	OD, in.	Working PSI	Bust pressure	Temp, F
1/4	0.560	TBD	TBD	TBD

3. Six large clamps
4. Six small clamps



Inside bag

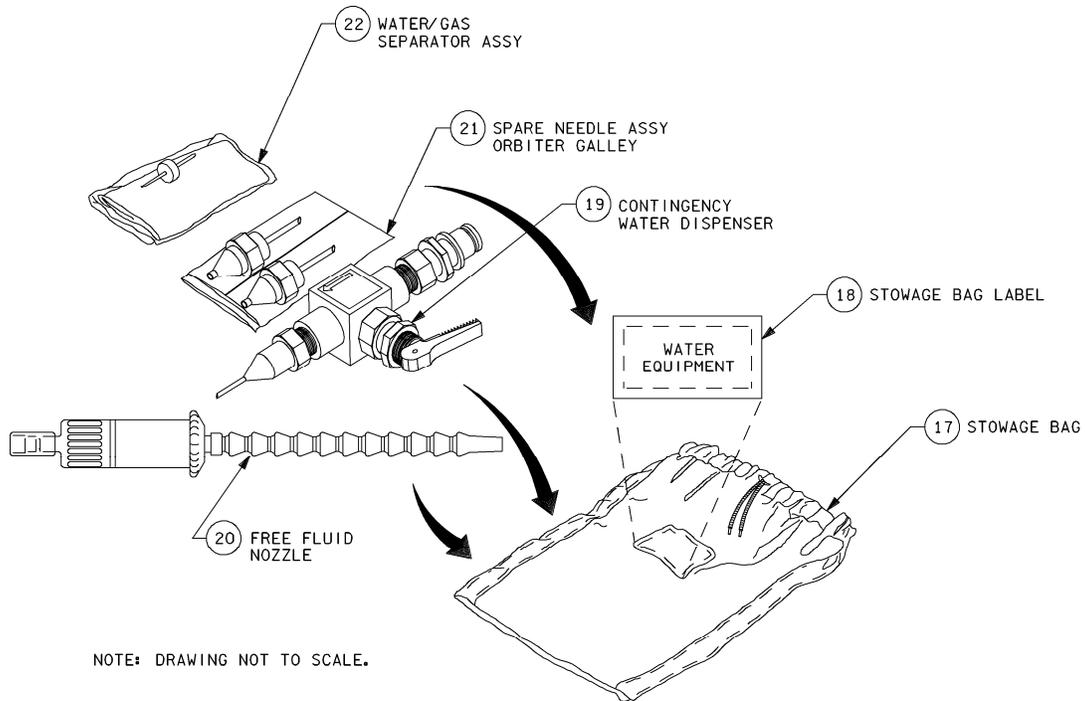
WATER EQUIPMENT ASSEMBLY



Item 14 Technical Information	
Location	IFM contingency hose and cable kit
CCCD drawing	SED32104259
Quantity flown	One



Outer flap



0033544. ART, 1

Water equipment assembly

COMMENTS

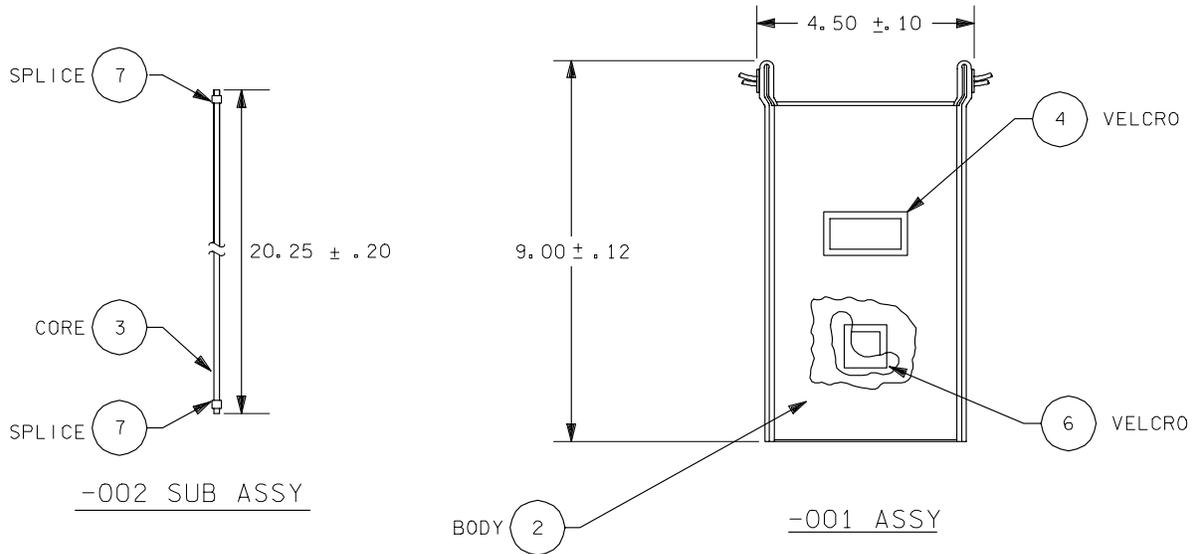
The water equipment assembly consists of a small blue stowage bag labeled “water equipment” and contains the following equipment:

1. Contingencyxx water dispenser
2. Free fluid nozzle
3. Spare needle assembly orbiter galley (two)
4. Water/gas separator assembly (two)

STOWAGE BAG (FOR THE WATER EQUIPMENT ASSEMBLY)



Item 15 Technical Information	
Location	IFM contingency hose and cable kit
CCCD part number	V634-661159-001/10105-10003-01
CCCD drawing	SED32104259
Other drawings	10105-10003 (stowage container, material assembly/ one sheet)
Manufacturer	Rockwell or ILC
Quantity flown	One



234460116.ORT; 4

Stowage bag for the water equipment assembly

Qty per assembly		Item	Description	Part number/ specification	Manufacturer part number	Manufacturer	Material
-001	-002						
		~	Stowage bag	V634-66159-001		Rockwell	
2		①	Subassembly	V634-66159-002			
1		②	Body (color: royal blue 0049 (DK))	V634-66159-003	7878	Noah Lamport, Los Angeles, CA	Nomex (9.00 by 24.00)
1		③	Cord (1/8 diam by 20.25; color: natural)	V634-66159-004		Bally Ribbon Mills, Bally, PA	Nomex
		④	Velcro (1.00 by 2.00)	V634-66159-005	V12-1(80)-100-0199	Hartwell Corp., Placentia, CA	Nylon hook
1		⑤	Label (1.60 by 3.20; color: royal blue)	V634-66159-006	7878	Noah Lamport, Los Angeles, CA	Nomex (1.60 by 3.20)
1		⑥	Velcro (1.00 by 1.00)	V634-66159-007	V12-1(80)-100-0199	Hartwell Corp., Placentia, CA	Nylon hook
	1	⑦	Splice	ME416-0030-0002			
2		⑧	Grommet	ME154-0002-1010			
A/R	A/R	⑨	Thread, type I, size E, natural	MIL-T-43636			Nomex

COMMENTS

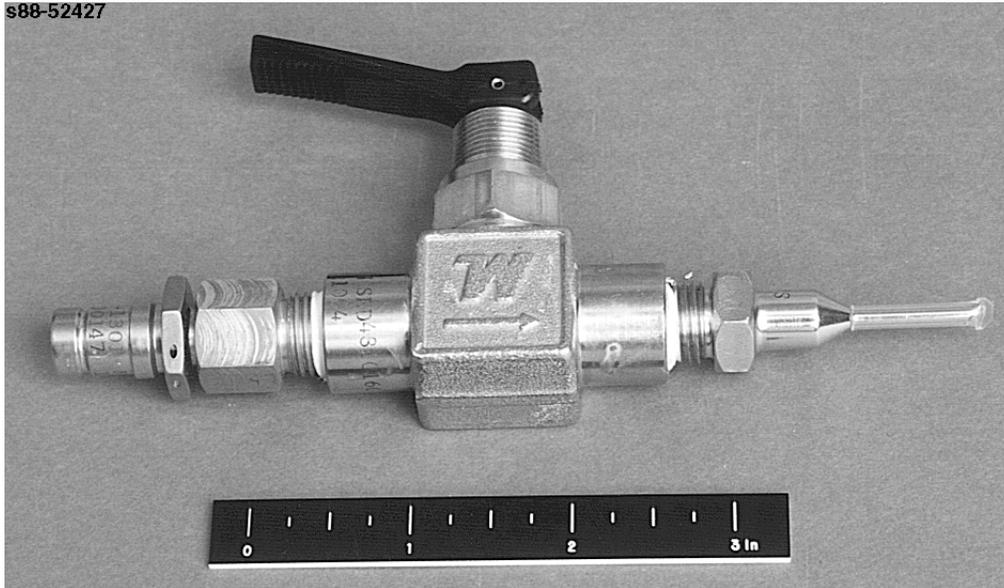
The small blue stowage bag is labeled “water equipment.” It contains the following equipment:

1. Free fluid nozzle (one)
2. Contingency water dispenser (one)
3. Spare needle assembly, orbiter galley (two)
4. Water/gas separator assembly (two)

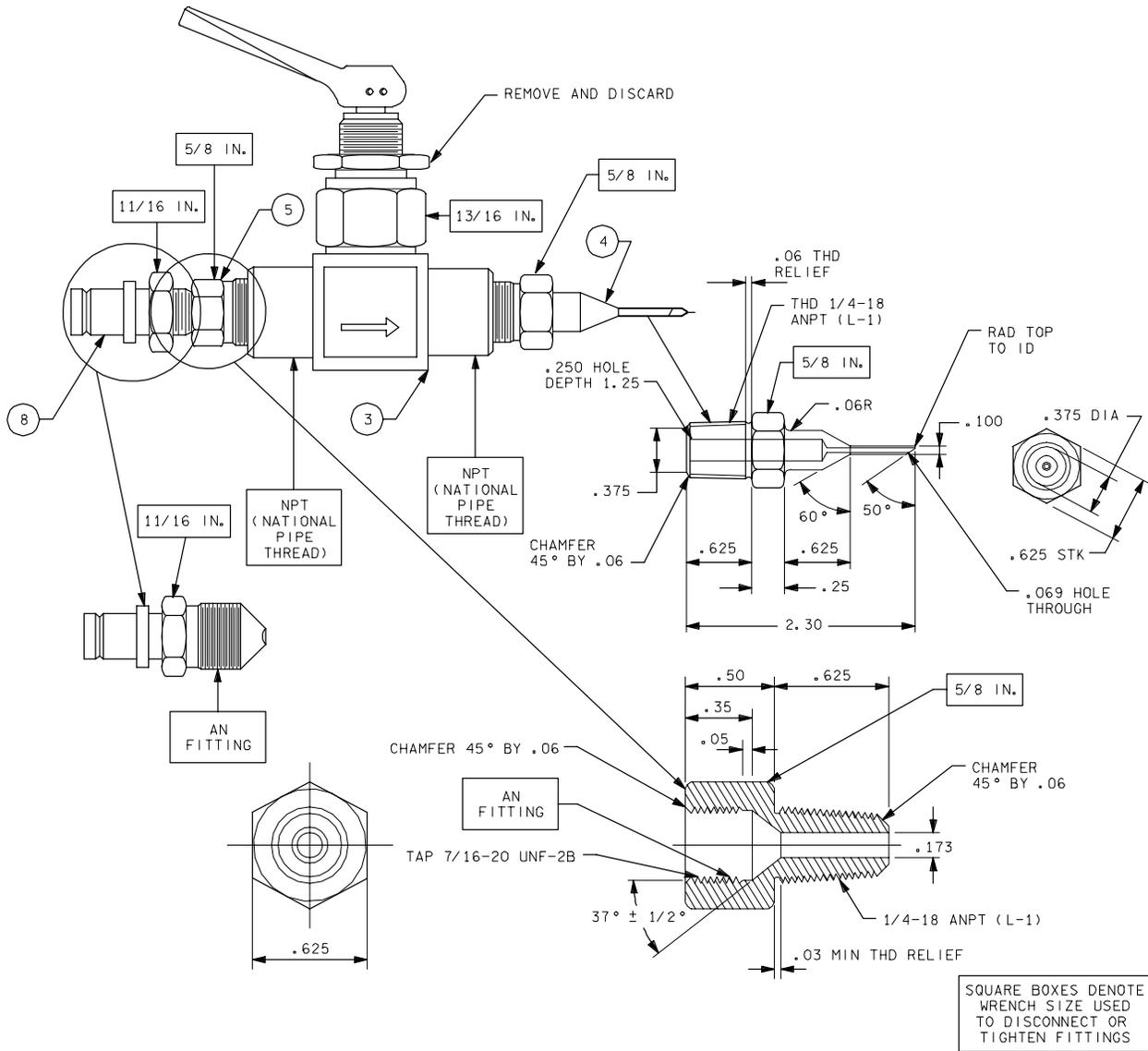
The same type of stowage bag is used for the following stowage bags in IFM tool locker drawer 1:

1. Screwdriver batteries, allen driver
2. HDRR tape leader repair kit
3. Treadmill fittings
4. Anti-static wrist tethers

CONTINGENCY WATER DISPENSER



Item 16 Technical Information	
Location	IFM contingency hose and cable kit
CCCD part number	SED48101607-304
CCCD drawing	SED32104259
Other drawings	SED48101607 (contingency water dispenser/one sheet)
Manufacturer	Boeing (responsibility transferred from NASA)
Weight	0.540 lb
Quantity flown	One



234460119. ART, 5

Contingency water dispenser

Qty per assembly	Item	Description	Part number/ specification	Manufacturer part number	Manufacturer	Material
-301	①	Contingency water dispenser	SDD48101607-301		Boeing (responsibility transferred to)/NASA (original)	
1	③	Valve, toggle		SS1GF4	Whitey Co., Oakland, CA	Stainless steel
1	④	Needle adapter	SED48101606-001	MIL-S-5059		3000 ser., CRES
1	⑤	Adapter	SDD48101608-001	AMS-5640		Type 303 CRES 11/16 hex stock
A/R	⑥	Tape, Teflon (0.25 wide)	FSN8030- 00384916		Federal stock	Teflon
A/R	⑦	Krytox lubricant	ST53F382	240 ac	DuPont Co., Wilmington, DE	Lubricant
1	⑧	Coupling half (1/4-in. male QD with a male "AN" fitting)	MC276-0020-1301	502040-1301	Symetrics, Inc., Newbury Pk, CA	
1	⑨	Tubing, PVC (1.5 in. long)	SED48101607-501		Cormed, Inc., Middleport, NY	Plastic (PVC)

DRAWING NOTES

Unless otherwise specified,

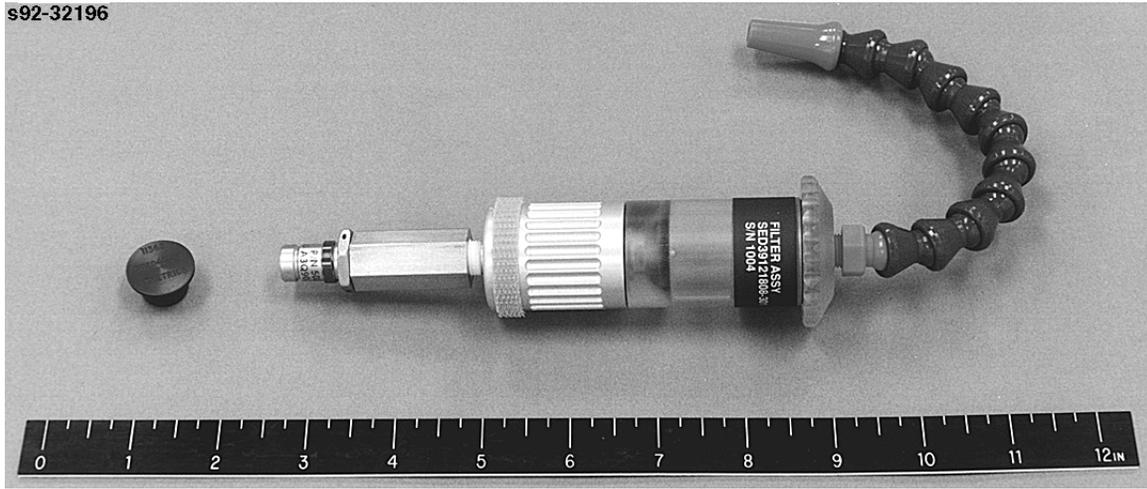
1. Leak test system using clean water at 36 ± 2 psig. Repair all visible leaks and retest.
2. Use Teflon tape on all pipe threads.

COMMENTS

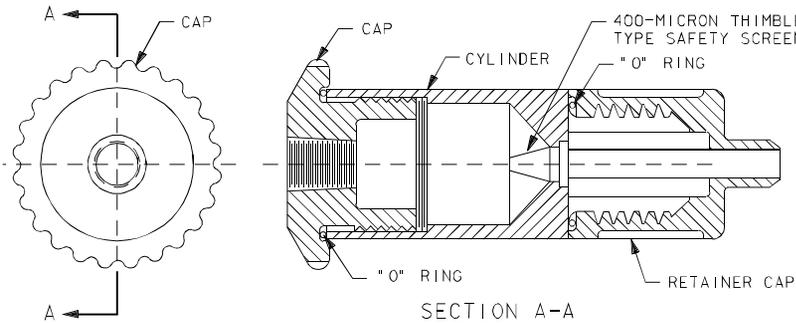
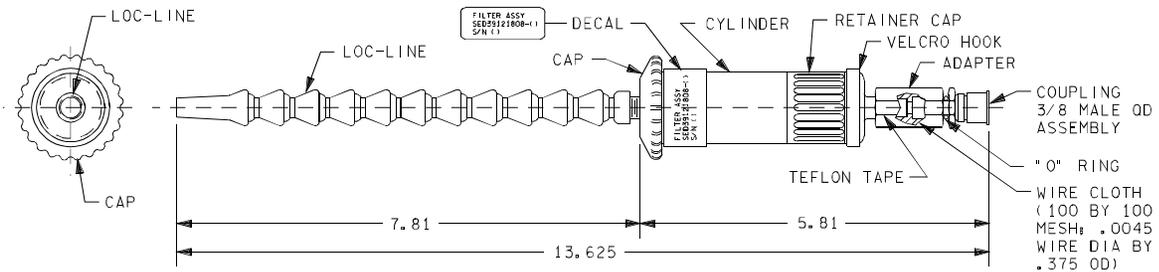
The contingency water dispenser has a -1301 (male) QD, which can be connected to the red/red contingency hose (see item 6) and galley AUX port to rehydrate food or dispense water (if the galley is not working properly).

The contingency water dispenser can also be connected to the yellow/red QD adapter (see item 7).

FREE FLUID NOZZLE



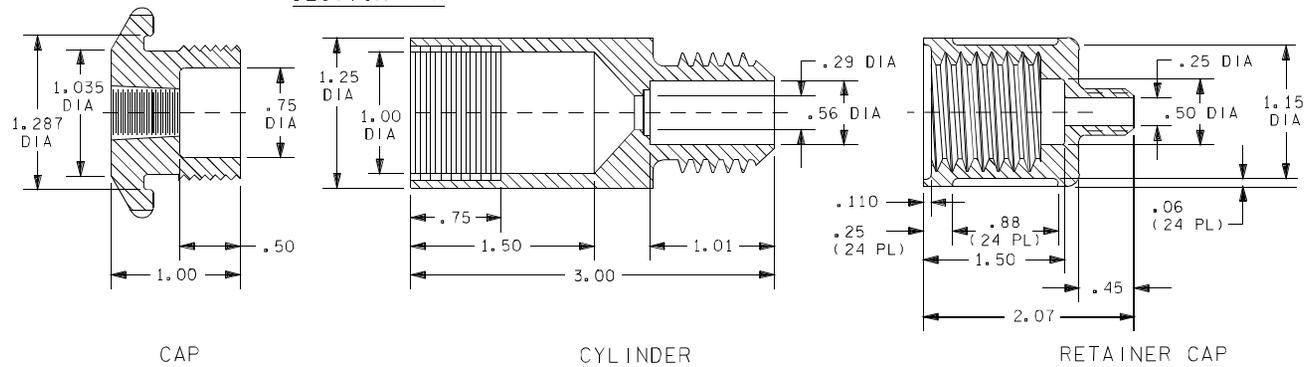
Item 17 Technical Information	
Location	IFM contingency hose and cable kit
CCCD part number	SED39121808-301
CCCD drawing	SED32104259
Other drawings	SED39121808 (filter assembly, wand extender, flexible/ four sheets)
Manufacturer	NASA JSC Technical Services
Weight	185.36 grams
Quantity flown	One



COMPARISON OF FILTER SIZES

FILTER	400 μN THIMBLE TYPE FILTER SCREEN (ATTACHED TO CYLINDER)	WIRE CLOTH (100 BY 100 MESH, .0045 WIRE DIA, INSIDE OF ADAPTER)
PORE SIZE DIAMETER	4 BY 10 ⁻⁴ METERS (.016 INCHES)	1.4 BY 10 ⁻⁴ METERS (.0055 INCHES)

THE 400 μN FILTER PORE SIZE DIAMETER IS ALMOST THREE TIMES LARGER THAN THE 100 BY 100 MESH FILTER



NOTE: ALL DIMENSIONS ARE IN INCHES.

23446120B, ART# 6

6120b-art6.cv5

Free fluid nozzle

Qty per assembly -01	Item	Description	Part number/ specification	Manufacturer part number	Manufacturer	Material
	①	Vacuum attach, assembly	10108-20039-01		Boeing (responsibility transferred to)/ ILC (original)	
1	②	Handle	10108-20040-01		ILC	17-4PH H-1050 or H-1075 stainless steel
1	③	End cap	10108-20041-01		ILC	17-4PH H-1050 or H-1075 stainless steel
1	④	Wire cloth (filter)	10108-20042-01	ST20W1008-01	ILC	Stainless steel
1	⑤	Coupling half (3/8-in. male QD with a male "AN" fitting)	10108-20046-1 (MC276-0020-1301)	502040-1301	ILC/Symetrics, Inc., Newbury Pk, CA	

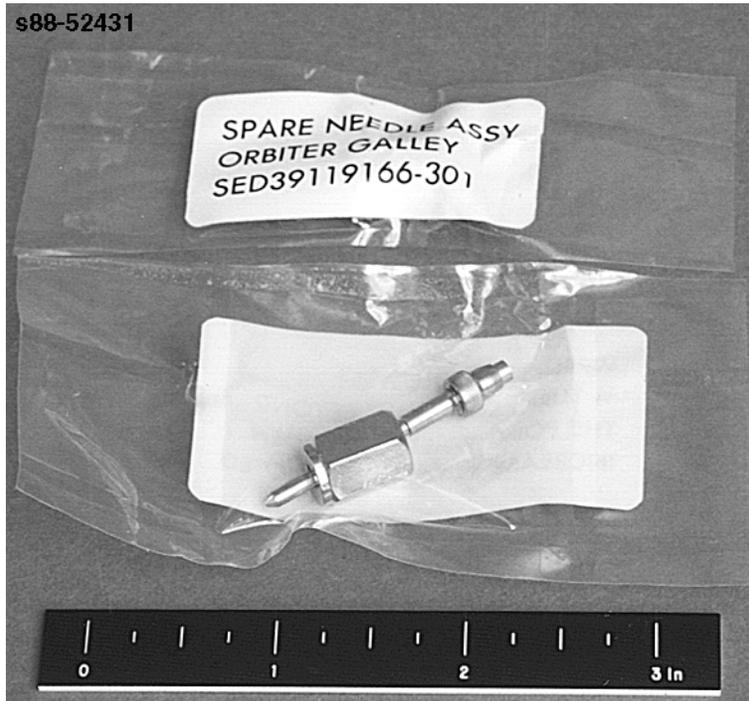
COMMENTS

The free fluid nozzle has a 3/8-inch male QD, which mates with the yel/yel contingency hose (see item 4) or the CWC contingency hose assembly (see item 5).

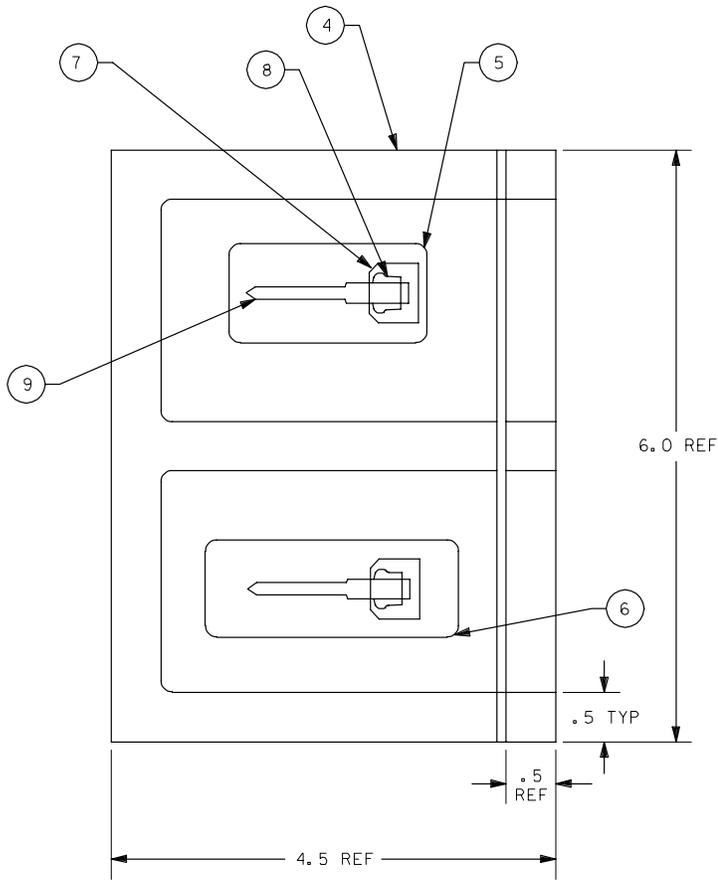
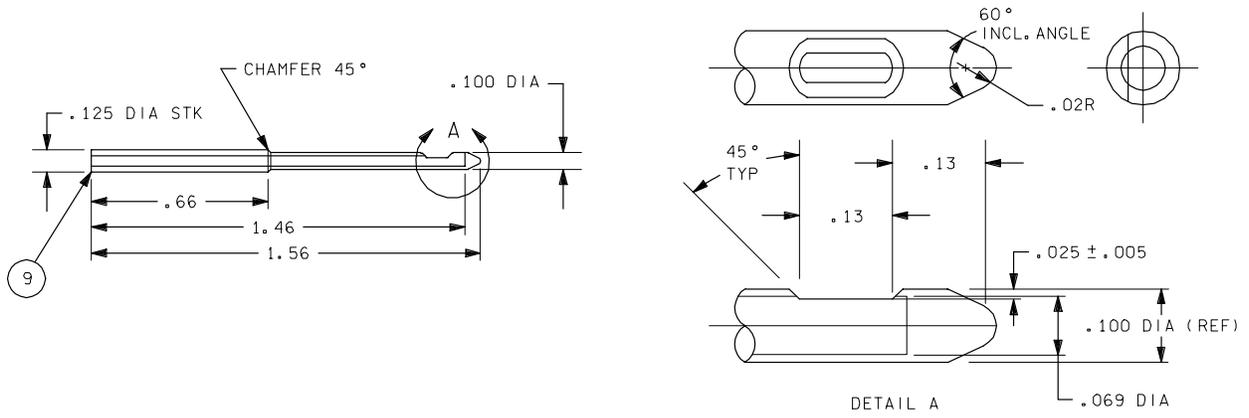
The free fluid nozzle can be used to clean up water in the crew module. (See the IFM Checklist procedure for "Free Fluid Disposal.")

"Change Filter Wand Quick Disconnect" (from 1/4 inch to 3/8 inch CQ# G04561); presented on 5/8/96.

SPARE NEEDLE ASSEMBLY (ORBITER GALLEY)



Item 18 Technical Information	
Location	IFM contingency hose and cable kit
CCCD part number	SED39119166-302
CCCD drawing	SED32104259
Other drawings	SED39119166 (spare needle packaging assembly, orbiter galley rehydration station)
Manufacturer	NASA
Weight	0.010 lb
Quantity flown	Two



234460122, ART: 4

Spare needle assembly orbiter galley

Qty per assembly	Item	Description	Part number/ specification	Manufacturer part number	Manufacturer	Material
-301	~	Spare needle assembly (galley)	SED39119166-301		NASA	
1	(4)	Bag enclosure (Ziploc, 6 in. by 6 in.)	FSN 8105-00-837-7754		Federal stock	Polyethylene
1	(5)	Label	SDD48101645-014			
1	(6)	Label	SDD48101645-010			
2	(7)	Nut, 5/16 - 24UNF	MS51823-1SS (MIL-F-18866)			Stainless steel
2	(8)	Sleeve, 1/8 OD	MS51825-1SS (MIL-F-18866)			Stainless steel
2	(9)	Needle	SDD39119165-001 (AMS5659)		Molectrics, Inc., Carson City, CA	15-5 PH, Cond A 0.125D/A by 1.56L

DRAWING NOTE

Unless otherwise specified,

1. This assembly shall remain stowed in the in-flight maintenance locker assembly, unless installation is required.

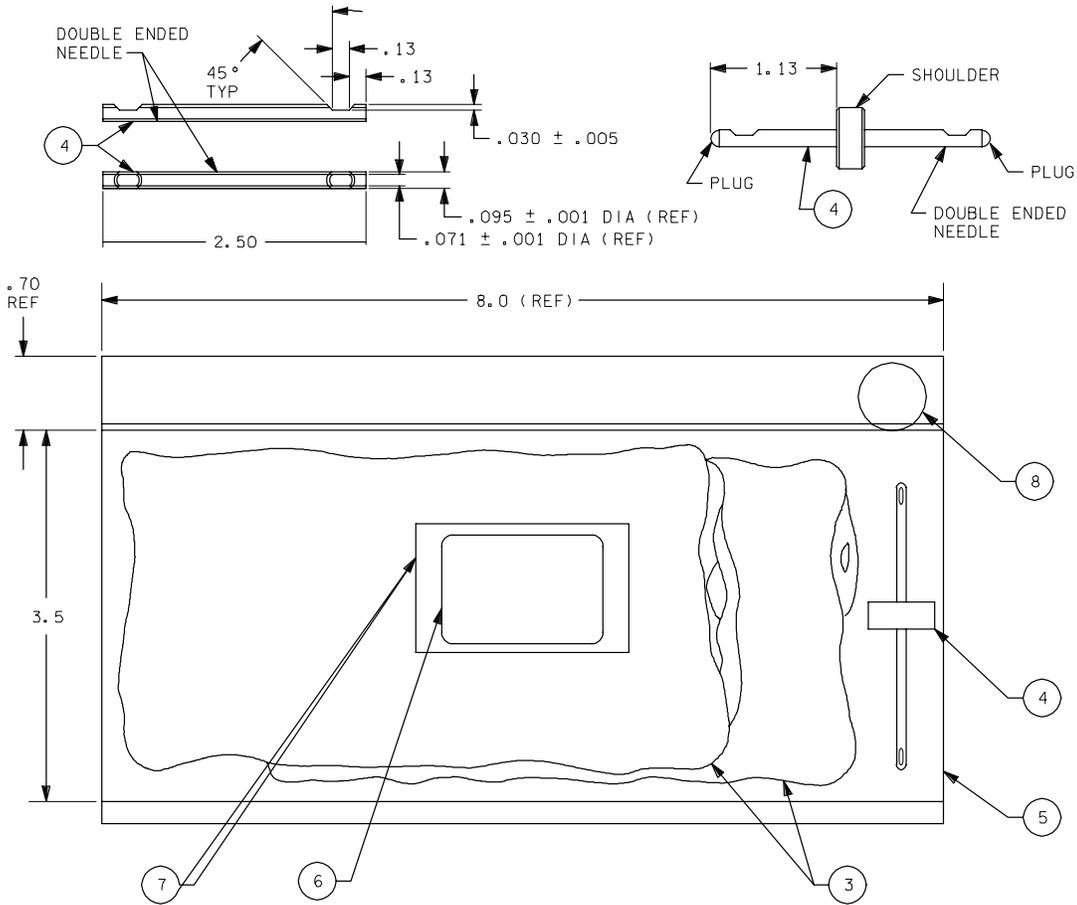
COMMENTS

A 3/8-inch deepwell socket (which has a bolt clearance of 1-21/32 inch) is used to replace the orbiter galley needle. A 3/8-inch combination wrench does not have enough clearance to be used.

WATER/GAS SEPARATOR ASSEMBLY



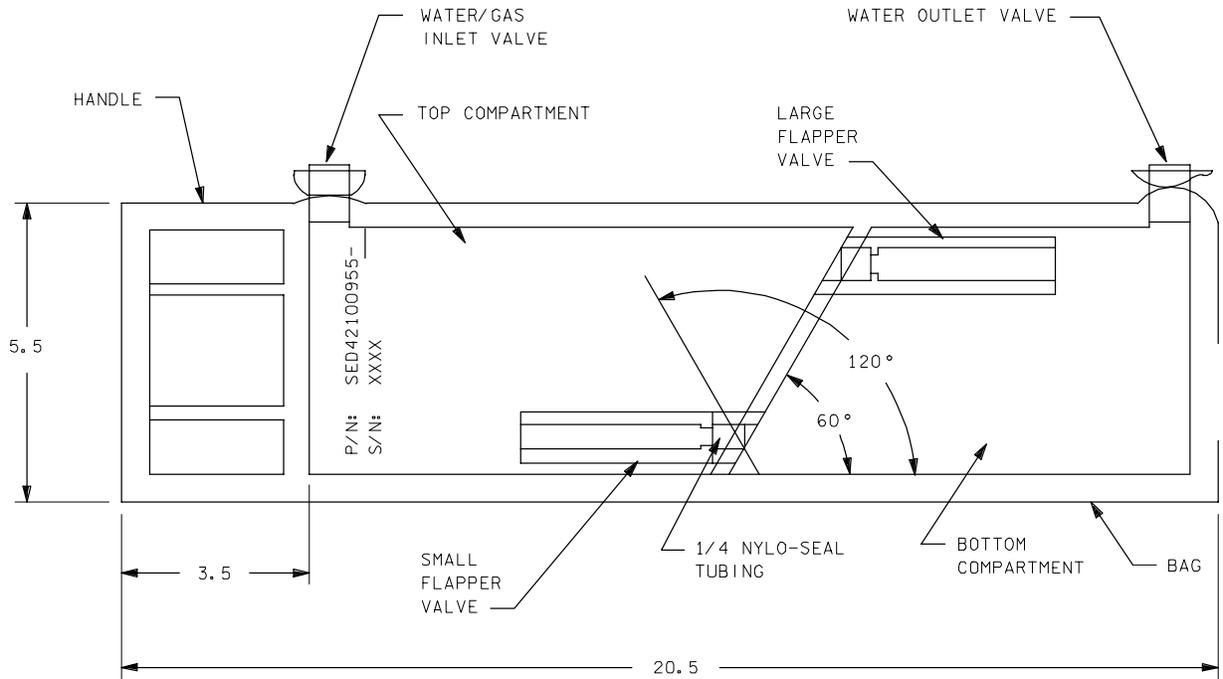
Item 19 Technical Information	
Location	IFM contingency hose and cable kit
CCCD part number	SED42100957-301
CCCD drawing	SED32104259
Other drawings	SED42100957 (assembly, water/gas separator II/ one sheet)
Manufacturer	NASA
Weight	0.170 lb
Material	See drawing SED42100957
Quantity flown	Two



234460123.ORT; 3

Water/gas separator assembly

Qty per assembly	Item	Description	Part number/specification	Manufacturer part number	Manufacturer	Material
-301	~	Water/gas separator assembly	SED42100957-301		NASA	
2	(3)	Bag assembly	SDD42100955-302			
1	(4)	Transfer probe	SED42100960-301 (AMS56390)			304 CRES
1	(5)	Ziploc bag (8.0 by 8.0)	8105-008377755		Federal stock	Polyethylene
1	(6)	Label (1.5 by 1.0)		S-1624	Avery	Paper
1	(7)	Rx label tape		800	Scotch	Paper
1	(8)	Velcro circular Velcro (white hook)	062-065-012-0100EK		Velcro USA, NY, NY	Nylon



234460140, ART. 2

Water/gas separator assembly

DRAWING NOTES

1. Use ribbon or cartridge tape to type the following information on label (item ±)

WATER/GAS SEPARATOR II ASSY
P/N: SED42100957-301
S/N: XXXX

2. S/N to be assigned by engineering drawing control center.
3. This item is nonfracture critical.

COMMENTS

The water/gas separator is used if excessive gas is present in the water dispensed from the galley. Separate the gas and water by performing the following steps:

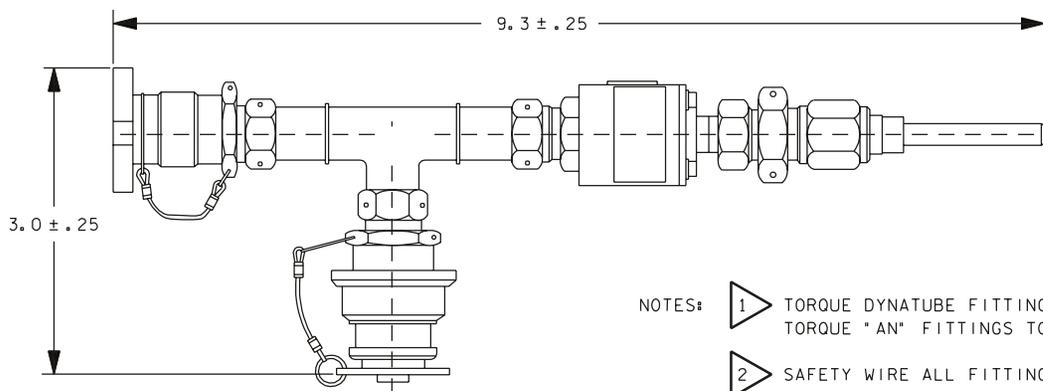
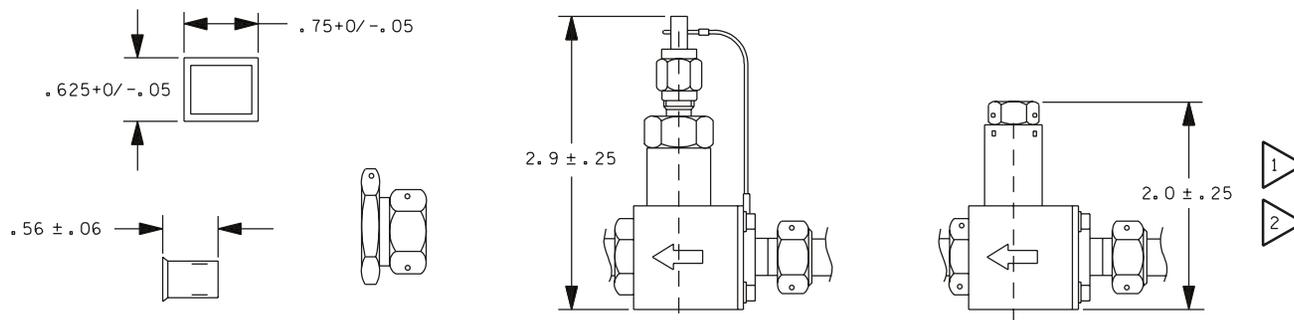
1. Insert the galley water dispenser needle into the inlet water valve.
2. Dispense the water (with the excessive gas) through the inlet water valve into the top compartment of the gas/water separator bag.
3. Separate the gas from the water by grabbing the handle and slinging the bag in a circular motion until separation is complete (by centrifugal force, the denser water is forced out of the top compartment into the bottom compartment through the flapper valves; the gas remains in the top compartment).
4. Insert the transfer probe into the water outlet valve to dispense the water into a rehydratable food or beverage container.
5. Insert the transfer probe into the water/gas inlet valve to vent the gas from the top compartment.

SUPPLY WATER DUMP LINE PURGE ASSEMBLY

Item 20 Technical Information	
Location	IFM contingency hose and cable kit (CHCK), outer flap
CCCD part number	SED11100288
CCCD drawing	SED32104259
Other drawings	
Manufacturer	Boeing
Weight	
Material	
Quantity flown	One



Purge device



- NOTES:
- 1 TORQUE DYNATUBE FITTINGS TO 180-300 IN. LBS
TORQUE "AN" FITTINGS TO 135-150 IN. LBS
 - 2 SAFETY WIRE ALL FITTINGS

0033567. ART. 1

Supply water dump line purge assembly

COMMENTS

The purge device was developed by Engineering to alleviate a problem that has been observed on several shuttle missions; namely, the continued expulsion (or burping) of supply water through the dump valve after termination of a supply water dump. Although the hardware is mostly identical from orbiter to orbiter, the phenomenon was only observed after supply water dumps on OV-103 and OV-104, and never following a wastewater dump. OV-105 has never “burped” after completion of a water dump (supply or waste) and therefore, never has required the use of the dump line purge device.

The most obvious need for the dump line purge device is to avoid potential payload contamination from water getting through the closed dump valve. However, the theory for the mechanism of the burping dump valve involves residual water trapped in the 2-foot section of dump line (between the dump valve and the overboard dump nozzle) freezing, expanding, and forcing the dump valve open long enough to allow a small amount of warm dump line water to flow past it. The warm water thaws the ice and the valve closes. The thing to remember is that this is only a momentary opening of the dump valve, and there is no way to predict how many times this may occur following a supply water dump. To our knowledge, it was never determined why only two of the vehicles exhibited this behavior. The purge device is also used to minimize potential damage to the dump valve itself from the repeated freeze/thaw cycles following a dump.

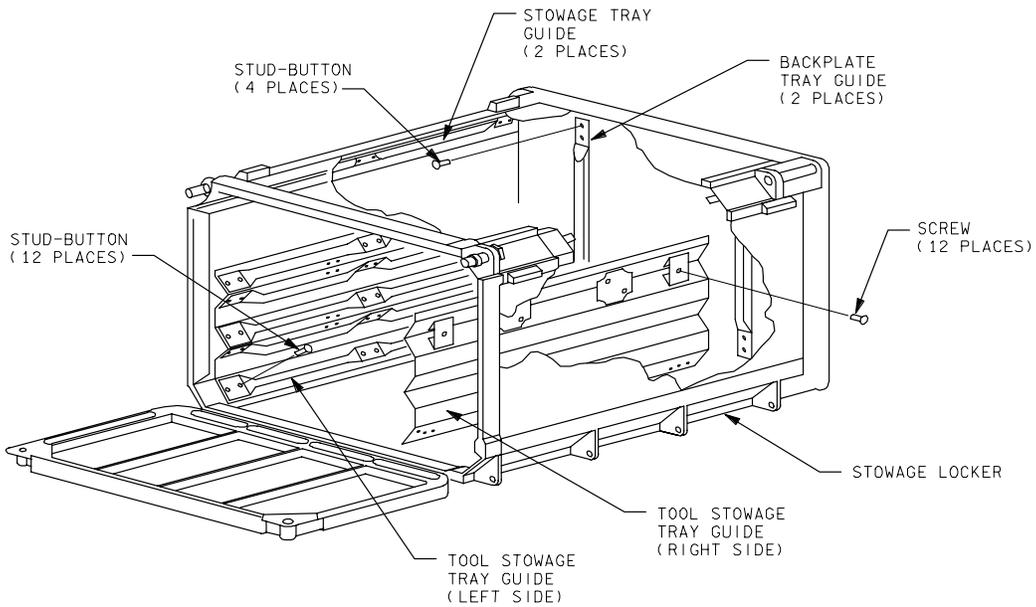
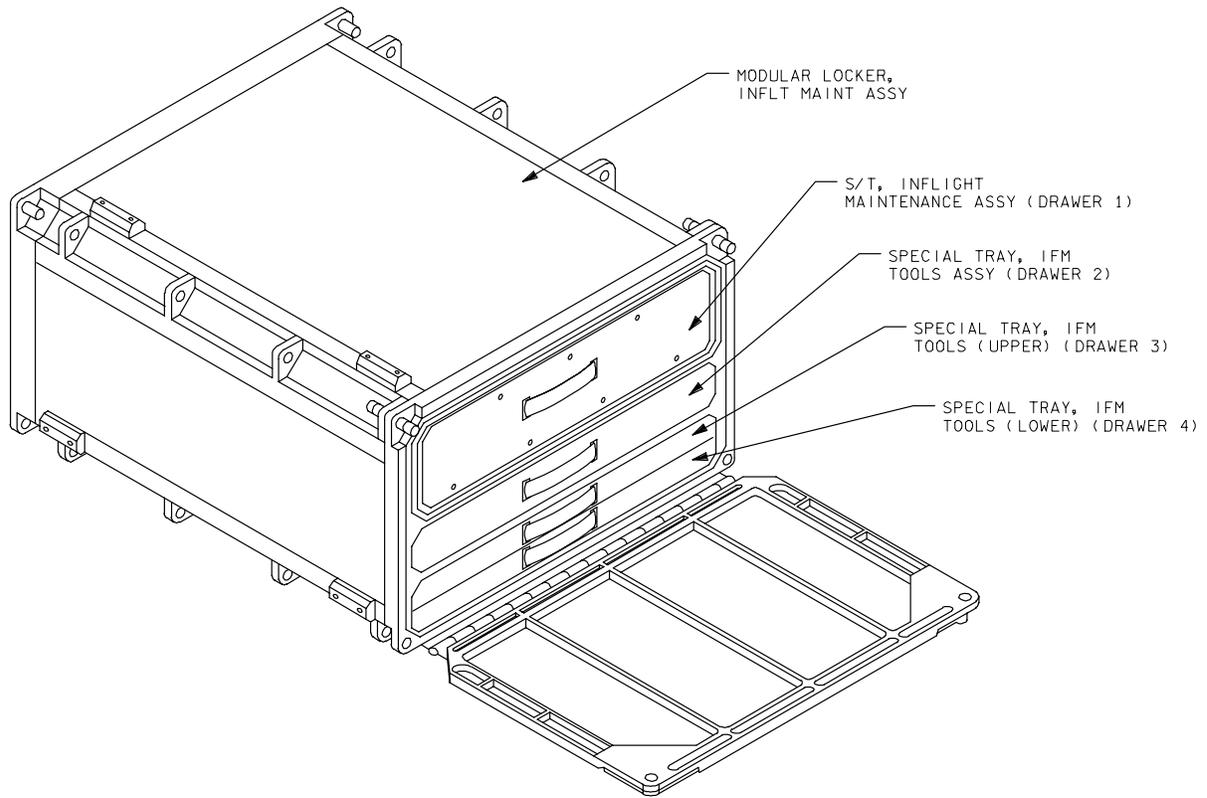
The procedure for using the purge device is found in the Orbit Ops Checklist. In a nutshell, the purge device is installed into the Cont H2O X-Tie Pot QD at the beginning of the Supply Water Dump Procedure. The device really does not come into play until step 4, Supply H2O Dump Termination, when you close the Sply H2O Dump Vlv close/open/close. With the device in place, these actions will allow cabin air to purge the dump line of all residual water, and avoid the problems encountered from water left in the line. Once the Sply H2O Dump Isol Vlv is reopened, and the Sply H2O Dump Vlv Ena/Noz Htrs are off, the purge device can be removed from the Cont H2O X-Tie Pot QD.

The purge device is nothing more than a “T” fitting with one end (the one with the gold collar) that fits into the Cont H2O X-Tie Pot QD, a capped QD that can be used if a line needs to be attached here for the entire mission (i.e., UMS), and a mesh screen tube that allows cabin air to be routed overboard for the purge. In addition, a check valve is located inline, upstream of the mesh screen tube to avoid backflow of fluid from the Cont H2O X-Tie Pot QD into the cabin.

IFM TOOL LOCKER DRAWER 1

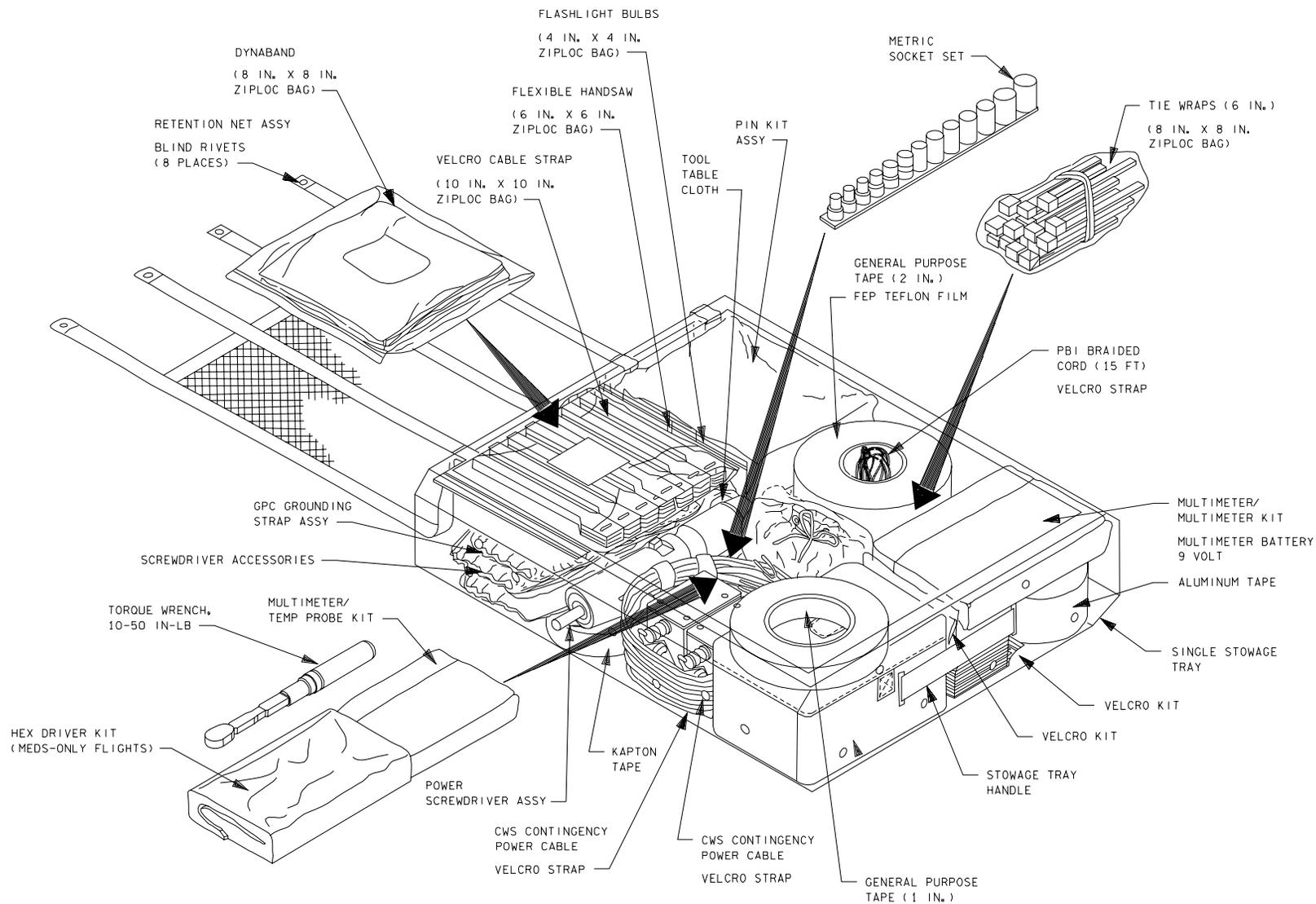
Item		Page
TRAY		
21	1/4-INCH TORQUE WRENCH (10 – 50 IN/LB)	2-3
22	IFM TOOL LOCKER DRAWER 1 SINGLE STOWAGE TRAY	2-5
23	RETENTION NET	2-8
MULTIMETER KIT/TEMPERATURE PROBE – PRESSURE MODULE KIT		
24	MULTIMETER KIT/TEMPERATURE PROBE - pressure module KIT	2-10
25	TEFLON THREAD SEAL TAPE.....	2-24
26	MULTIMETER BATTERY, 9-VOLT.....	2-25
PIN KIT		
27	IFM PIN KIT	2-27
28	CRIMP TOOL	2-47
29	SPLICE CRIMP TOOL.....	2-50
30	WIRE STRIPPER.....	2-52
VELCRO STRAP KIT		
31	VELCRO CABLE STRAP KIT	2-54
32	VELCRO CABLE STRAP	2-55
33	ALUMINUM TAPE	2-57
34	GENERAL PURPOSE TAPE (1-INCH).....	2-59
35	GENERAL PURPOSE TAPE (2-INCH).....	2-61
36	KAPTON TAPE (1-INCH)	2-63
TOOL TABLECLOTH/VELCRO KIT		
37	TOOL TABLECLOTH (TOOL CADDY).....	2-64
38	VELCRO KIT (1-INCH by 1-INCH).....	2-68
39	VELCRO KIT (2-INCH by 2-INCH).....	2-70
CWS CONTINGENCY CABLES		
40	CWS CONTINGENCY POWER CABLES	2-71

Item		Page
MISCELLANEOUS		
41	POWER SCREWDRIVER ASSEMBLY	2-76
42	HEX DRIVER KIT (1/4-INCH DRIVE)	2-78
43	ANTI-STATIC WRIST TETHERS/RCRS CROWFOOT	2-80
44	TIE WRAPS (6-INCH).....	2-82
45	PBI BRAIDED CORD (15 FEET)	2-84
46	MINIMAG SPARE bulb KIT.....	2-85
47	DYNABAND	2-86
48	BONE SAW (FLEXIBLE HANDSAW)	2-87
49	METRIC SOCKET SET (1/4-INCH DRIVE)	2-88



234460201, ART 3

IFM tool drawer 1



0033550.150:2

**Modular locker
(based on CCD SED32103900)**

21 1/4-INCH TORQUE WRENCH (10 – 50 IN/LB)



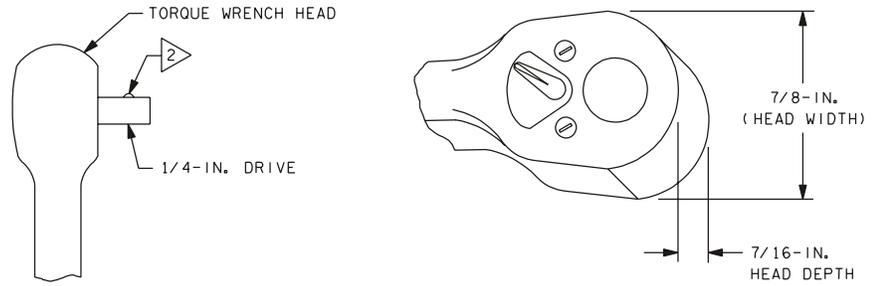
IFM tool locker drawer 1

Item 21 Technical Information	
Location	IFM tool locker drawer 1
CCCD part number	528-20145-32
CCCD drawing	SED32106300
Manufacturer	Snap-On/Boeing
Snap-On Part Number	QD1R50
Weight	
Material	Nickel/chrome-plated, high-quality steel with an aluminum, knurled handle covering
Quantity flown	One

COMMENTS

The quarter-inch torque wrench is not to be used as a standard ratchet wrench. The head clicks to indicate when the proper torque is attained.

If used in conjunction with the torque adapter, the proper torque is not correctly indicated by the setting on the handle.

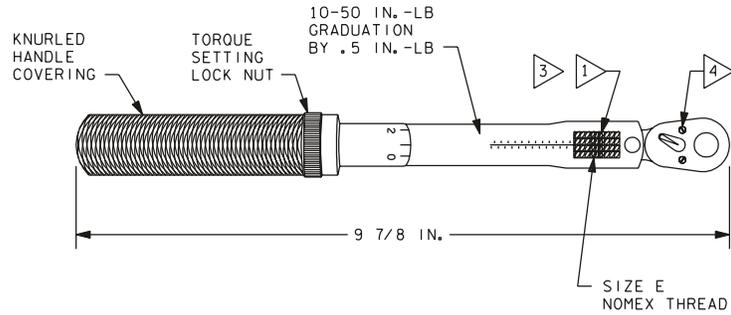


4 REMOVE TWO RETAINING SCREWS ON HEAD OF TORQUE WRENCH, DISASSEMBLE AND CLEAN INTERNAL PARTS PER BOEING DOCUMENT NO. 10107-70009, PARA 5.4.2.1. LUBRICATE WITH APPROVED BATCH/LOT CONTROLLED BRAYCOTE 3L-38 RP OR 601, AVAILABLE FROM BRAY PRODUCTS DIV., BURMAH-CASTROL, INC., IRVINE, CA., 92714. AVOID CONTAMINATION FROM EXCESSIVE LUBRICANT OR OTHER FOREIGN MATTER, REASSEMBLE, AND APPLY LOCKTITE GRADE "A" TO END OF SCREW AND FASTEN IN PLACE (MANUFACTURED BY LOCKTITE CORP, NEWINGTON, CT, 06111) TORQUE TO $2.3 \pm .3$ IN-LB.

3 ATTACHMENT TAB SHALL BE INSTALLED IN AN AREA SO AS NOT TO IMPEDE THE FUNCTIONAL OPERATION OF THE TOOL OR NOT TO COVER THE PART NUMBER (IF POSSIBLE).

2 SPRING-LOADED FRICTION BALL LOCKING MECHANISM. THIS SPRING-LOADED BALL SECURES THE SOCKET TO THE TORQUE WRENCH BY PUSHING AGAINST THE INTERNAL WALL OF THE SQUARE END OF THE SOCKET. SOME SOCKETS HAVE A SMALL HOLE (IN ONE WALL), OR MACHINED RECESSES (IN ALL FOUR WALLS).

1 HOOK TAPE ON A NYLON RIBBON ($3/8$ BY $3/4$ -INCH, APPLIED WITH TWO-PART NEOPRENE ADHESIVE).

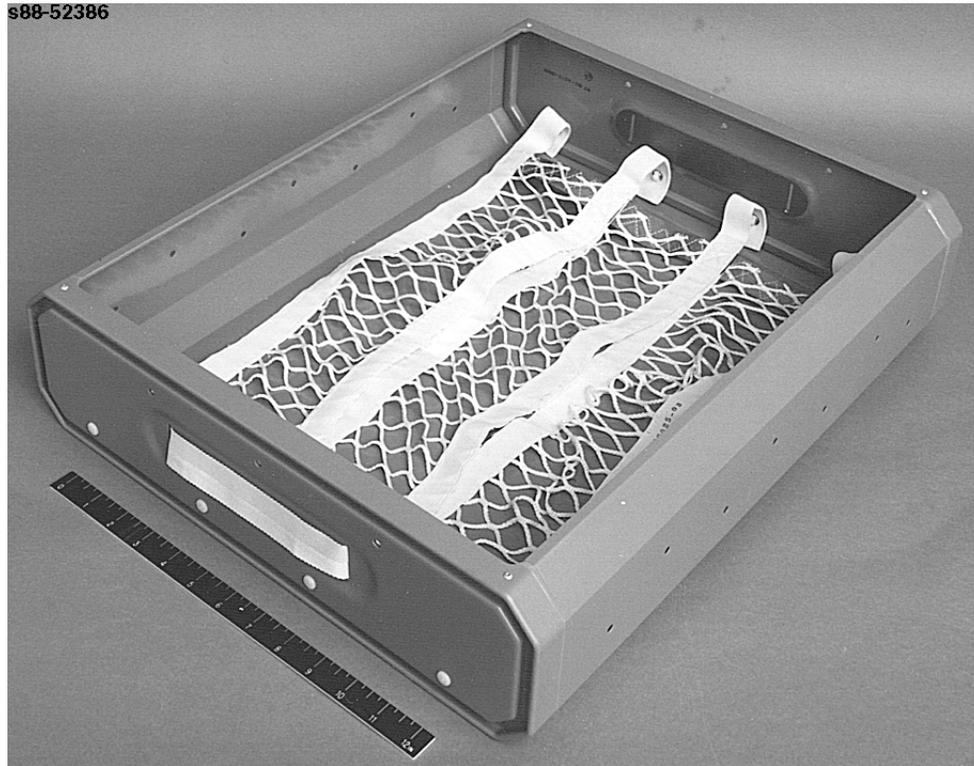


SQUARE DRIVE	HEAD STYLE	RANGE		
		MINIMUM	MAXIMUM	INCREMENTS
1/4-IN.	FIXED-RATCHET	10 IN.-LB	50 IN.-LB	.5 IN.-LB

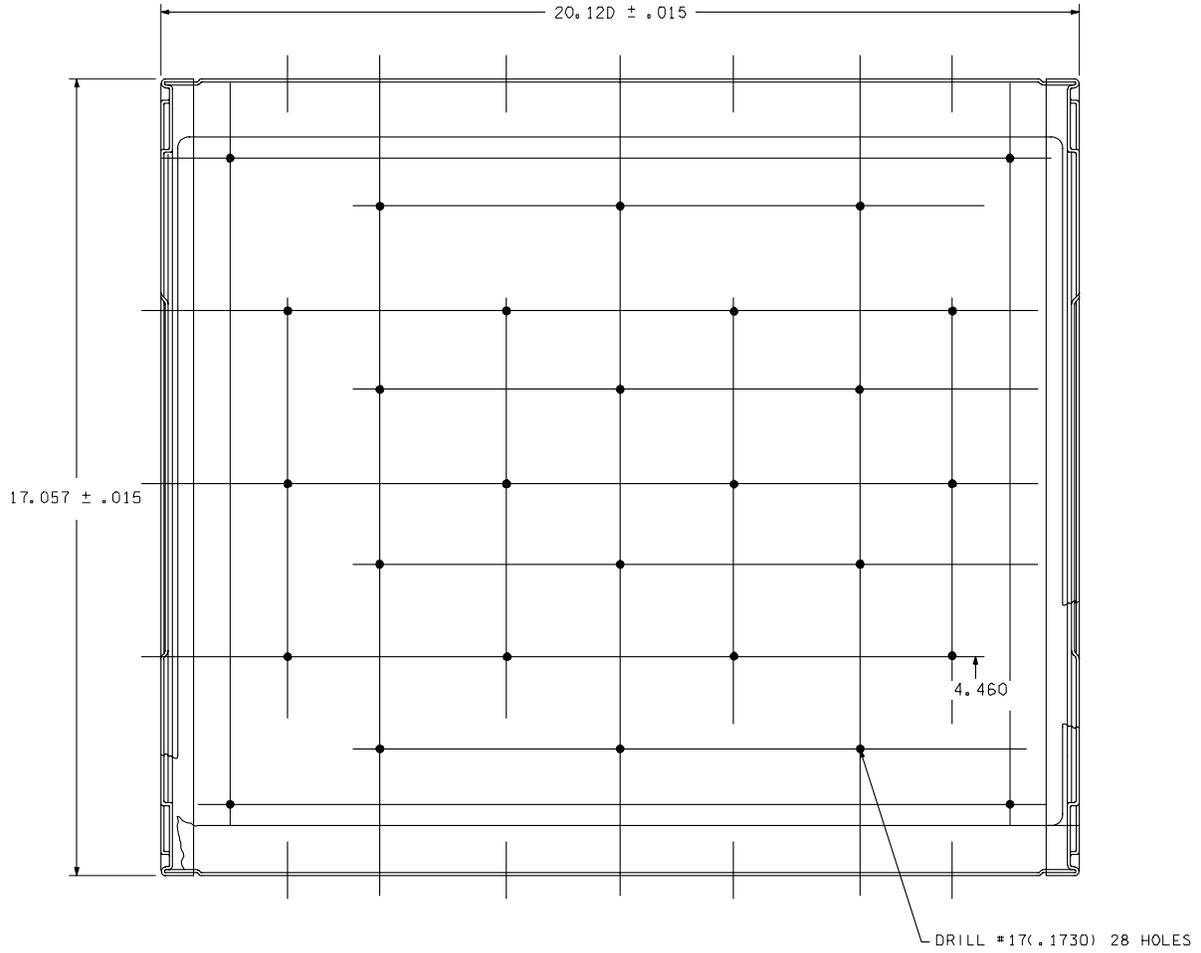
0033560. ART, 1

1/4-inch torque wrench (click type)

IFM TOOL LOCKER DRAWER 1 SINGLE STOWAGE TRAY

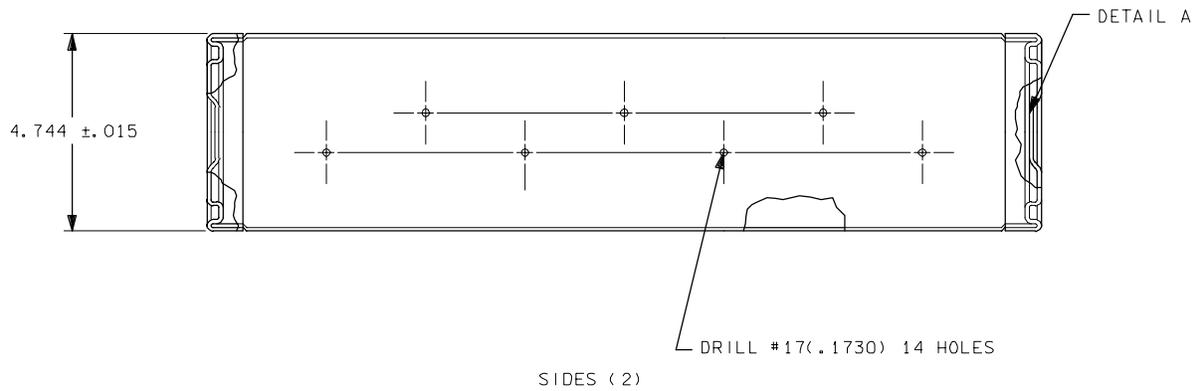


Item 22 Technical Information	
Location	IFM tool locker drawer 1
CCCD part number	SED32101897-302
CCCD drawing	SED32101960
Other drawings	ME192-0070 (stowage tray, single)
Manufacturer	Rockwell
Weight	2.12 lb
Quantity flown	One



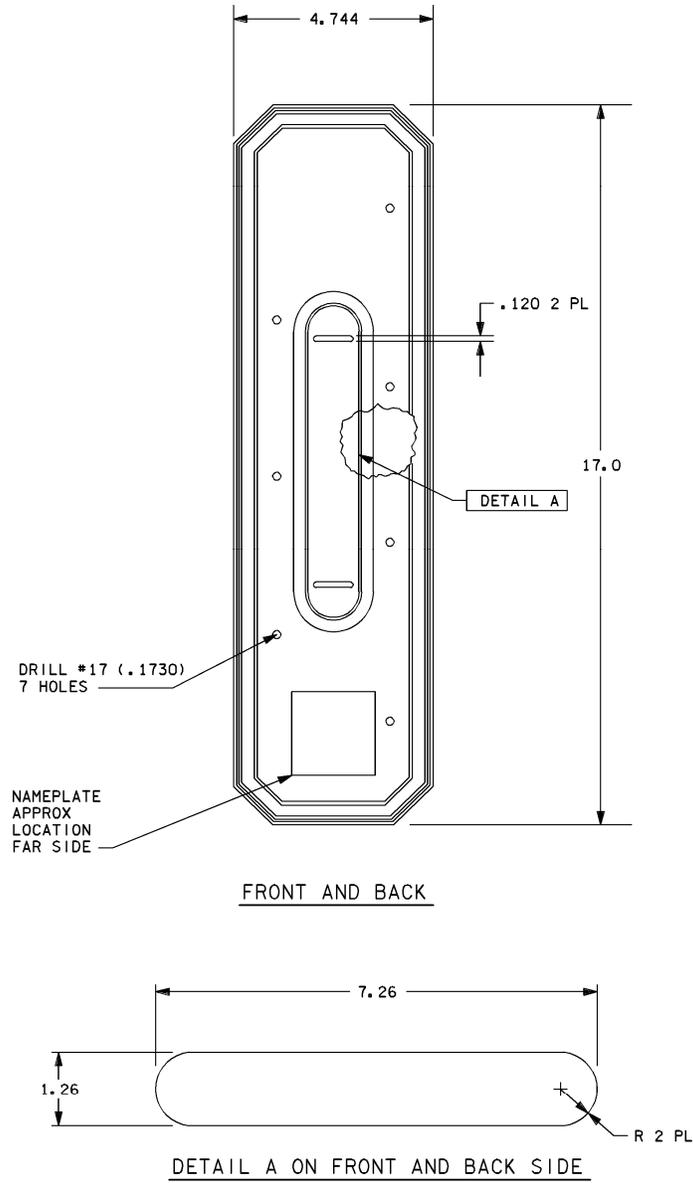
234460207, ART: 4

Overhead view - single storage tray



234460208, ART: 3

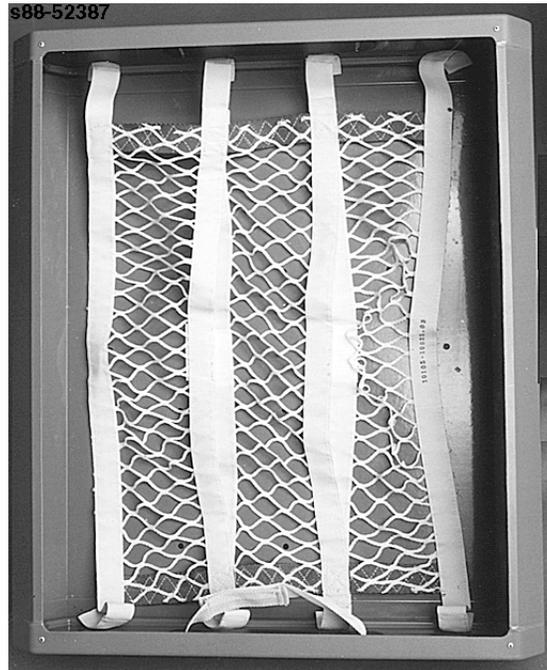
Single storage tray



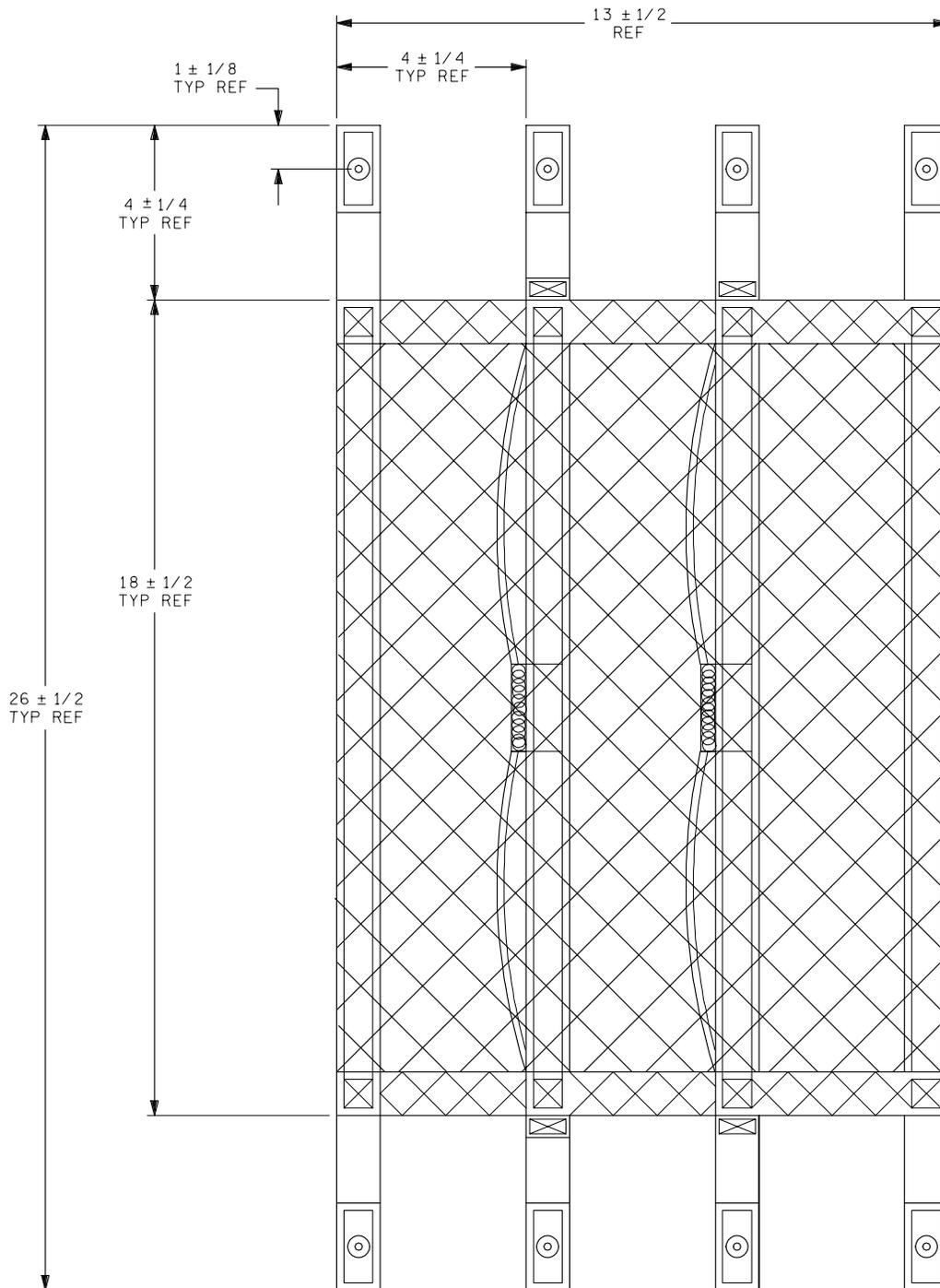
0033520. ART# 1

Stowage tray front and back

RETENTION NET



Item 23 Technical Information	
Location	IFM tool locker drawer 1
CCCD part number	10105-10025-03
CCCD drawing	SED32101960
Other drawings	10105-10025 (retention net assembly/one sheet)
Manufacturer	Boeing (responsibility transferred from ILC)
Weight	0.33 lb
Quantity flown	One

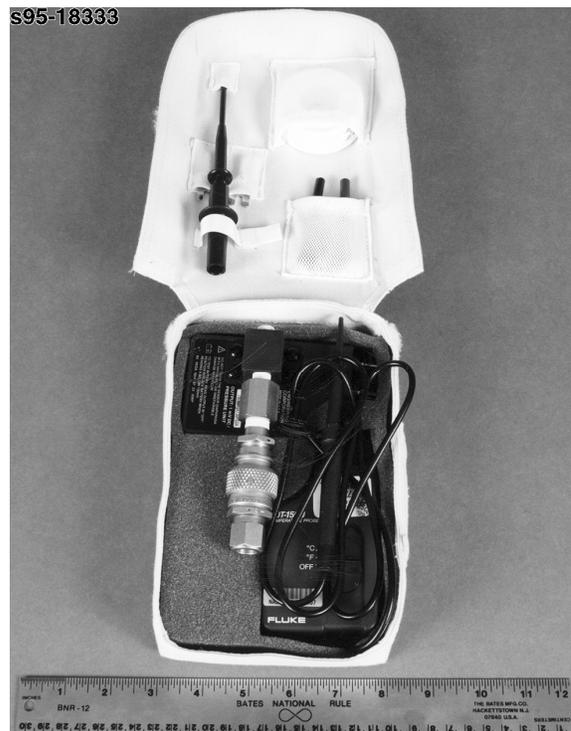
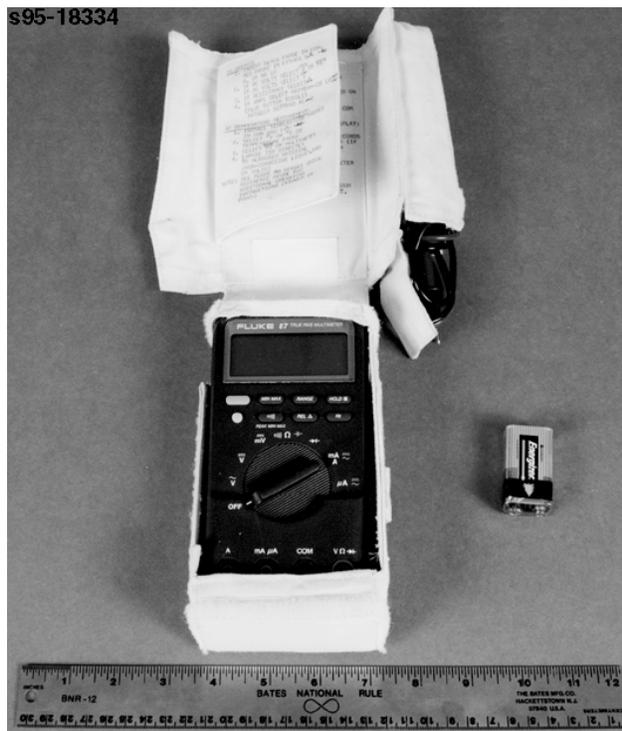


234460211. ART.

All dimensions are in inches.

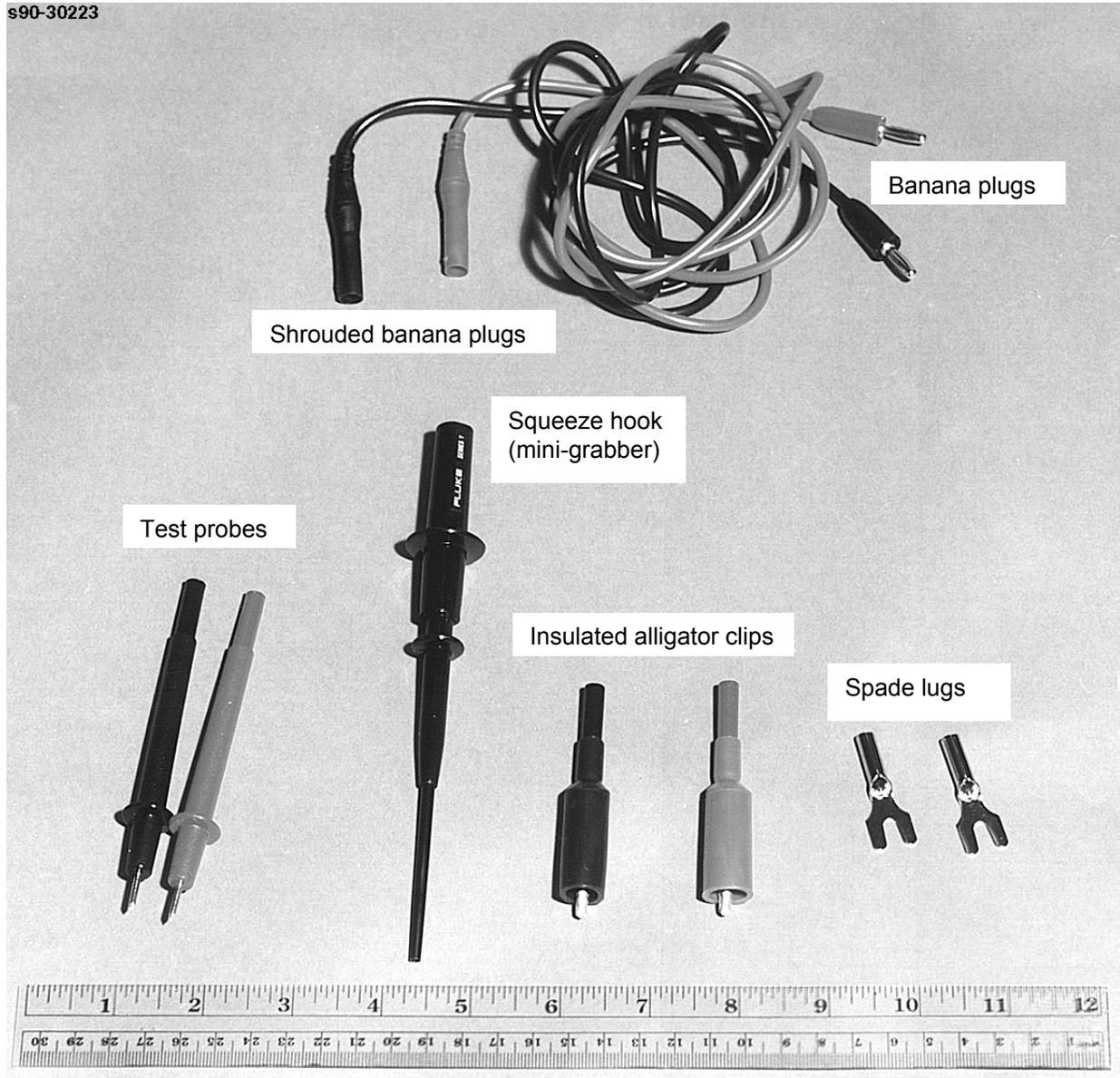
Retention net

MULTIMETER KIT/TEMPERATURE PROBE - PRESSURE MODULE KIT



Item 24 Technical Information	
Location	IFM tool locker drawer 1
CCCD part number	10118-10018-04
CCCD drawing	SED32103900
Other drawings	10118-10018 (multimeter kit)/528-20389 (temperature probe kit)
Manufacturer	Fluke (multimeter, test leads, and temperature probe) Crystal MultiCal (pressure module) Boeing (multimeter container and temperature probe - pressure module container)
Fluke part numbers/weights	Fluke 87 true RMS multimeter (12.5 oz) Fluke Y8133 test lead set (2.5 oz) Fluke 80T-150U universal temperature probe (5.7 oz) Crystal MultiCal pressure module S/N1008 (352.4 grams)
Quantity flown	One kit
Calibration	Digital multimeter, temp probe, and pressure tested once a year. If an EVA is scheduled, the PM is tested within 30 days before flight

s90-30223



Fluke Y8133 test lead set

COMMENTS

The multimeter/temperature probe kits contain the following equipment:

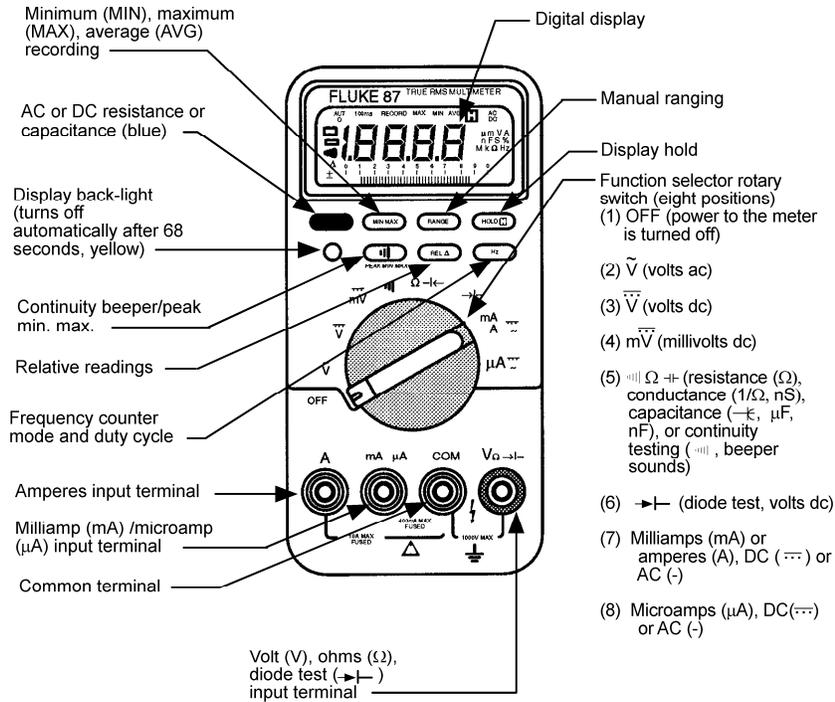
1. Fluke 87 true RMS multimeter
2. Fluke Y8133 test lead set
3. Fluke 80T-150U universal temperature probe
4. Multimeter kit
5. Temperature probe kit
6. Pressure module kit

The four identified uses of the Fluke multimeter on orbit are to measure voltages, resistances/continuity, temperature (using the temperature probe), and pressure (using the pressure module). The multimeter uses two test leads (flown in the multimeter container side pouch) with shrouded banana plugs, which can be connected to the following items:

1. Test probes - Two flown in the multimeter container side pouch (one red, one black).
2. Insulated alligator clip - Six flown.
 - a. Two flown in the temperature probe container (one red, one black).
 - b. Four flown in the pin kit flap 8 (see item 27).
3. Spade lugs - Two flown in the temperature probe container.
4. Squeeze hook - One flown in the temperature probe container (black).
5. Pin/socket test adapters - Eight flown in the pin kit flap 7 (see item 27). There is one pin (red) and one socket (black) test adapter each for 12-, 16-, 20-, and 22-gauge sizes.

Basic instructions for use of the multimeter, temperature probe, and pressure module, including a Fluke 87 multimeter quick reference guide card, are found in the back side of the multimeter container top flap. The multimeter, temperature probe, and pressure module are individually powered by a 9-volt battery (one 9-volt battery for each device). The 9-volt batteries can be replaced on orbit. A spare battery is flown in the multimeter container side pouch (see item 26).

The multimeter/temperature probe/pressure module kits are illustrated on the following pages.



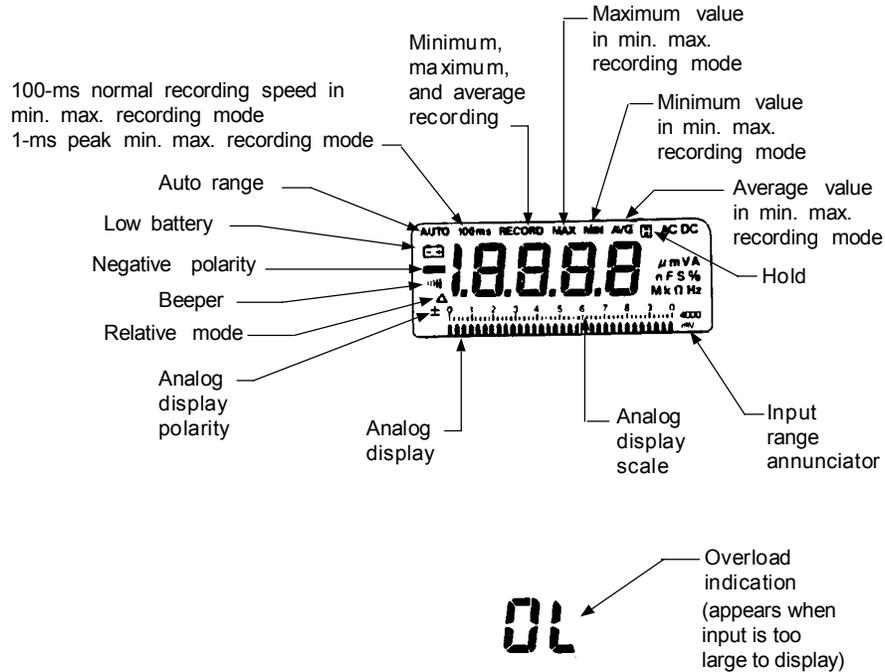
usa00035_308.crv

Function	Ranges
\tilde{V} (volts ac)	400 mV, 4 V, 40 V, 400 V, 1000 V (5)
\overline{V} (volts dc)	4 V, 40 V, 400 V, 1000 V (4)
mV (millivolts dc)	400 mV (1)
Ω (resistance)	400 Ω , 4 k Ω , 400 k Ω , 4 m Ω , 40 m Ω (5)
1/ Ω (conductance)	40 nS (equal to 25-100,000 m Ω) (1)
$\text{---}\mu\text{F}$ (capacitance)	05.00 nF, 0.0500 μF , 0.500 μF , 05.00 μF (4)
$\rightarrow $ (Diode Test)	3 V (1)
μA (microamps)	400 μA , 4000 μA (2)
mA (milliamps)	40 mA, 400 mA (2)
A (amperes)	4000 mA, 10 A (2)
Hz (frequency counter mode)	199.99 Hz, 1999.9 Hz, 19.999 KHz, 199.99 KHz (5)
Hz (duty cycle)	0.0 to 99.9 percent (1)

j_23446_313.ovs

Fluke 87 RMS multimeter¹

¹Fluke 87 True RMS Multimeter User's Manual. John Fluke Manufacturing Co., Inc., August 1988

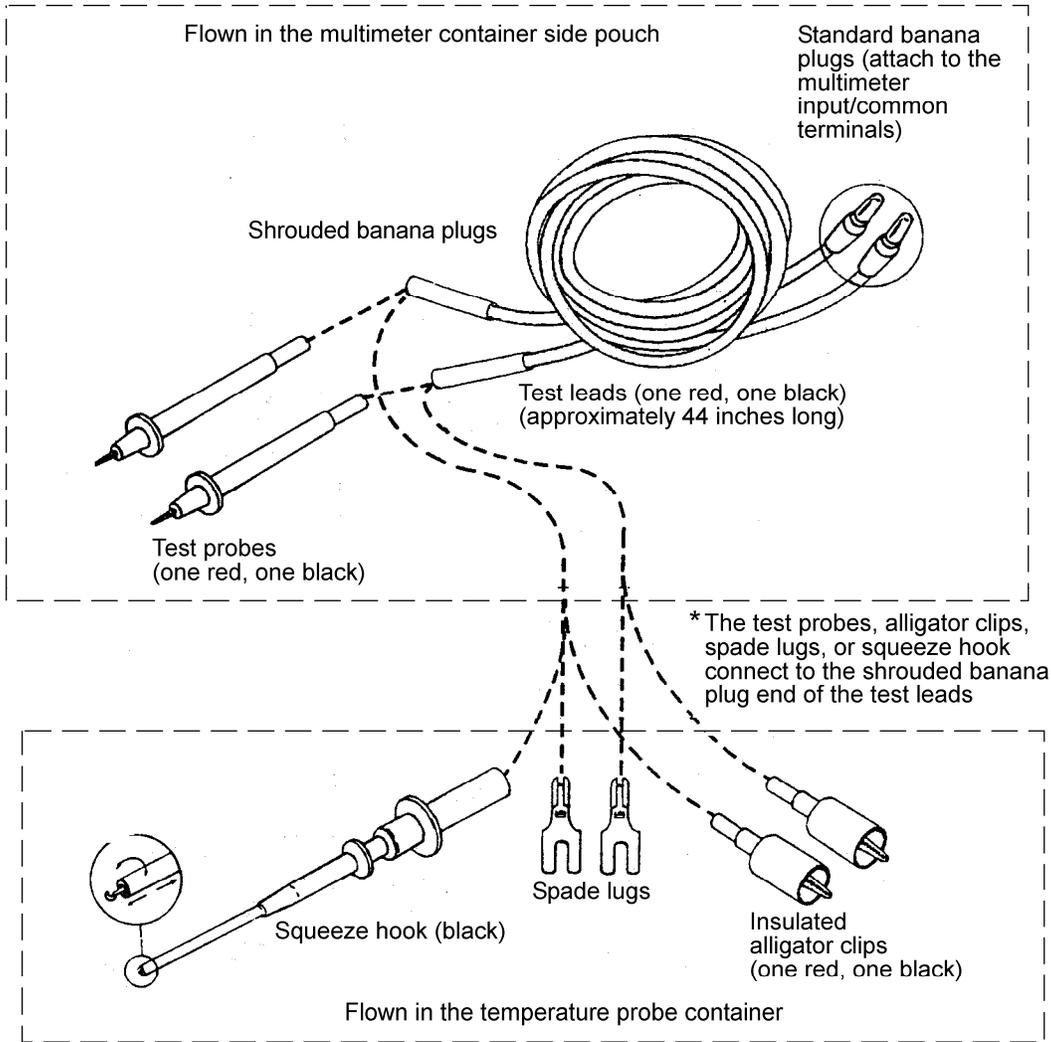


J_23446_309

Digital display

The following annunciators indicate the unit of the value displayed:

AC	Alternating current or voltage
DC	Direct current or voltage
V	Volts
mV	Millivolts (1 by 10^{-3} volts)
A	Ampere (amps). Current
mV	Milliamperere (1 by 10^{-3} amps)
μ A	Microampere (1 by 10^{-6} amps)
nS	Nanosiemens (1 by 10^{-9} siemens) Conductance (1/ohms)
%	Percent annunciator (for duty cycle readings only)
Ω	Ohms. Resistance
k Ω	Kilohm (1 by 10^3 ohms). Resistance
M Ω	Megohm (1 by 10^6 ohms). Resistance
Hz	Hertz (1 cycle/sec). Frequency
kHz	Kilohertz (1 by 10^3 cycles/sec). Frequency
μ F	Microfarads (1 by 10^{-6} Farads). Capacitance
nF	Nanofarads (1 by 10^{-9} Farads). Capacitance



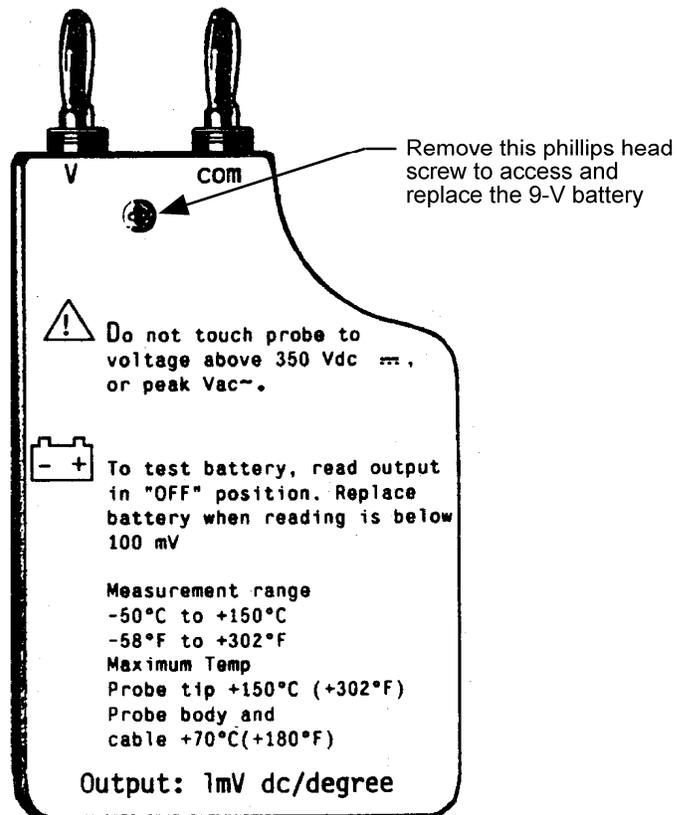
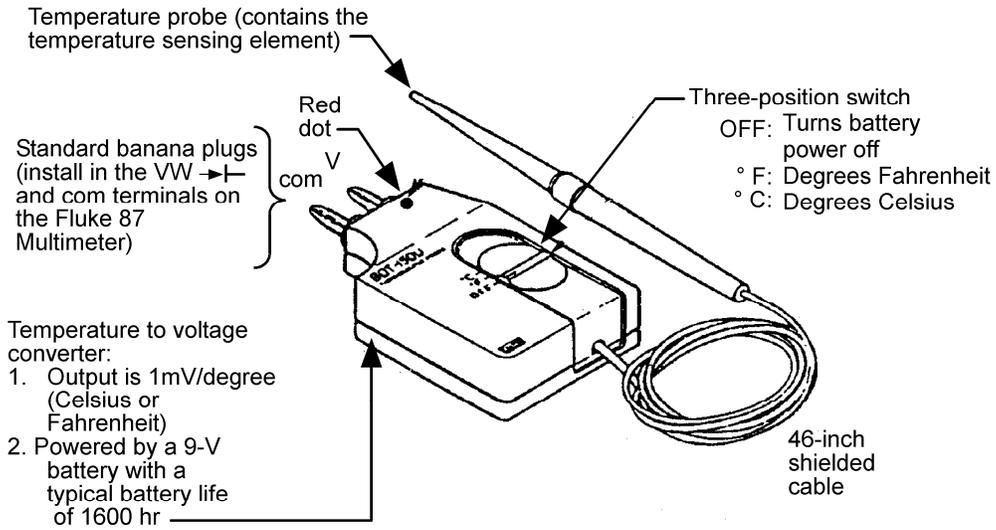
usa000335_310.crv

Fluke Y8133 test lead set²

SPECIFICATIONS

Ratings	Maximum current (amps)	Maximum voltage (volts)
Test leads	10	2000
Test probes	10	2000
Squeeze hook	1	1000

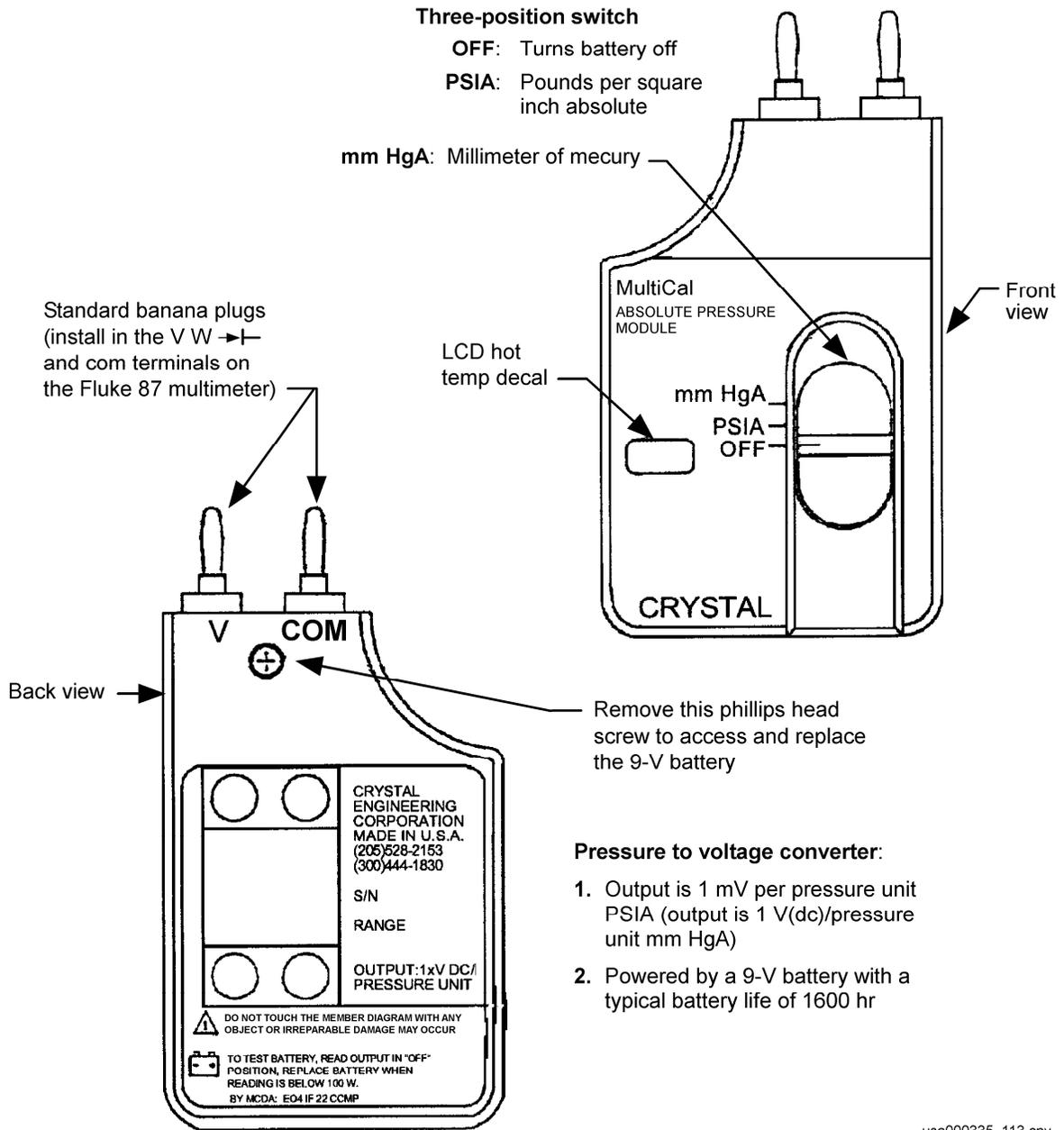
²Fluke Y8133/Y8134 Test Lead Set Instruction Sheet. John Fluke Manufacturing Co., Inc., April 1980.



usa000335_311.cnv

Back of meter
80T-150U temperature probe³

³Fluke 80T-150U Universal Temperature Probe Instruction Sheet. John Fluke Manufacturing Co., Inc., January 1988.



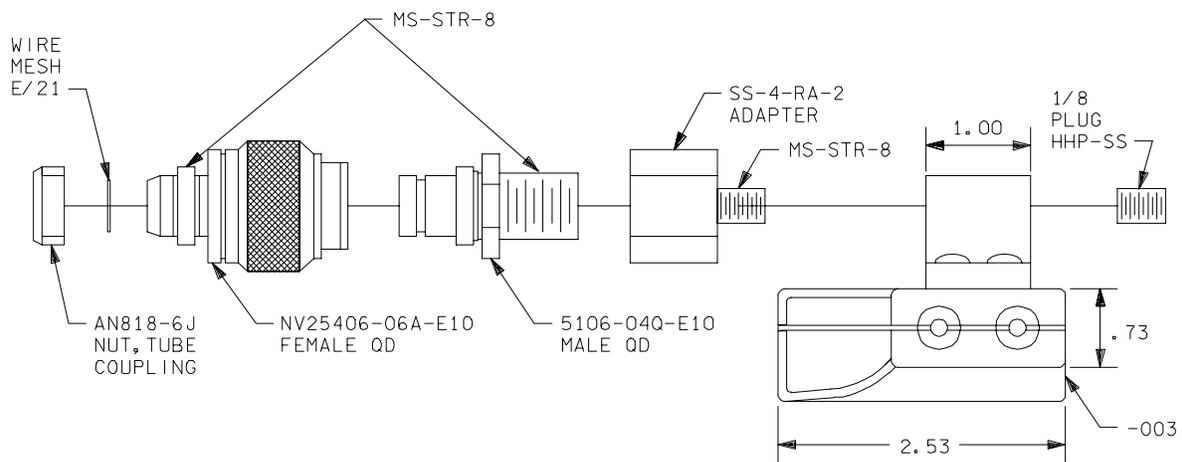
usa000335_113.cnv

MultiCal (HgA/mmHgA) absolute pressure module⁴

⁴ MultiCal™. 80T-150U Universal Temperature Probe Instruction Sheet. John Fluke Manufacturing Co., Inc., January 1988.



Pressure probe with QD



23446021A. ART. 3

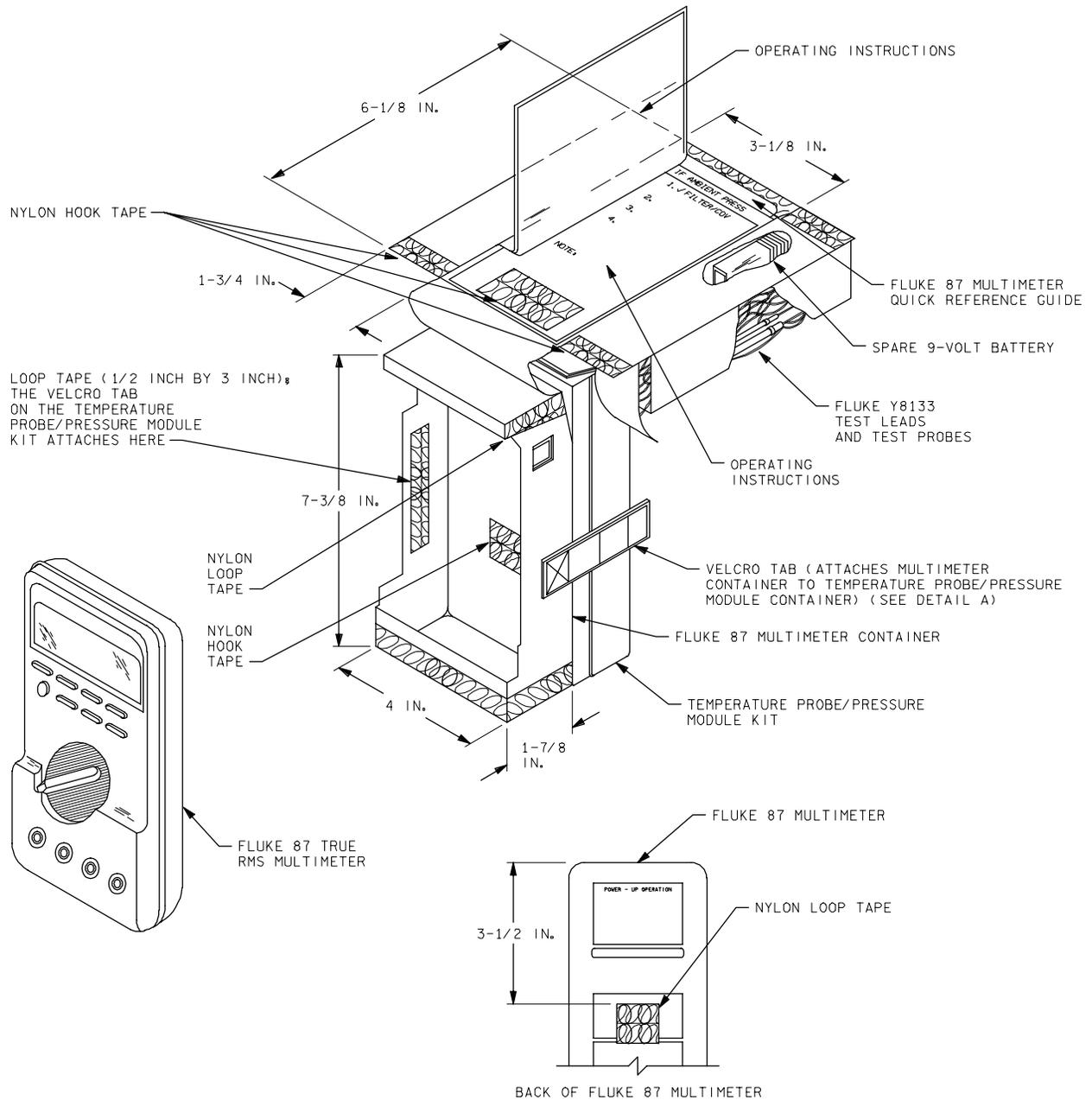
**Quick disconnect installation configuration
MultiCal (HgA/mmHgA) absolute pressure module**

COMMENTS

The Pressure Module (PM) can be used to measure almost any type of pneumatic or hydraulic pressure.

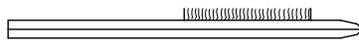
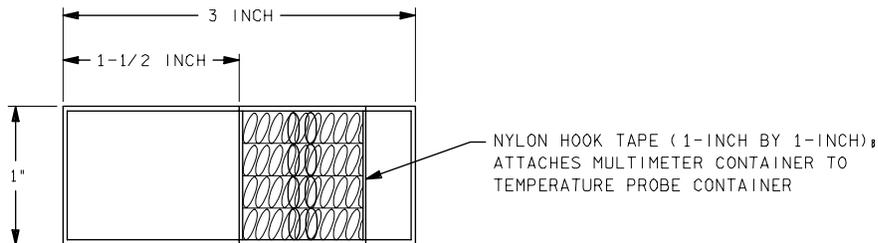
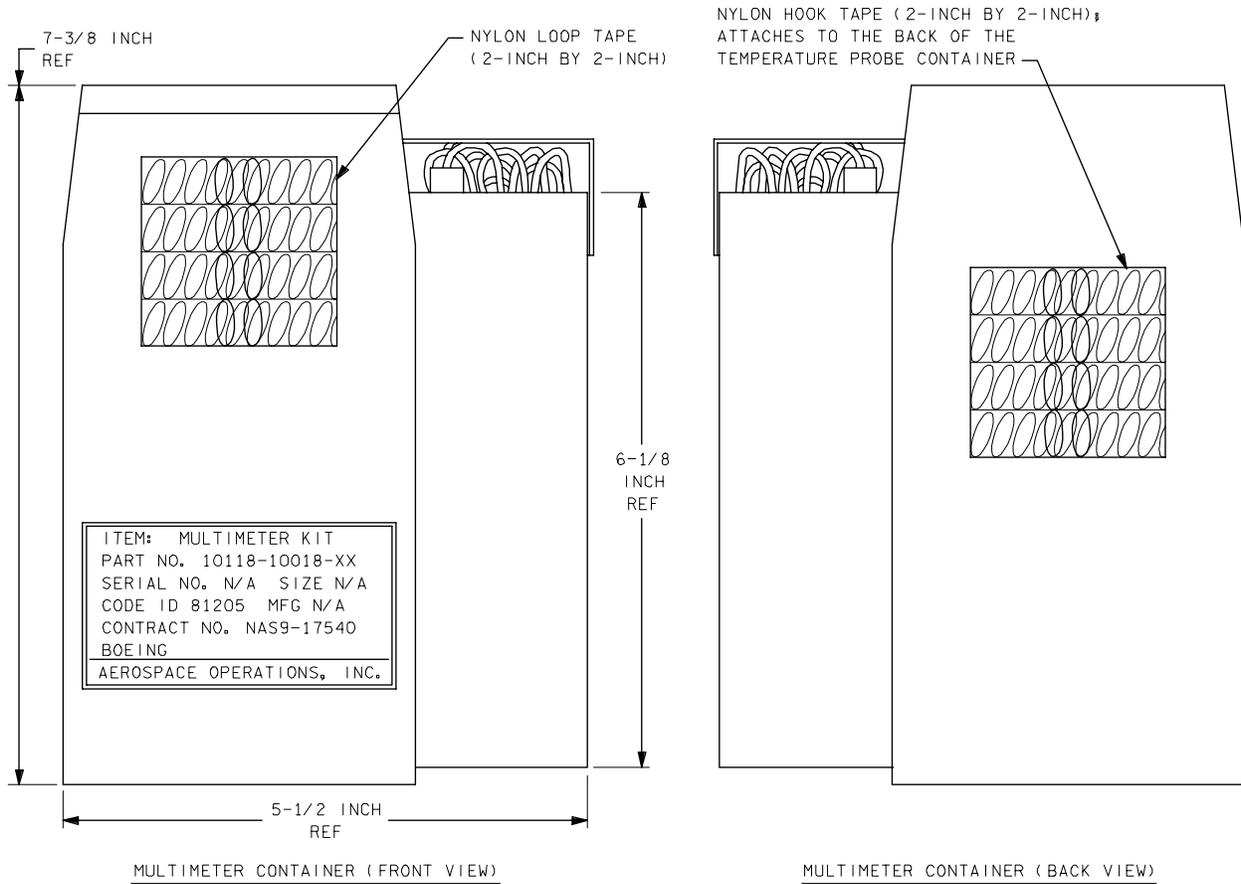
PM specifications

Working pressure: 30 psia
Maximum pressure: 100 psia



23446024A, ISO 6

Multimeter kit (attached to temperature probe/pressure module container by two Velcro tabs)



VELCRO TAB
(DETAIL A)

23446024B. ORT, 3

Multimeter kit

The following instructions are written on the back side of the top flap of the multimeter container.

TO OPERATE

1. Insert black probe in COM.
Red probe in either $V\Omega \rightarrow \text{---} \text{---} \text{---}$, A, or mA $\text{---} \text{---} \text{---}$.
2. If dc volts, select $\overline{\text{V}}$ or $\overline{\text{mV}}$.
If ac volts, select $\overline{\text{V}}$.
3. If resistances, select Ω .
4. If amps, select mA $\text{---} \text{---} \text{---} / \text{A} \sim$ or $\mu\text{A} \text{---} \text{---} \text{---}$ (blue button toggles between DC $\text{---} \text{---} \text{---}$ and AC \sim).

If temperature measurement

1. Install temperature probes in COM and $V\Omega \rightarrow \text{---} \text{---} \text{---}$.
2. Select °F or °C on temperature probe.
3. Select $\overline{\text{mV}}$ on multimeter.
4. Expose probe tip directly to measured material (noncorrosive liquid, gas, or solid).

Note: See Fluke 80 Series Quick Reference Guide on card for additional operating instructions (stowed in pouch).

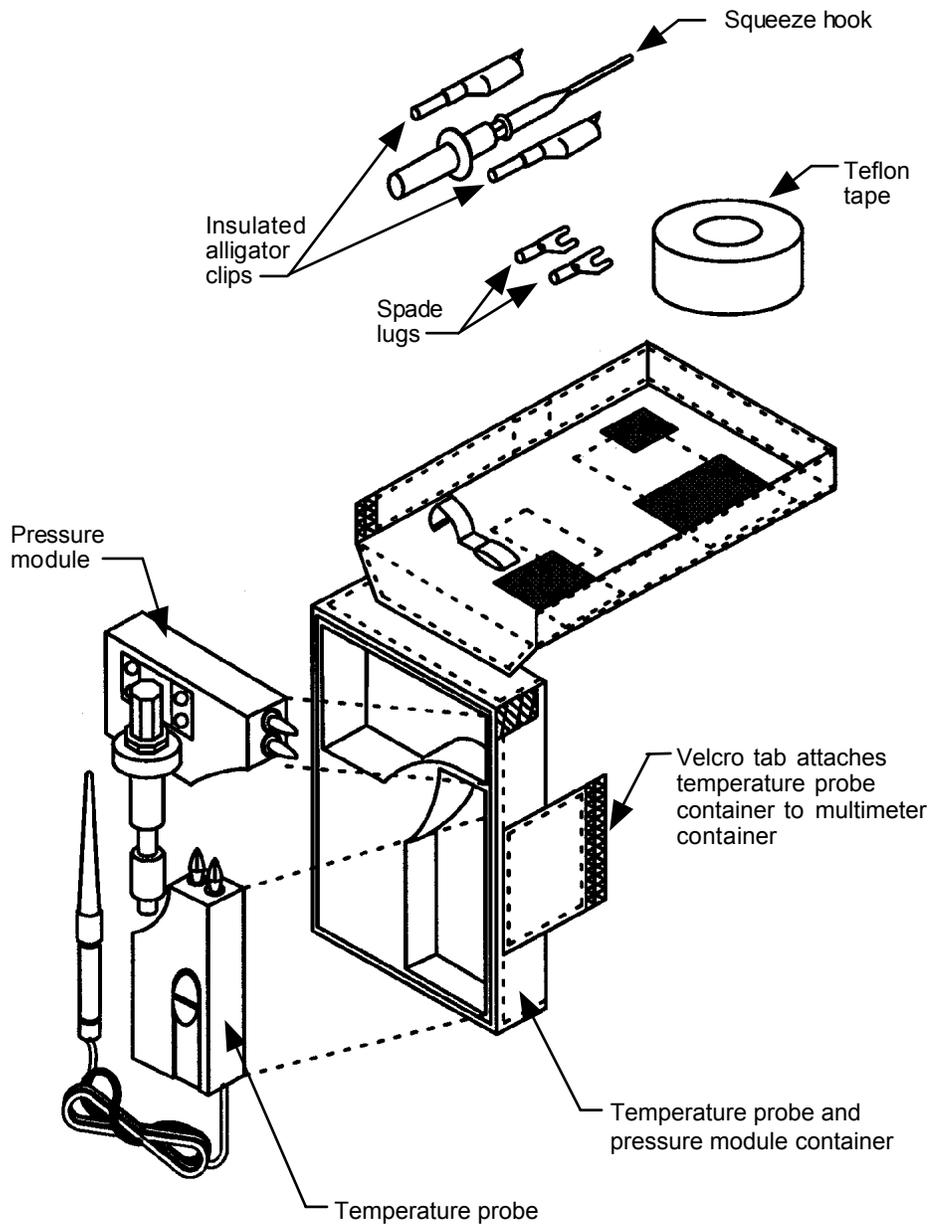
INSTRUCTIONS ON FLAP:

If ambient pressure measurement in PSIA (mmHgA)

1. ✓ filter/coupler connected to QD on pressure module (PM).
2. Plug PM into multimeter (COM to COM and V to $V\Omega \rightarrow \text{---} \text{---} \text{---}$).
3. For PSIA output with four-digit display:
✓ multimeter - OFF
Depress yellow button for 2 seconds while selecting mV on multimeter (if mmHgA select $\overline{\text{V}}$). Select PSIA (mmHgA) on PM.
4. Deactivate by turning PM multimeter - OFF.

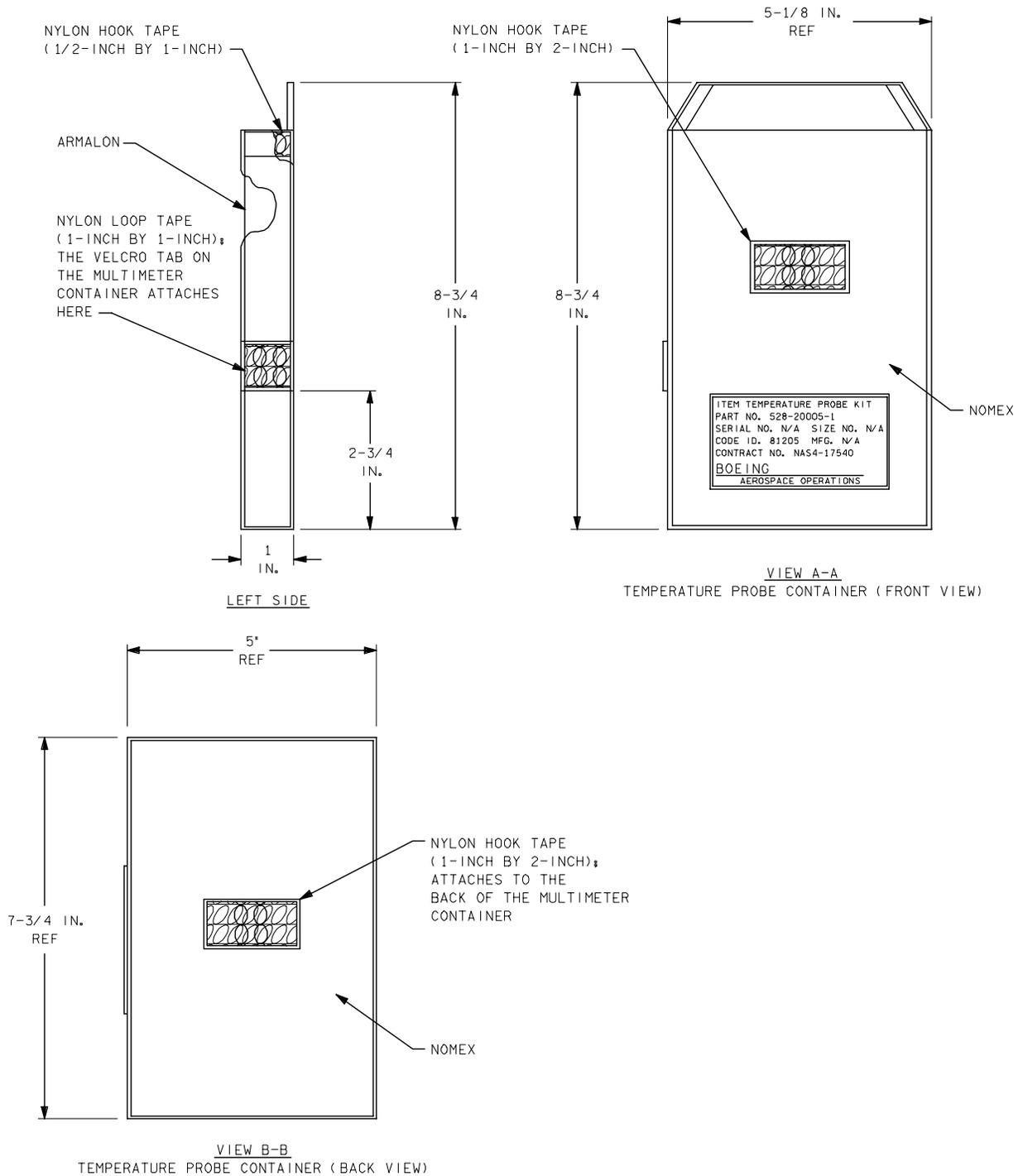
Note: For pressure measurement of vacuum vent supply H₂O or waste H₂O system, contact MCC.





j 23446 039

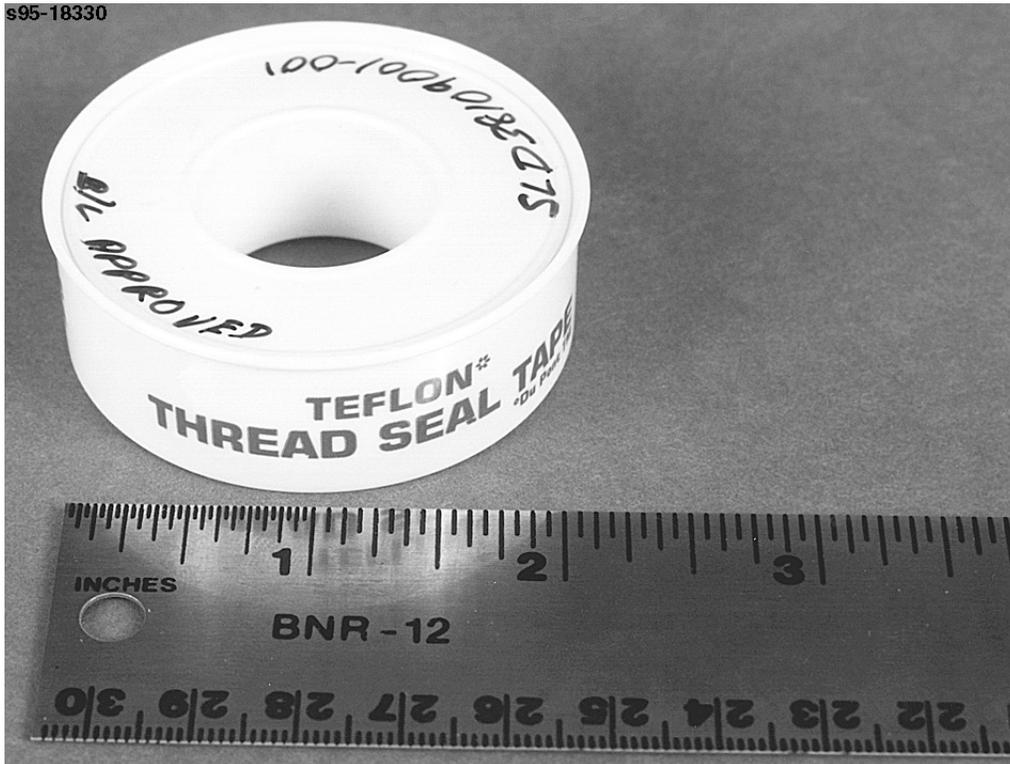
Temperature probe kit



23446026B.ORT; 4

Temperature probe kit (left side, front, and back views)

TEFLON THREAD SEAL TAPE

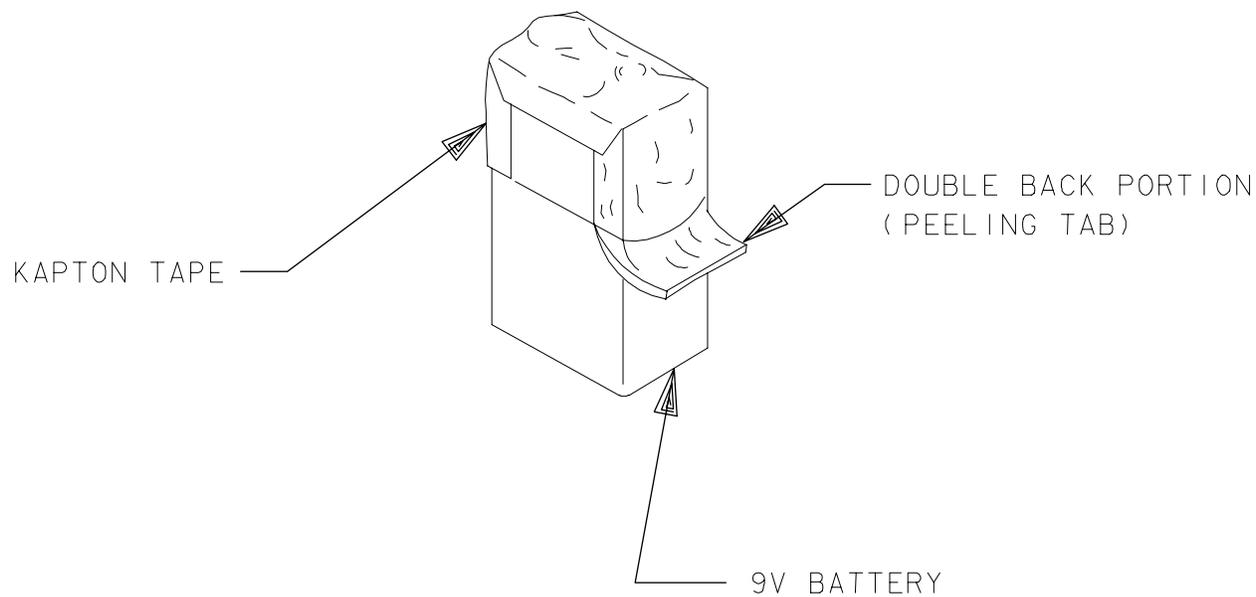


Item 25 Technical Information	
Location	IFM tool locker drawer 1
CCCD part number	SLD38109001-001
CCCD drawing	SED32103900
Other drawings	10118-10018-04 (multimeter/temp probe kit)
Manufacturer	DuPont
Quantity flown	One

MULTIMETER BATTERY, 9-VOLT



Item 26 Technical Information	
Location	IFM tool locker drawer
CCCD part number	528-41350-6 (ST20B1350-02)
CCCD drawing	SED32103900
Other drawings	528-41350 (alkaline batteries/three sheets)
Manufacturer	Eveready (Energizer), Rayovac, or Duracell
Manufacturer part number	MN 1604 (Duracell)/A-1604 (Rayovac)/522 (Eveready)
Weight	0.100 lb
Quantity flown	One



23446213A. ART# 2

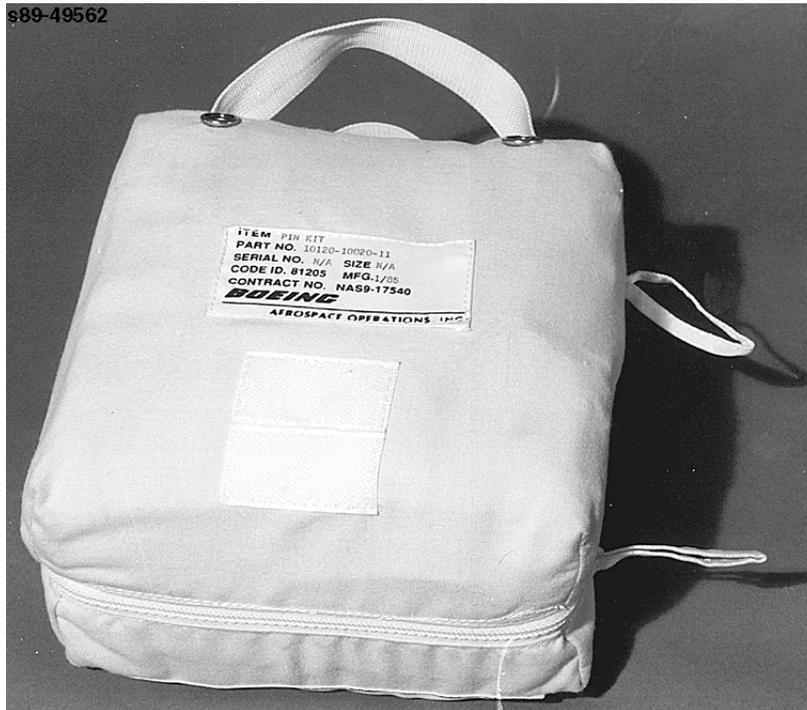
Multimeter battery, 9-volt

COMMENTS

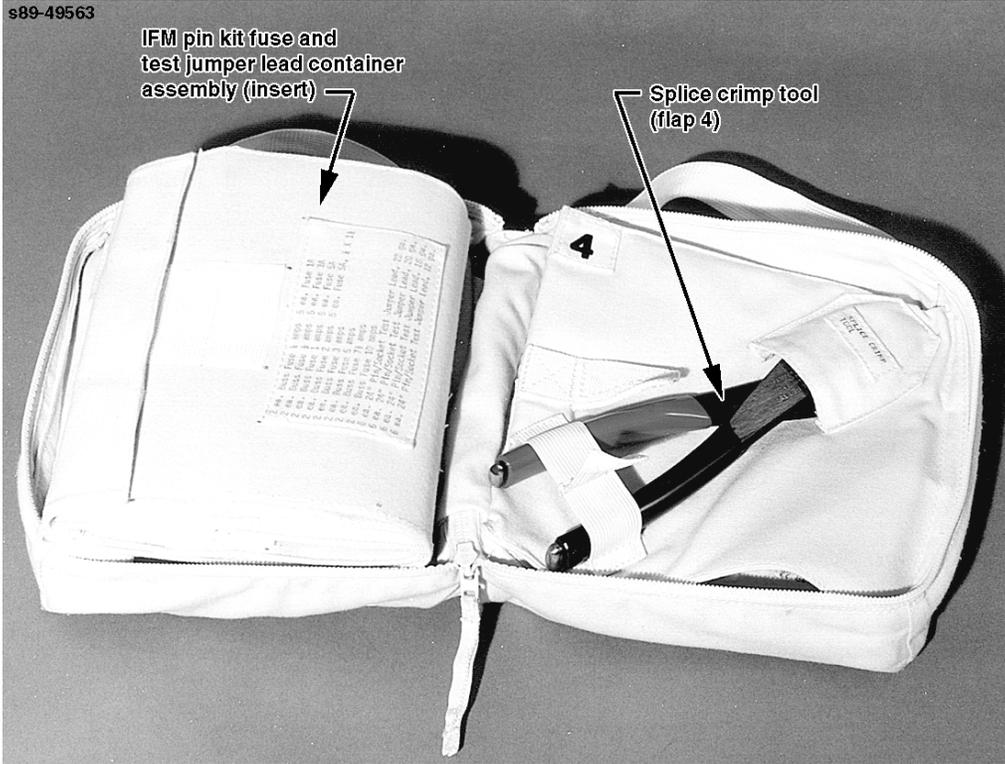
This spare multimeter battery is stowed in the side pouch of the Fluke 87 multimeter container. Shelf life is 1 year from date of manufacture.

Kapton tape is applied to the battery before it is inserted in the multimeter container pouch.

IFM PIN KIT



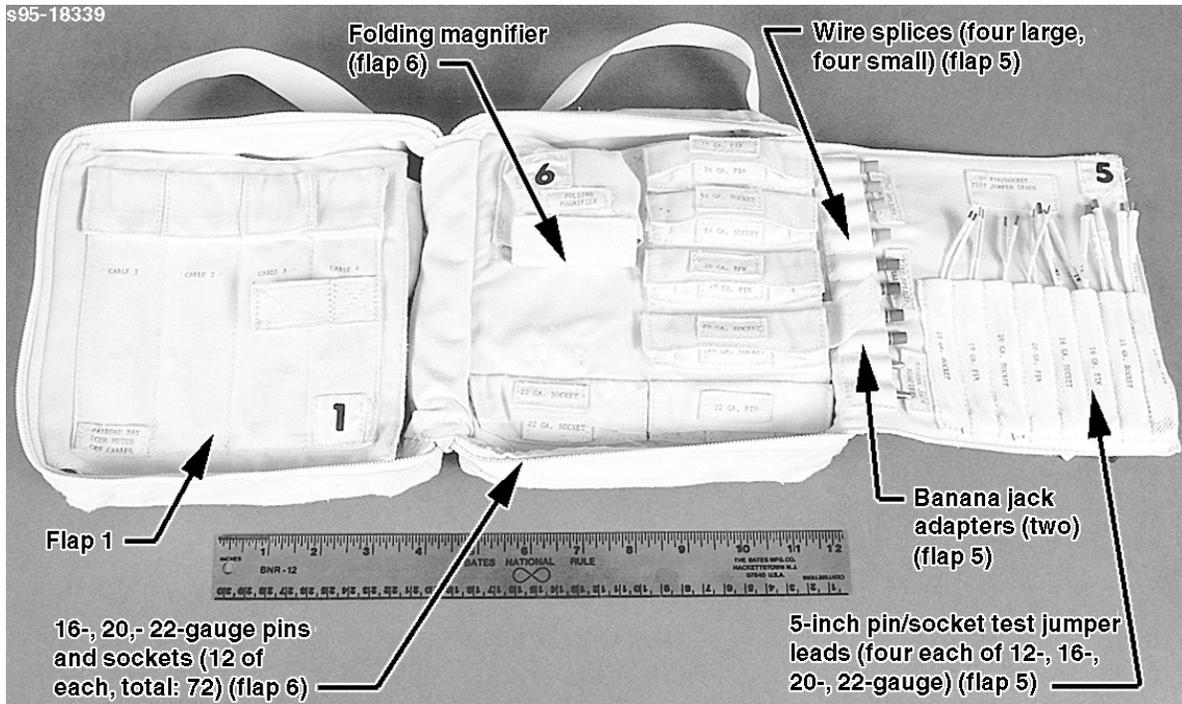
Item 27 Technical Information	
Location	IFM tool locker drawer 1
CCCD part number	10120-10020-14
CCCD drawing	SED32103900
Other drawings	10120-10020 (pin kit/two sheets) 528-20165 (spliced crimp tool assembly/one sheet) 528-20166 (crimp tool assembly/one sheet) 528-20167 (wire stripper assembly/one sheet)
Manufacturer	Boeing (responsibility transferred from ILC)
Weight	5.7 lb
Quantity flown	One



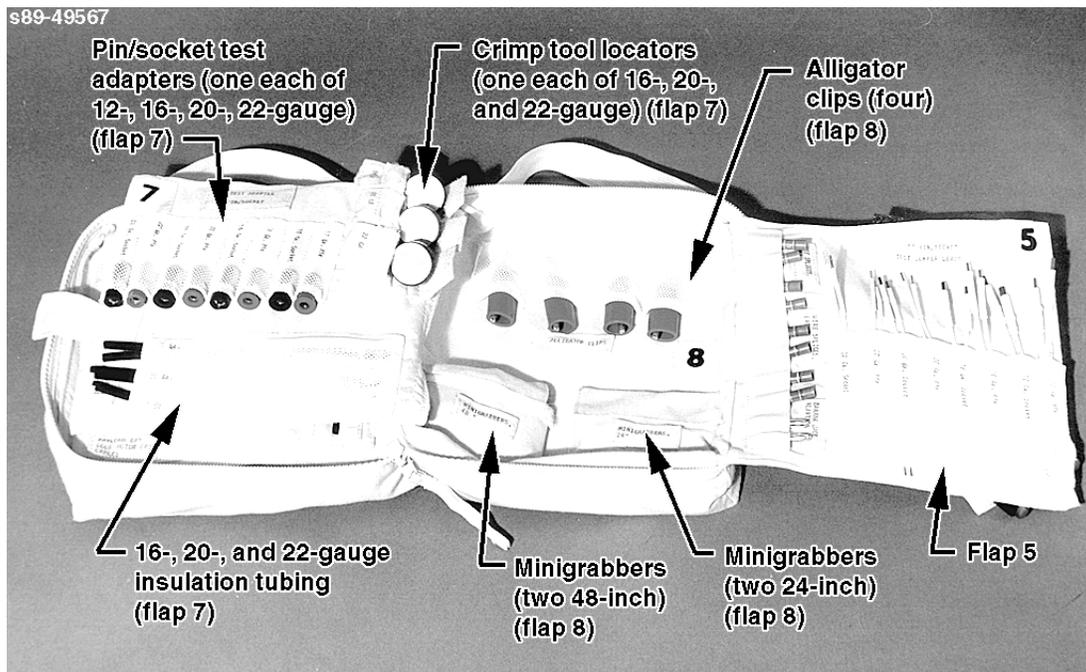
IFM pin kit



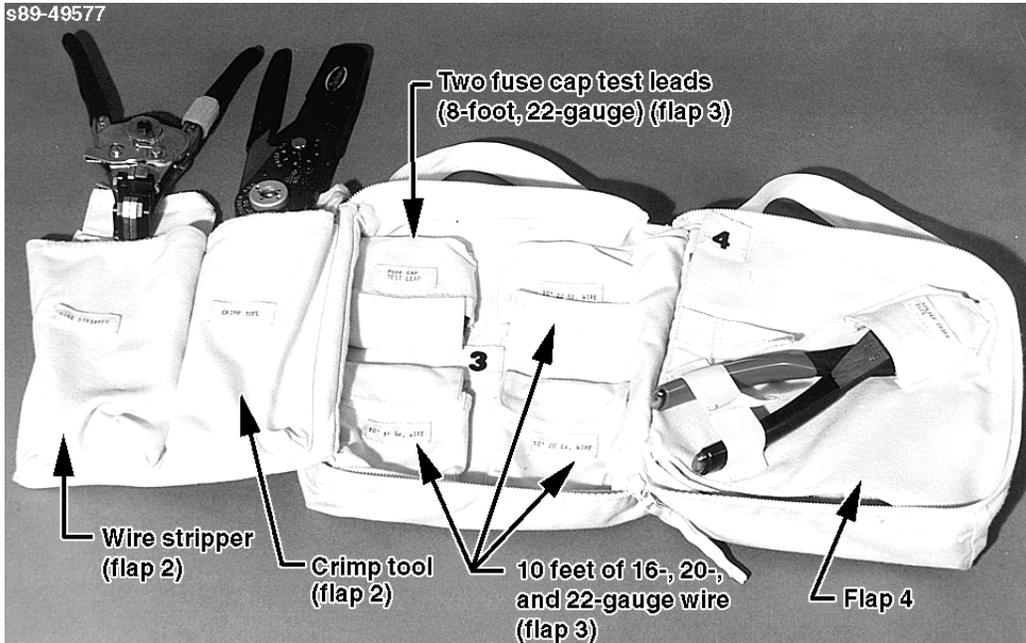
IFM pin kit



IFM pin kit



IFM pin kit

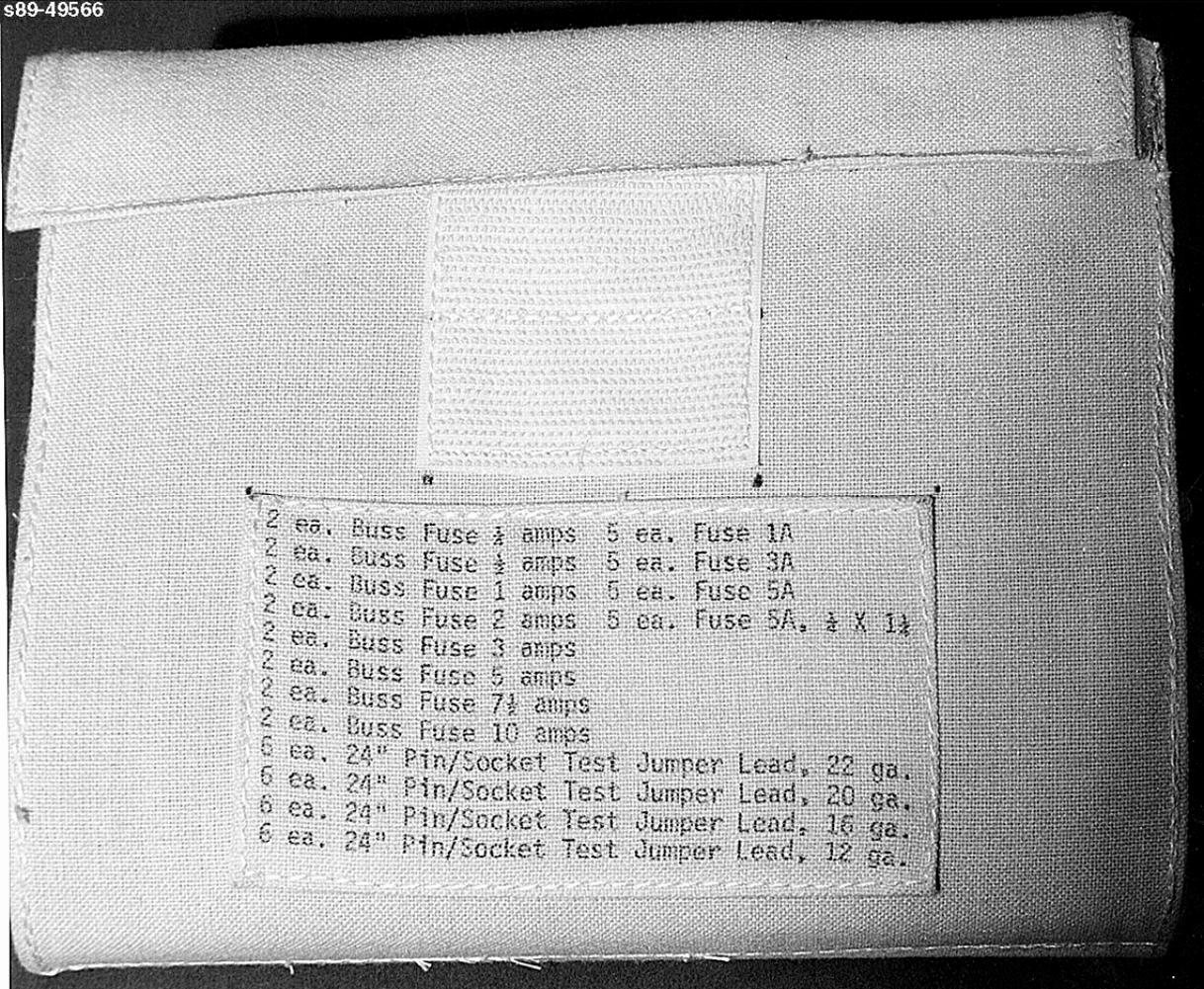


IFM pin kit

IFM pin kit insert (fuse and test jumper lead container)

Front flap		
Item	Quantity	Size
Pin/socket test jumper leads	6 each size (24 total)	24-in.; 12-, 16-, 20-, and 22-gauge
Standard bus fuses	2 each size (16 total)	1/4-, 1/2-, 1-, 2-, 3-, 5-, 7½-, and 10-amp
Additional standard bus fuses	3	5-amp
Subminiature (instrument) fuses	23 total	5 each of 1-, 3-, and 5-amp 2 each of 1/2-, 2-, 7½-, and 10-amp
Back flap		
Item	Quantity	Size
Socket/socket test jumper leads	4 each size (16 total)	5-in.; 12-, 16-, 20-, and 22-gauge
Pin/pin test jumper leads	4 each size (16 total)	5-in.; 12-, 16-, 20-, and 22-gauge
Ku-band antenna contingency cable	1	22-gauge

s89-49566

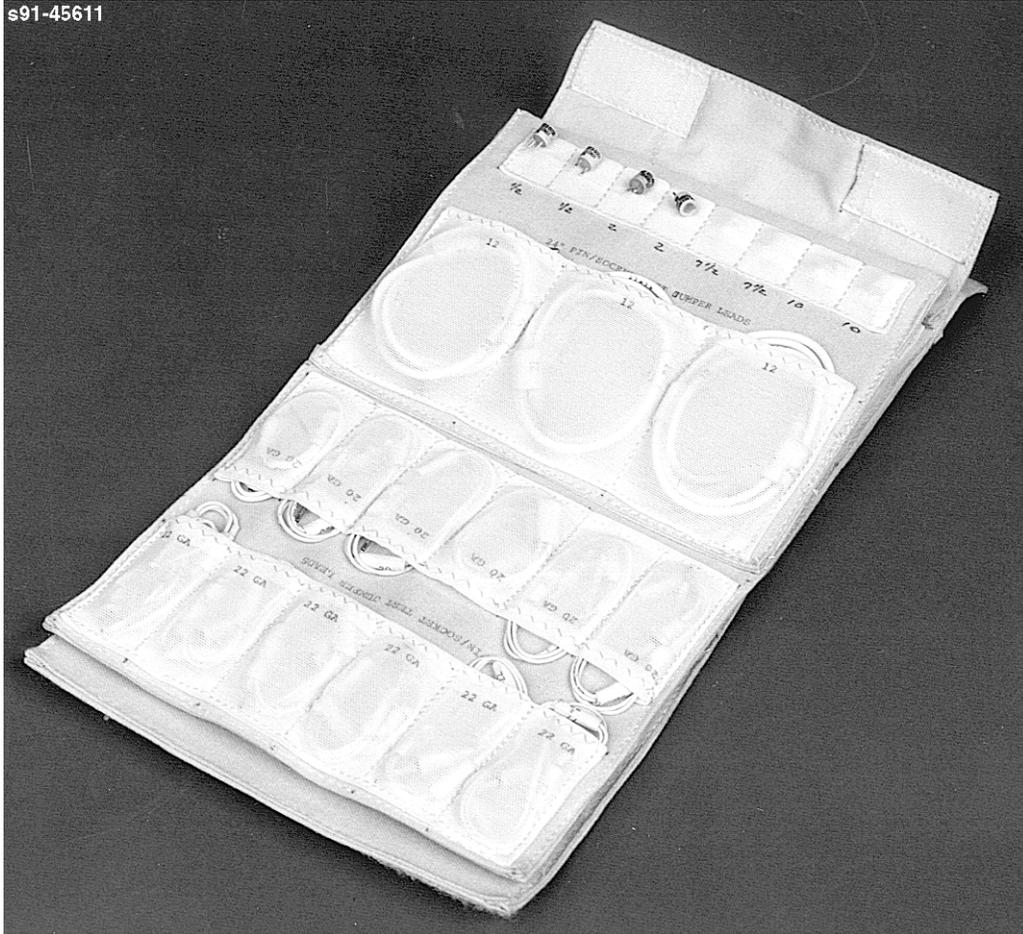


**IFM pin kit fuse and test jumper lead
container assembly (insert)**

s89-49565

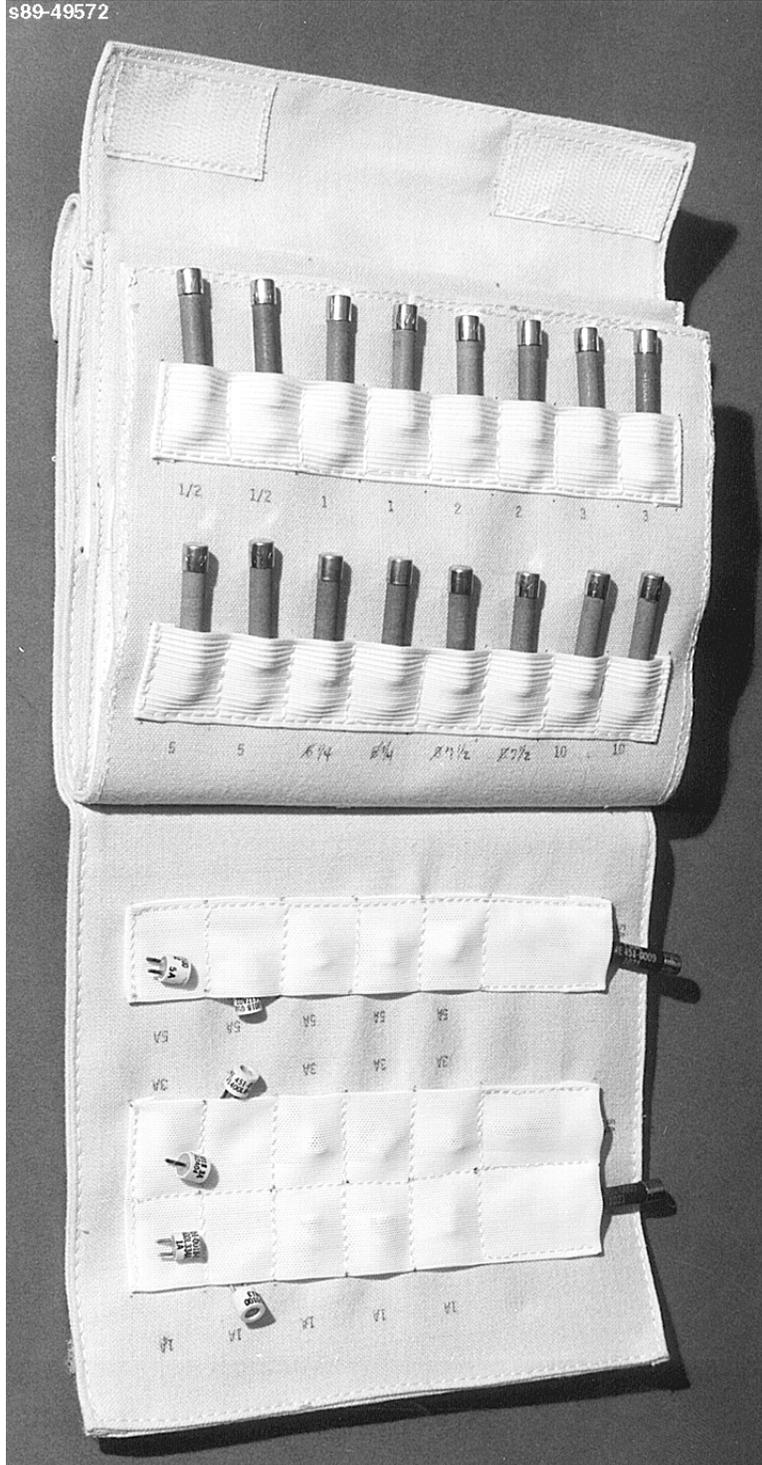


IFM pin kit fuse and test jumper lead
container assembly (insert)

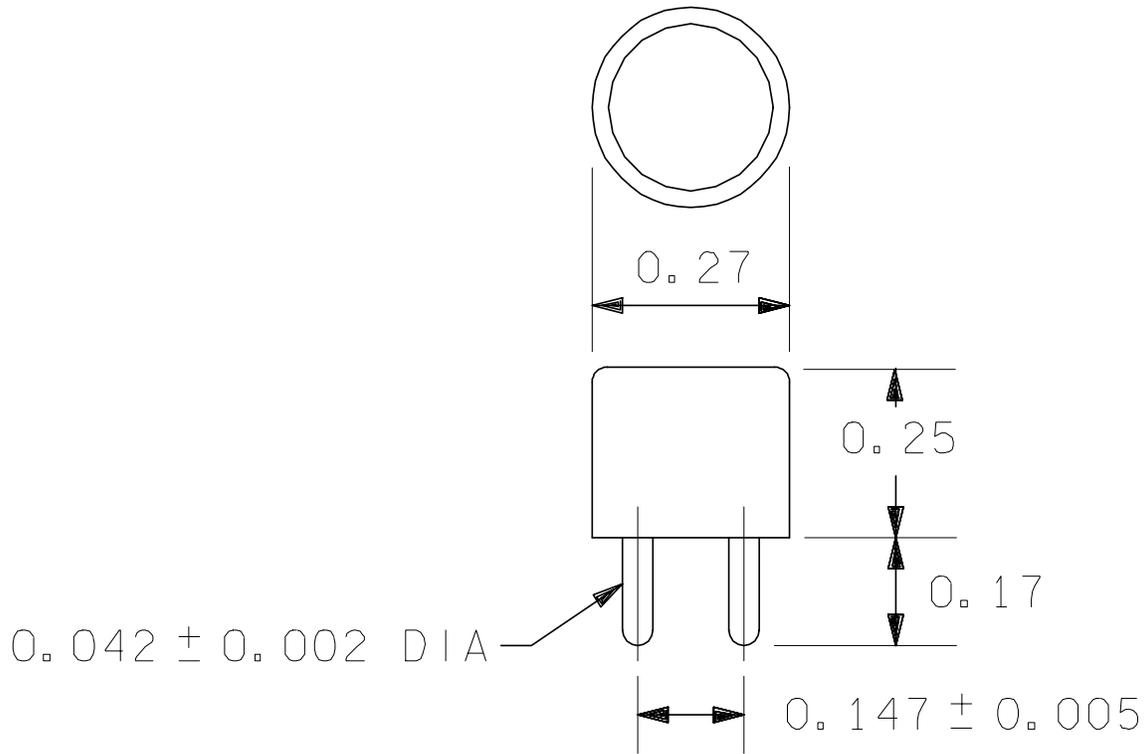


**24-inch pin/socket test jumper leads
(three 12-gauge, six 20-gauge, and six 22-gauge)**

s89-49572



Standard and subminiature (instrument) fuses



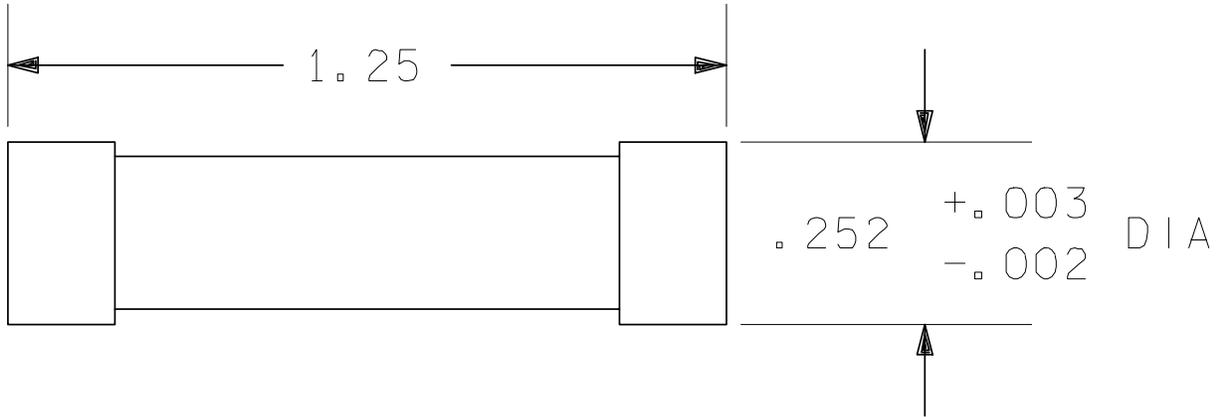
23446213B. ORT; 2

Fuse - Subminiature plug in (ME451-0018-XXXX)^{5,6}

Ampere rating	Dash number	Number of spares flown in pin kit
0.5	0050	2
1.0	0100	5
2.0	0200	2
3.0	0300	5
5.0	0500	5
7.5	0750	2
10.0	1000	2

⁵ Fuse, subminiature. Rockwell Spec ME451-0018, July 1978.

⁶ Protective Devices, section 4.5.6.4. Shuttle Operational Data Book, Vol. I, January 1988.



23446213C.ORT; 1

Fuse - Cartridge (ME451-0009-XXXX)^{7 8}

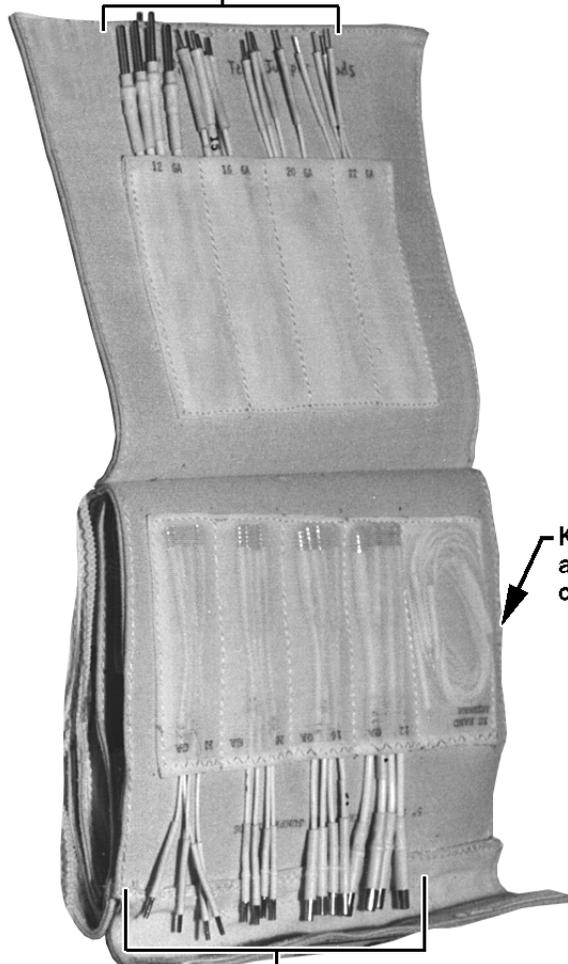
Ampere rating	Dash number	Number of spares flown in pin kit
0.25	-1022	2
0.5	-1023	2
1.0	-1001	2
2.0	-1002	2
3.0	-1003	2
5.0	-1021	5
7.5	-1019	2
10.0	-1005	2

⁷ Protective Devices, Section 4.5.6.4. Shuttle Operational Data Book, Vol. 1, January 1988.

⁸ Fuse, miniature, cartridge. Rockwell Spec ME451-0009, July 1978.

S95-08622

5-inch pin/pin test jumper leads
(four each of 12-, 16-, 20-, 22- gauge)

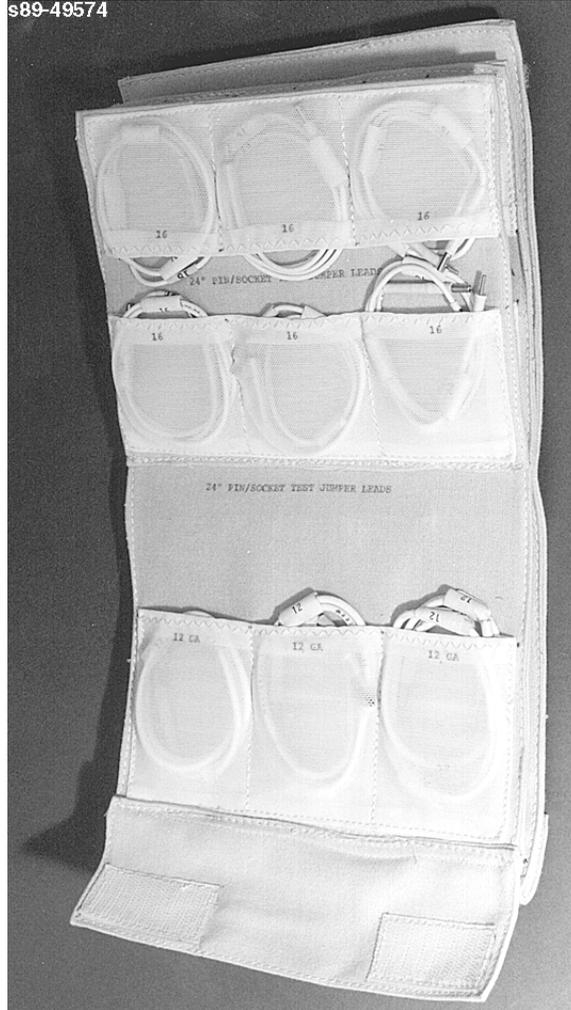


KU band
antenna
cable

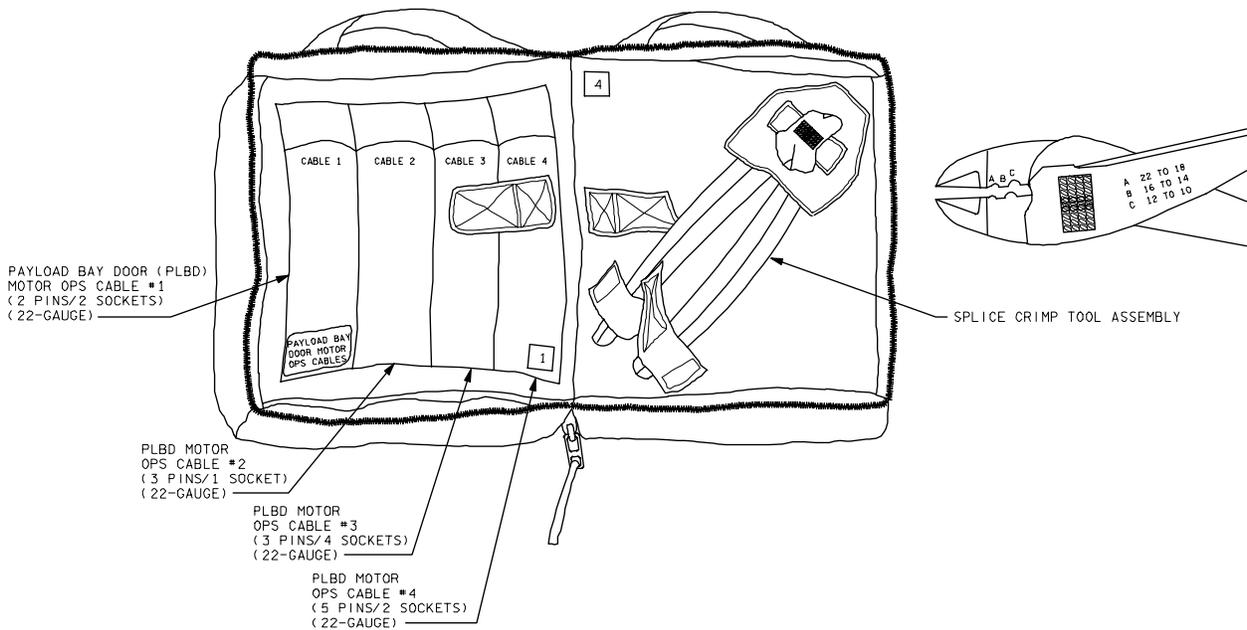
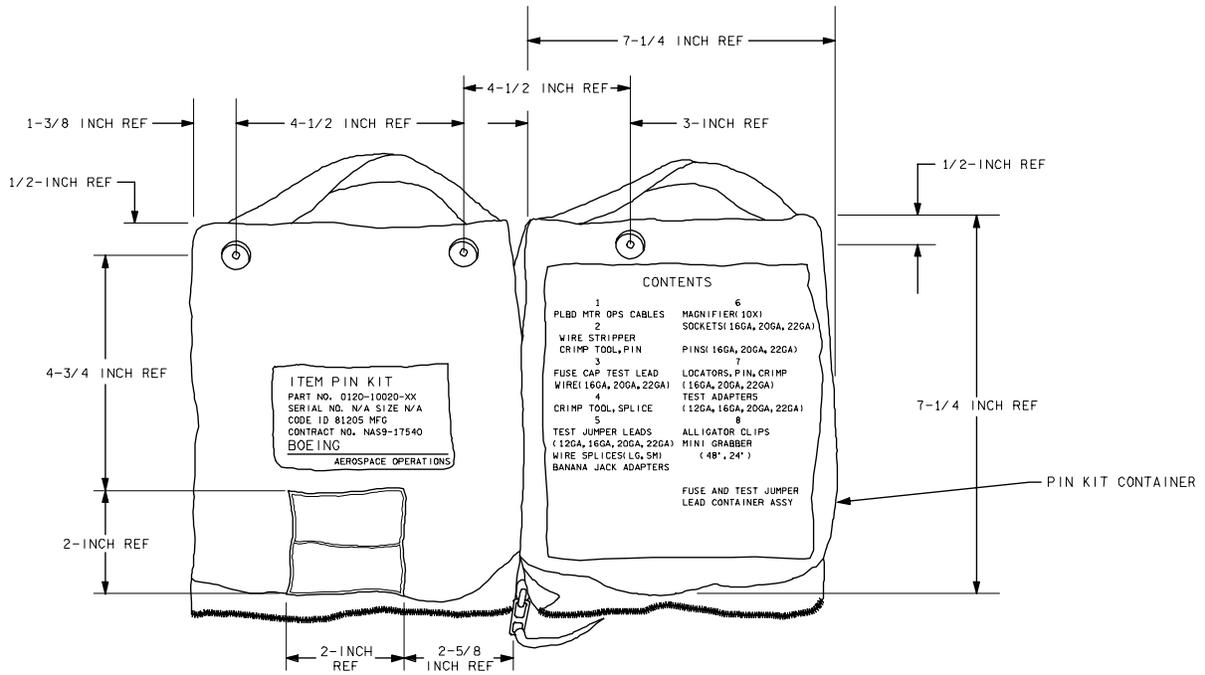
5-inch socket/socket test jumper leads
(four each of 12-, 16-, 20-, 22- gauge)

**Socket/socket and pin/pin test jumper leads,
and Ku-band antenna contingency cable**

s89-49574

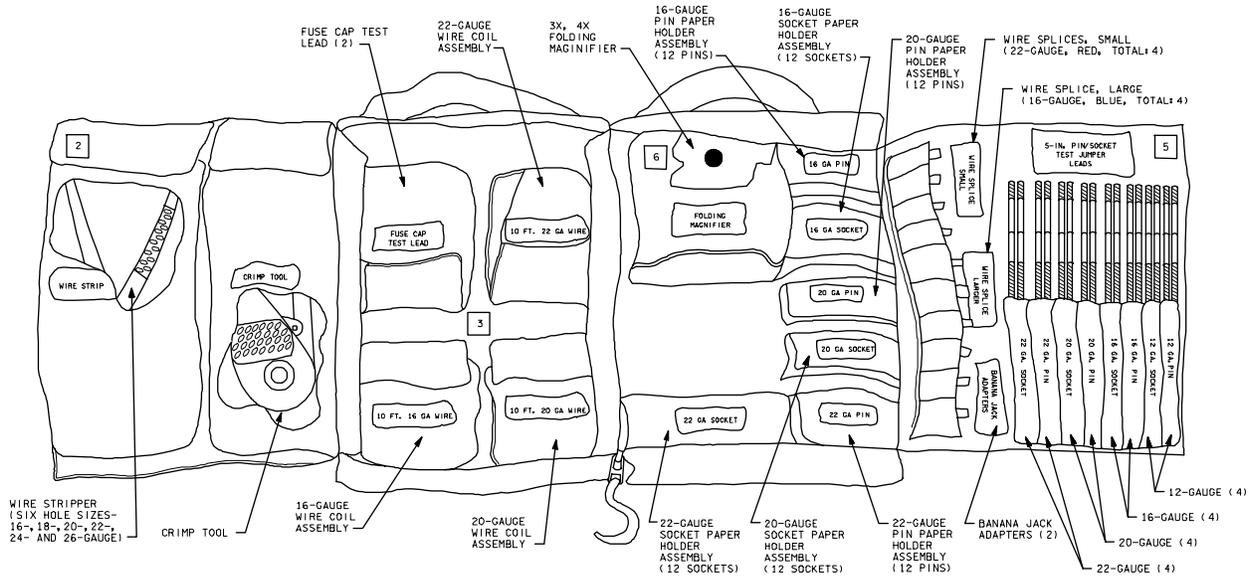


**24-inch pin/socket test jumper leads
(three 12-gauge and six 16-gauge)**

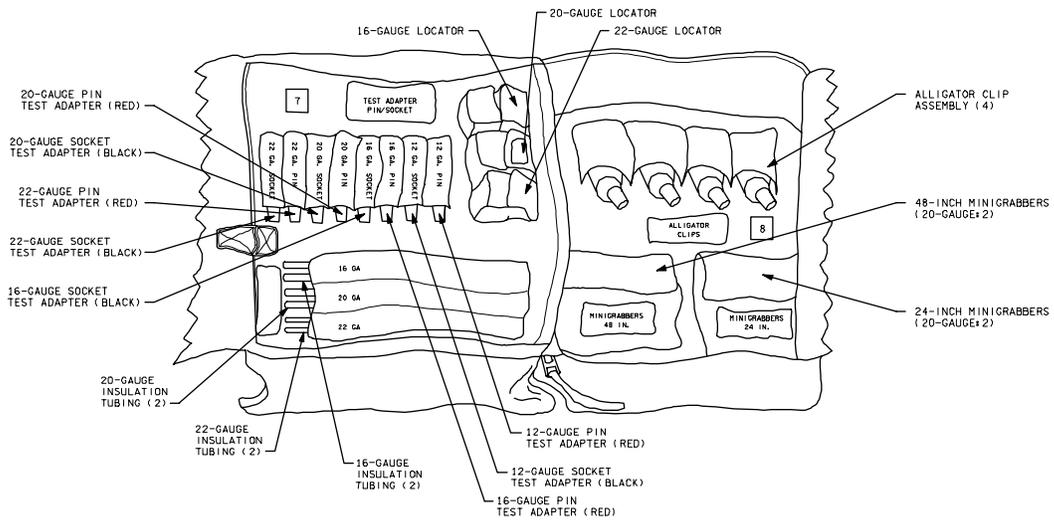


234460214, ART 4

IFM pin kit flaps 1 and 4



IFM PIN KIT FLAPS 2 AND 3, AND 5 AND 6

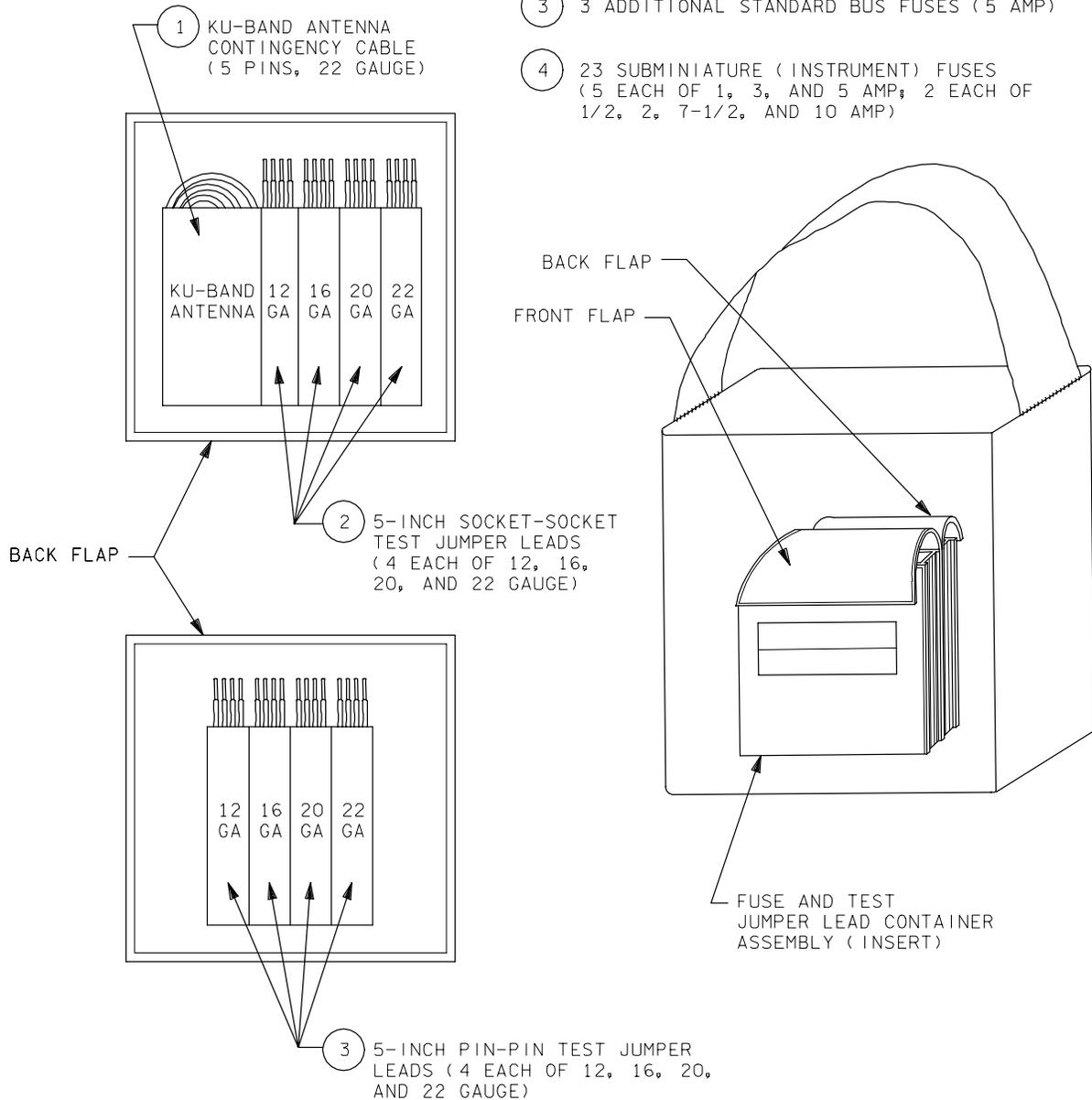


234460233, ART: 7

Top: IFM pin kit flaps 2 and 3, and 5 and 6
Bottom: IFM pin kit flaps 7 and 8

FRONT FLAP:

- ① 24-INCH PIN/SOCKET TEST JUMPER LEADS (6 EACH OF 12, 16, 20, AND 22 GAUGE)
- ② 16 STANDARD BUS FUSES (2 EACH OF 1/4, 1/2, 1, 2, 3, 5, 7-1/2, AND 10 AMP)
- ③ 3 ADDITIONAL STANDARD BUS FUSES (5 AMP)
- ④ 23 SUBMINIATURE (INSTRUMENT) FUSES (5 EACH OF 1, 3, AND 5 AMP; 2 EACH OF 1/2, 2, 7-1/2, AND 10 AMP)



234460234. ART; 5

Fuse and test jumper lead container assembly

Pin kit contents

Item	Description	Quantity
Pin kit	Alligator clips	4
	Banana jack adapter	2
	Crimp tool (see item 29) 16-gauge locator 20-gauge locator 22-gauge locator	
	Folding magnifier	1
	Fuse cap test leads 8-foot, 22-gauge	2
	Fuses (INSERT)	1/2-A, pin (subminiature)
	1-A, pin (subminiature)	5
	2-A, pin (subminiature)	2
	3-A, pin (subminiature)	5
	5-A, pin (subminiature)	5
	7.5-A, pin (subminiature)	2
	10.0-A, pin (subminiature)	2
	1/4-A, inline (cartridge)	2
	1/2-A, inline (cartridge)	2
	1-A, inline (cartridge)	2
	2-A, inline (cartridge)	2
	3-A, inline (cartridge)	2
	5-A, inline (cartridge)	5
	7.5-A, inline (cartridge)	2
	10-A, inline (cartridge)	2
Insulated pin/pin test jump leads, 5-in. (INSERT)	12-gauge	4
	16-gauge	4
	20-gauge	4
	22-gauge	4

Pin kit contents (continued)

Item	Description	Quantity
Insulated pin/socket test jumper leads, 5-in.	12-gauge	4
	16-gauge	4
	20-gauge	4
	22-gauge	4
Insulated pin/socket test jumper leads, 24-in. (INSERT)	12-gauge	6
	16-gauge	6
	20-gauge	6
	22-gauge	6
Insulated socket/socket test jumper leads, 5-in. (INSERT)	12-gauge	4
	16-gauge	4
	20-gauge	4
	22-gauge	4
Insulation tubing	16-gauge	2
	20-gauge	2
	22-gauge	2
Ku-band antenna cable (INSERT)	(Five pins) (22-gauge)	
Minigrabbers	24-in.; 20-gauge wire	2
	48-in; 20-gauge wire	2
Pins	16-gauge	12 (2 sheets of 6)
	20-gauge	12 (2 sheets of 6)
	22-gauge	12 (2 sheets of 6)
PLBD motor ops cables (22-gauge)	PLBD motor OPS cable #1 (Two pins/two sockets) (22-gauge)	1
	PLBD motor OPS cable #2 (Three pins/one socket) (22-gauge)	1
	PLBD motor OPS cable #3 (Three pins/four sockets) (22-gauge)	1
	PLBD motor OPS cable #4 (Five pins/two sockets) (22-gauge)	1

Pin kit contents (concluded)

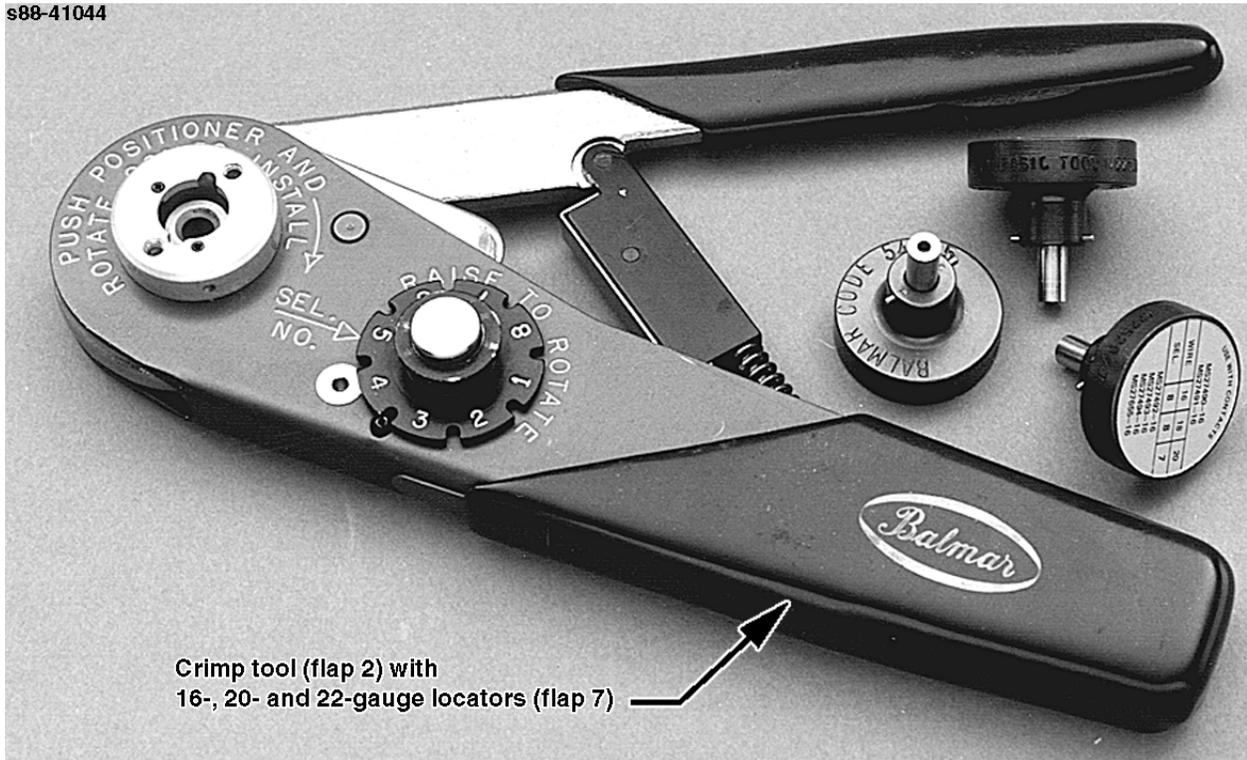
Item	Description	Quantity
Sockets	16-gauge	12 (2 sheets of 6)
	20-gauge	12 (2 sheets of 6)
	22-gauge	12 (2 sheets of 6)
Splice crimp tool (see item 29)		1
Pin test adapter (red)	12-gauge	1
	16-gauge	1
	20-gauge	1
	22-gauge	1
Socket test adapter (black)	12-gauge	1
	16-gauge	1
	20-gauge	1
	22-gauge	1
Wire, electrical	16-gauge; 10-foot	1
	20-gauge; 10-foot	1
	22-gauge; 10-foot	1
Wire splices	Large (blue) (12- and 16-gauge)	4
	Small (red) (20- and 22-gauge)	4
Wire stripper (see item 31)	Six hole sizes (16-, 18-, 20-, 22-, 24-, or 26-gauge)	1

1. Premanufactured test jumper leads and cables in the pin kit
 - a. 24-inch pin/socket test jumper leads (front flap of insert): six each of 12-, 16-, 20-, and 22-gauge; total: 24.
 - b. 5-inch pin/socket test jumper leads (flap 5): four each of 12-, 16-, 20-, and 22-gauge; total: 16.
 - c. 5-inch pin/pin test jumper leads (back flap of insert): four each of 12-, 16-, 20-, and 22-gauge; total: 16.
 - d. 5-inch socket/socket test jumper leads (back flap of insert): four each of 12-, 16-, 20-, and 22-gauge; total: 16.
 - e. Ku-band antenna cable (back flap insert) (22-gauge); used to bypass a failed Ku-band antenna deploy/stow switch on panel R13L; one flown.

- f. Payload bay door motor ops cables 1, 2, 3, and 4 (flap 1) (22-gauge); used with MDM PL1 in avionics bay 1 or MDM PL2 in avionics bay 2 to perform payload bay door motor operations; four flown.
 - g. Fuse cap test lead (flap 3); this special premanufactured 8-foot 22-gauge cable attaches to the bus type fuse #10 (and replaces the standard fuse cap) on PCA 1 (for fuel cell 1) in avionics bay 1 or PCA 3 (for fuel cells 2 or 3) while performing the fuel cell contingency powerup IFM procedure; two flown.
 - h. 24-inch and 48-inch minigrabbers (flap 8); these 20-gauge jumper wires with spring-loaded clamping hooks on each end can be used to connect to the middle of a wire length whose insulator has been spread or to bypass a failed switch; two of each or a total of four flown.
2. Materials to manufacture 16-, 20-, or 22-gauge jumper leads with pins or sockets
- a. Wire (flap 3) (10 feet each of 16-, 20-, and 22-gauge wire).
 - b. Wire stripper (flap 2). See item 31.
 - c. Crimp tool (flap 2). See item 29.
 - d. Crimp tool locators (flap 7). See item 29.
 - e. Insulation tubing (flap 7) (two pieces each of 16-, 20-, and 22-gauge tubing).
 - f. Pins (flap 6) (12 each of 16-, 20-, and 22-gauge; total: 36).
 - g. Sockets (flap 6) (12 each of 16-, 20-, and 22-gauge; total: 36).
 - h. Splice crimp tool (flap 4). See item 30.
 - i. Wire splices (flap 5). See item 30.
3. Adapters in the pin kit for use with the Fluke 87 multimeter (see page 2-42)
- a. Alligator clips (flap 8); four flown.
 - b. Pin/socket test adapters (flap 7); (one pin (red) and one socket (black) each for 12-, 16-, 20-, and 22-gauge; total: eight).
4. Miscellaneous items
- a. Banana jack adapters (flap 5); not used (were used with the multimeter test leads that are no longer flown); (two flown)
 - b. 3x, 4x folding magnifier (flap 6); (used for reading connector maps). Use singly or together for a combined 7x effect.

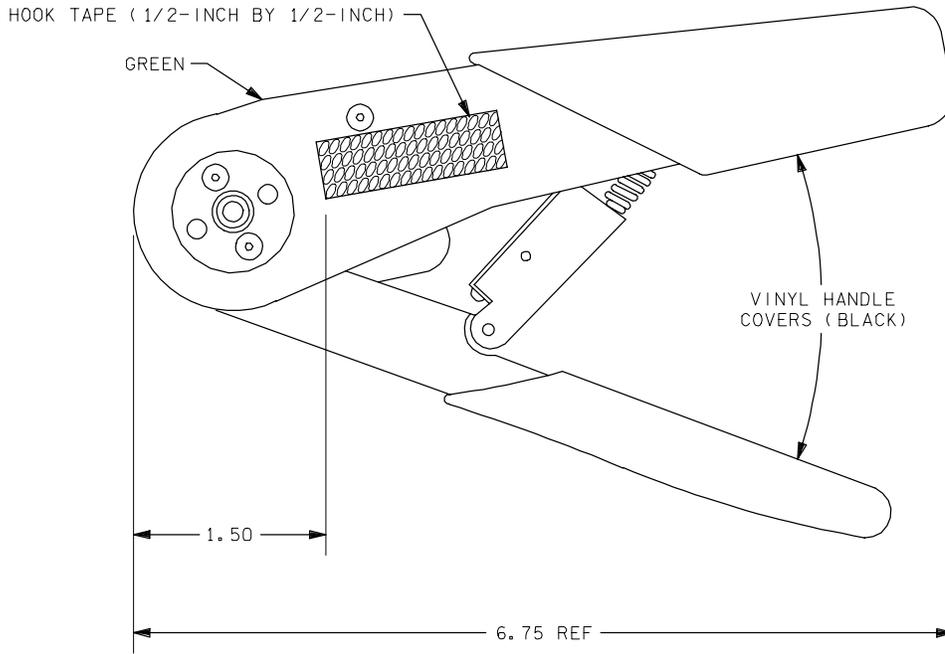
CRIMP TOOL

s88-41044

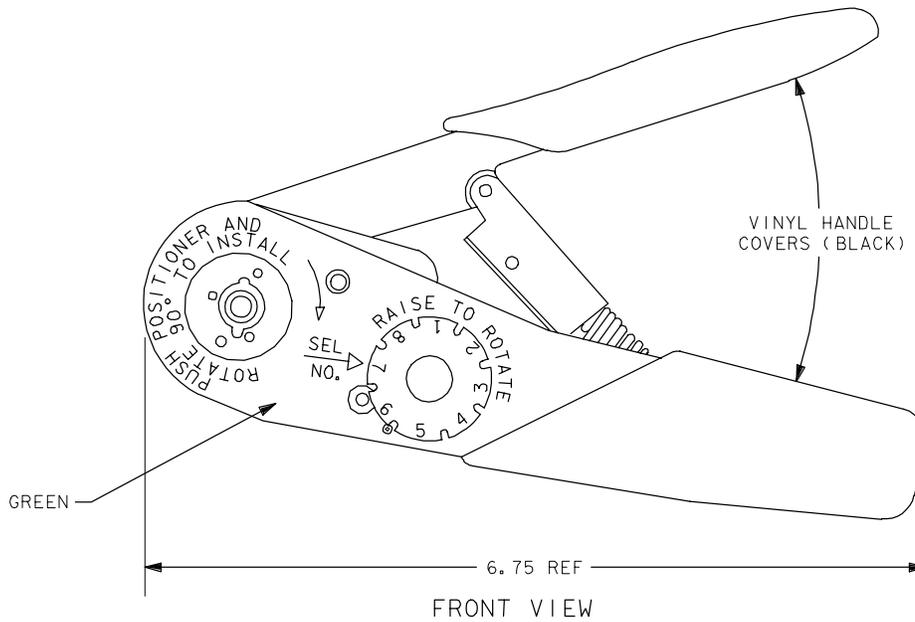


Crimp tool (flap 2) with
16-, 20- and 22-gauge locators (flap 7)

Item 28 Technical Information	
Location	IFM tool locker drawer 1 (pin kit)
Other drawings	528-20166 (crimp tool assembly, pin kit)
Manufacturer	Daniels Manufacturing Company/Boeing
Quantity flown	One



BACK VIEW



234460215. ART# 6

Crimp tool

COMMENTS

The crimp tool and crimp tool locators are stowed in the IFM pin kit.

1. Crimp tool (flap 2) - Used to attach pins or sockets to the ends of wires. It requires the use of a locator.

Selector (lifts and rotates/settings 1 through 8; sets crimping depth of the four crimp tool teeth).

1 = Maximum crimp (for the smallest wire; for example, a 22-gauge pin or socket on a 26-gauge wire).

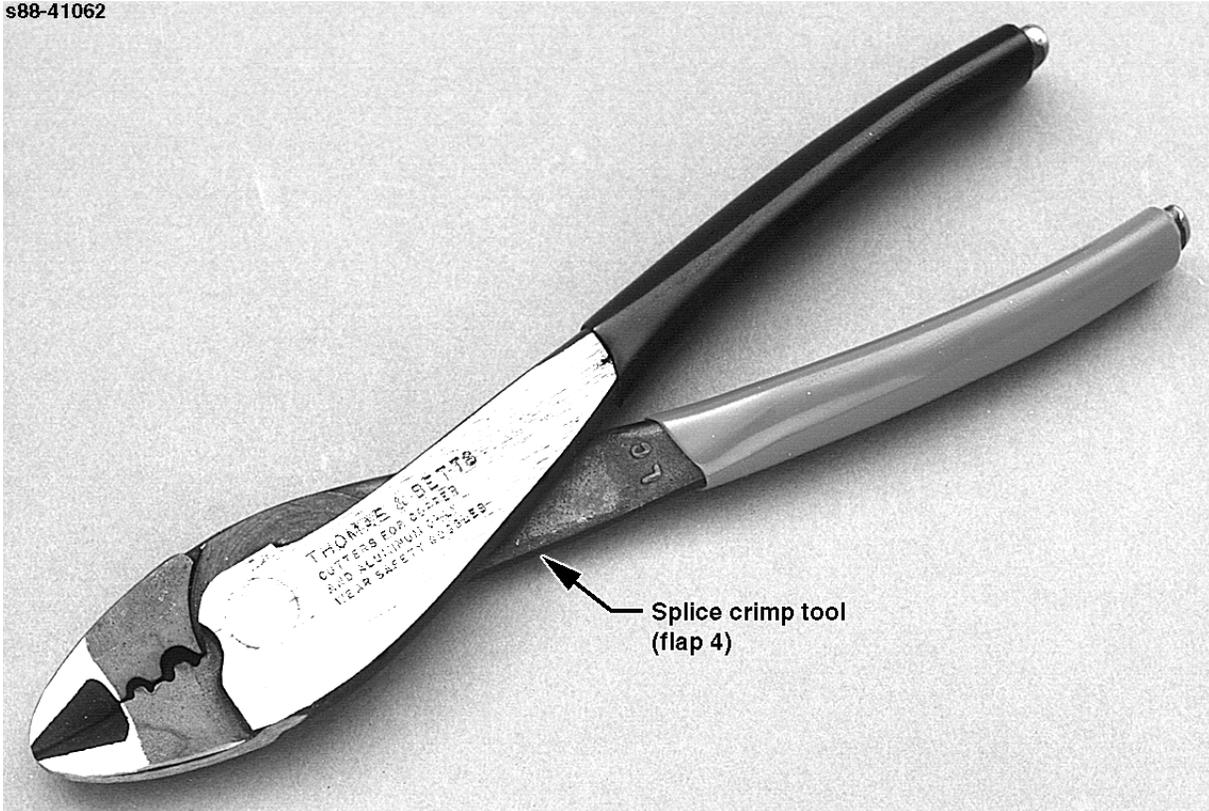
8 = Minimum (for the largest wire; for example, a 16-gauge pin or socket on a 16- or 18-gauge wire).

Note: Ensure that the tool is fully open before inserting the pin/socket into the crimp tool teeth hole. If the pin/socket is not fully inserted into the crimp tool teeth hole, it may cause the tool to jam or the pin/socket to be improperly crimped onto the wire.

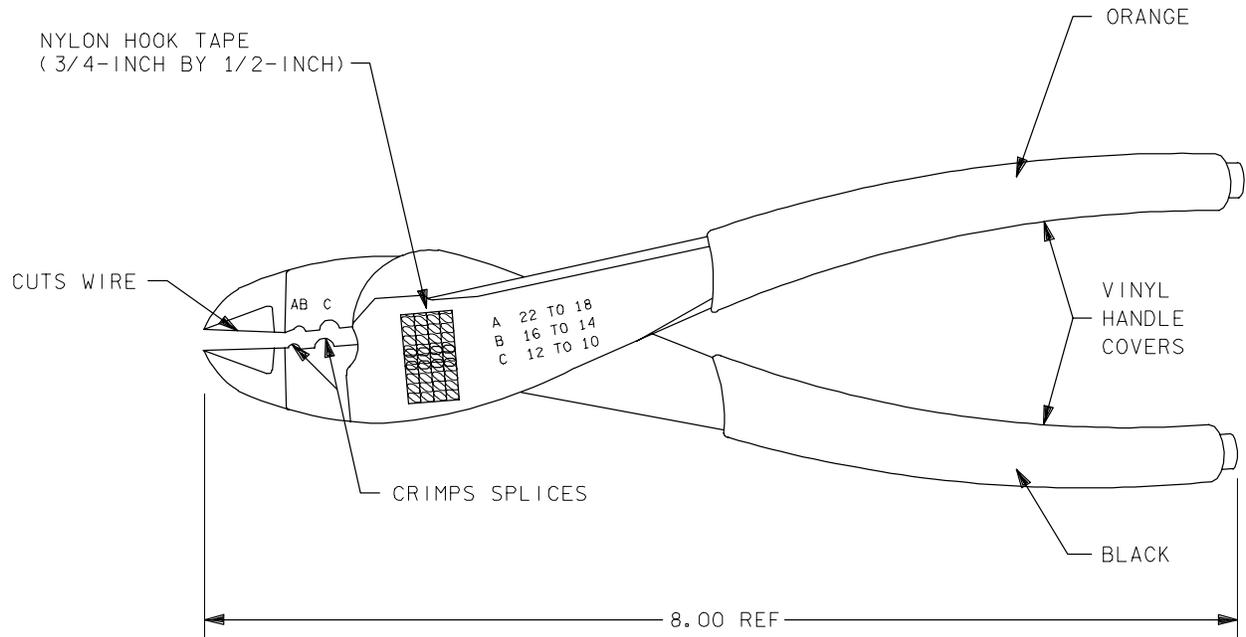
2. Crimp tool locators (flap 7) - Used with the crimp tool; each of three locators is sized for a particular gauge pin or socket (16-, 20-, and 22-gauge). Each locator has a printed legend for determining selector setting.
 - a. 16-gauge pin/socket locator
 - (1) 16-/18-gauge wire - Selector setting 8
 - (2) 20-gauge wire - Selector setting 7
 - b. 20-gauge pin/socket locator
 - (1) 20-gauge wire - Selector setting 6
 - (2) 22-gauge wire - Selector setting 5
 - (3) 24-gauge wire - Selector setting 4
 - c. 22-gauge pin/socket locator
 - (1) 22-gauge wire - Selector setting 3
 - (2) 24-gauge wire - Selector setting 2
 - (3) 26-gauge wire - Selector setting 1

SPLICE CRIMP TOOL

s88-41062



Item 29 Technical Information	
Location	IFM tool locker drawer 1 (pin kit)
Other drawings	528-20165 (splice crimp tool assembly, pin kit)
Manufacturer	Thomas and Betts, Inc./Boeing
Quantity flown	One



234460216. ART 4

Splice crimp tool

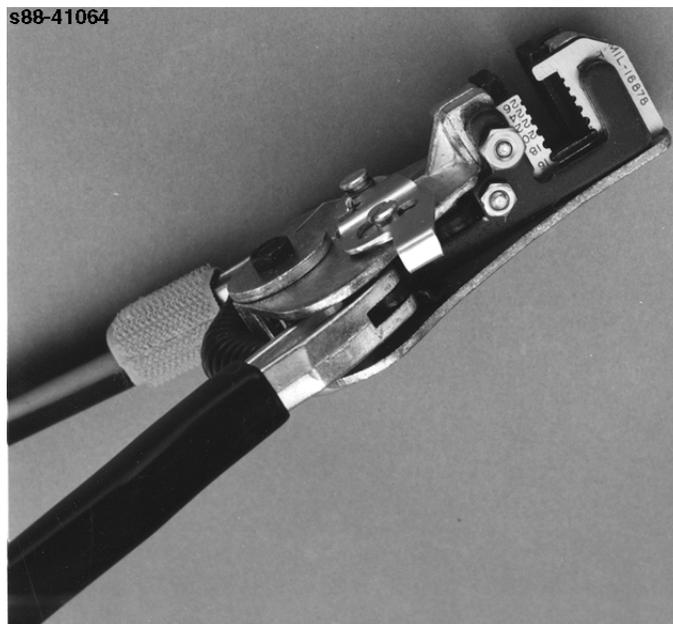
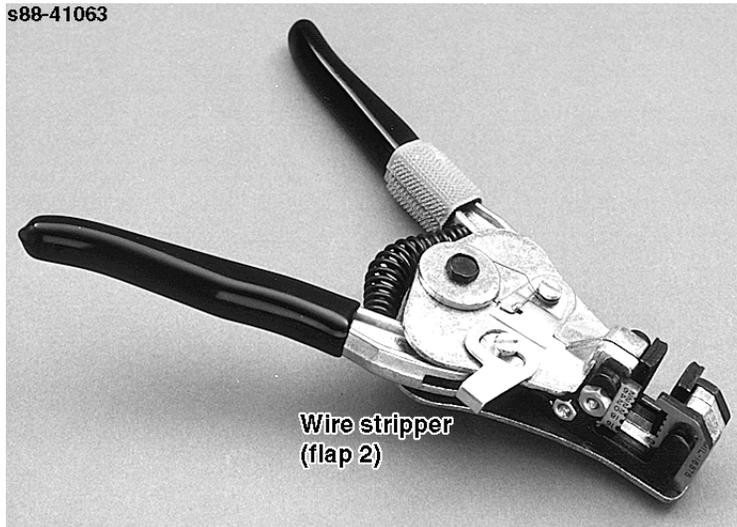
COMMENTS

The splice crimp tool is stowed in flap 4 of the IFM pin kit. It is used for splicing wires together (by crimping a wire splice) or cutting wires. There are two splice grooves, A/B (normally used) and C. The tool has the following inscription (refer to illustration):

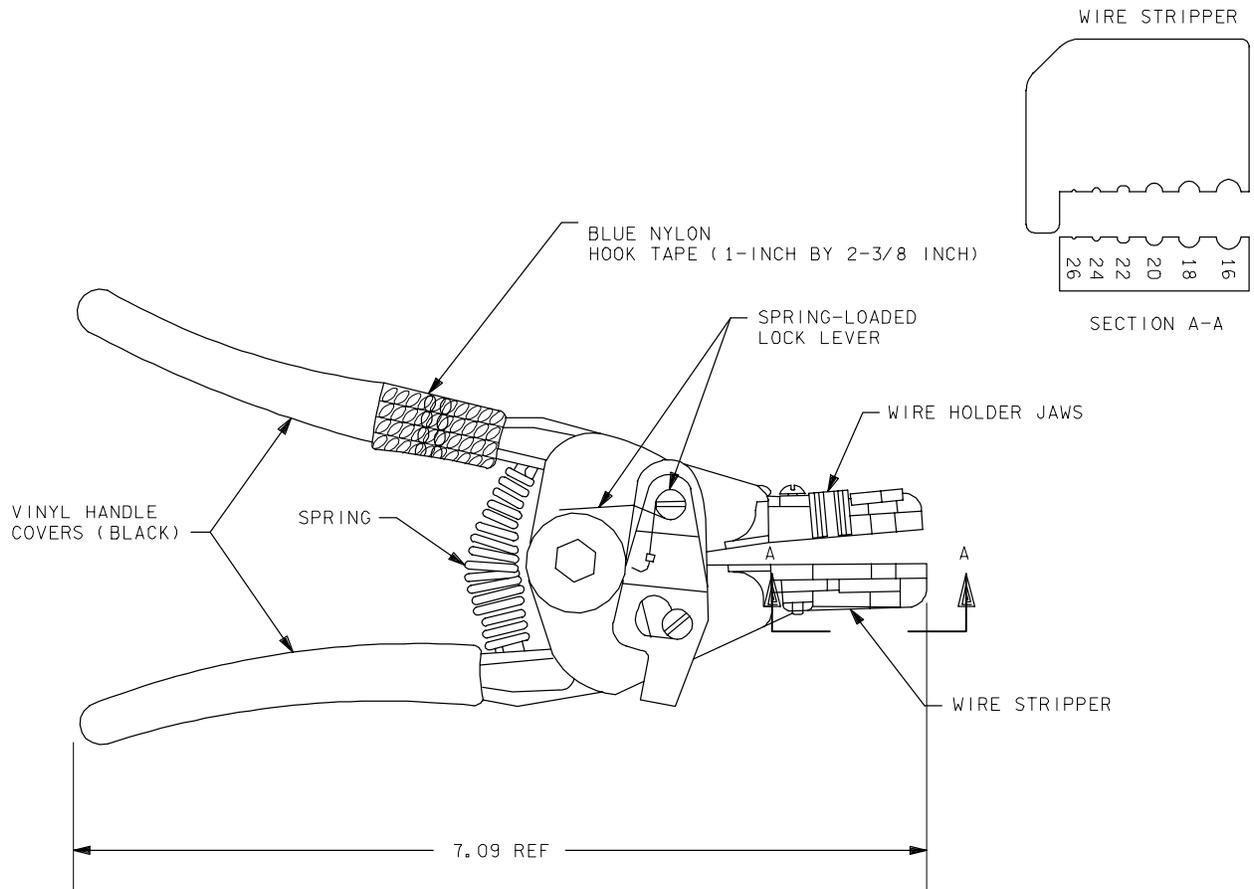
- A 22 to 18 (gauge wires)
- B 16 to 14 (gauge wires)
- C 12 to 10 (gauge wires)

Eight wire splices (four red and four blue) are in flap 5 of the IFM pin kit.

WIRE STRIPPER



Item 30 Technical Information	
Location	IFM tool locker drawer 1 (pin kit)
Other drawings	528-20167 (wire stripper assembly, pin kit)
Manufacturer	Ideal Industries, Inc./Boeing
Quantity flown	One



234460217. ART 4

Wire stripper

COMMENTS

The wire stripper is stowed in flap 2 of the IFM pin kit. It is used to

1. Strip insulation from wires before attaching pins and sockets (strip approximately 3/16 inch).
2. Strip insulation from wires before splicing wires together, using the splice crimp tool and a wire splice (strip approximately 1/4 inch).
3. Spread insulation in the middle of a length of wire.

The wire stripper has six hole sizes (16-, 18-, 20-, 22-, 24-, and 26-gauge wires).

To strip or spread the insulation on a wire, place the wire with the desired location of cut in the proper die for that wire size and squeeze the handles.

VELCRO CABLE STRAP KIT



Item 31 Technical Information	
Location	IFM tool locker drawer 1
CCCD drawing	SED32103900
Quantity flown	One kit

COMMENTS

The Velcro strap kit consists of a Ziploc bag that contains 50 Velcro straps (item 36).

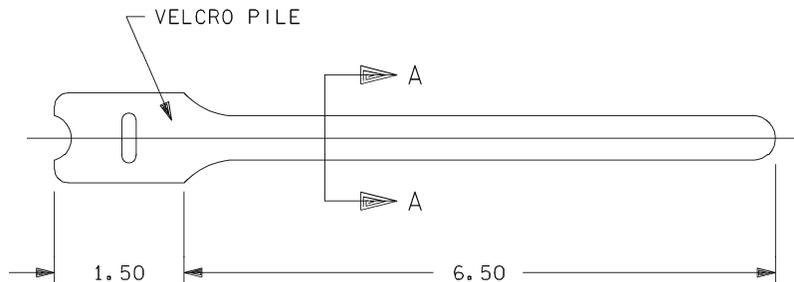
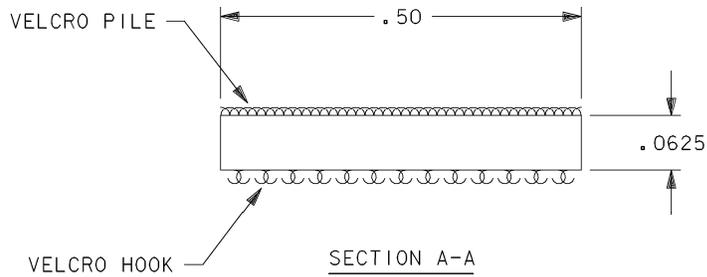
Qty per assembly	Item	Description	Part number/ specification
-05			
1	①	Ziploc bag 6 in. by 6 in. by 0.004 in. thick	528-50000-2

VELCRO CABLE STRAP

s94-036284



Item 32 Technical Information	
Location	IFM tool locker drawer 1
CCCD part number	528-43074-1
CCCD drawing	SED32103900
Other drawings	V627-650631 (strap-assembly cable securing universal)/ 10105-10059 (strap-Velcro cable restraint)
Manufacturer	Rockwell/Boeing (responsibility transferred from ILC)
Quantity flown	50



0033521. ART. 1

Velcro strap

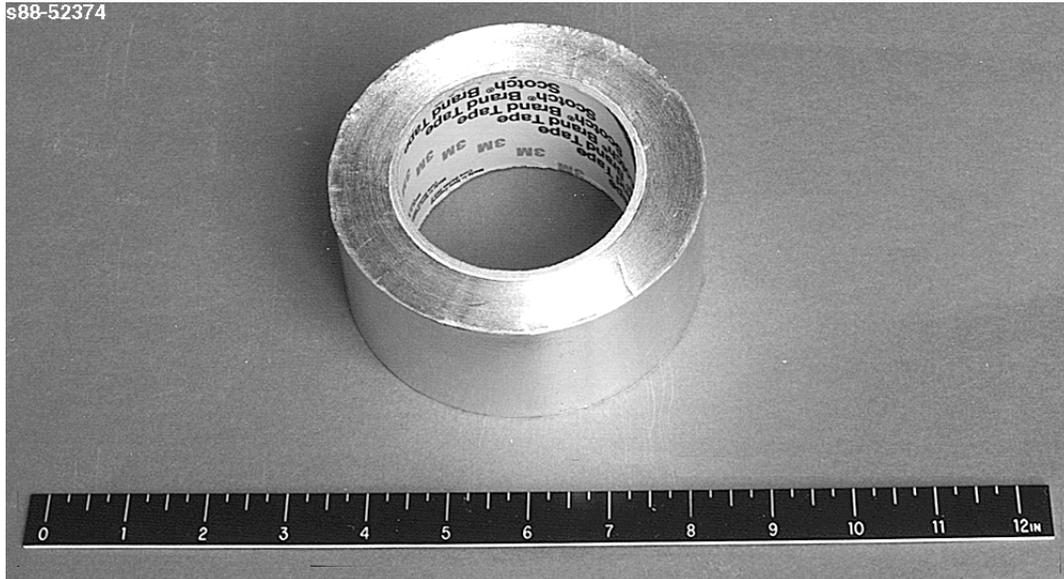
COMMENTS

Fifty of these Velcro straps are flown in the small Ziploc bag.

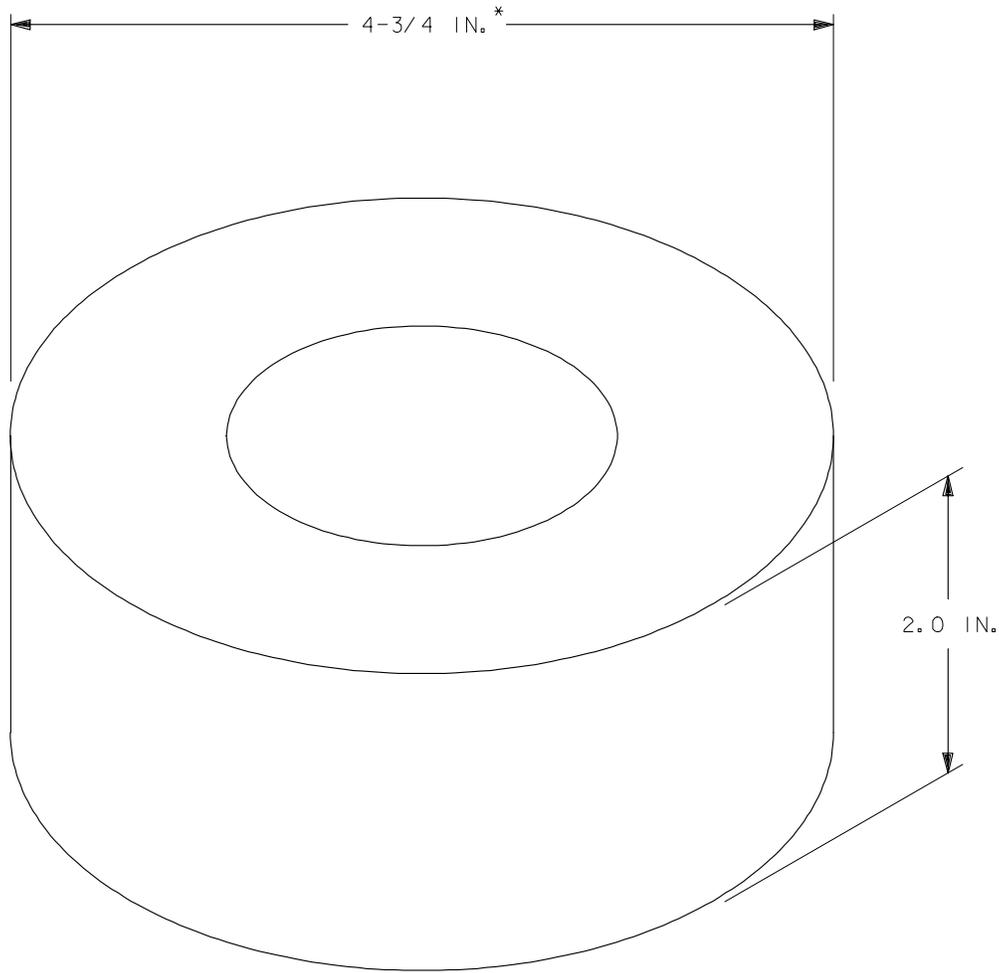
The same type of Velcro strap is flown in

1. This drawer to secure the CWS contingency power cables (six flown) and the PBI braided cord (one flown)
2. The IFM contingency hose and cable kit to secure the contingency hoses and cables (15 flown)
3. The IFM tool locker drawer 3 to secure the flexible handsaw (two flown)
4. The vacuum cleaner locker to secure the vacuum cleaner power cord (two flown)

ALUMINUM TAPE



Item 33 Technical Information	
Location	IFM tool locker drawer 1
CCCD part number	528-41020-3
CCCD drawing	SED32103900
Other drawings	528-41020 (tape 3M/three sheets)
Manufacturer	3M
Manufacturer part number	425
Weight	15.83 oz
Material	Aluminum
Quantity flown	One



* THE MINIMUM DIAMETER IS 4-1/4 INCHES.

234460227. ART: 4

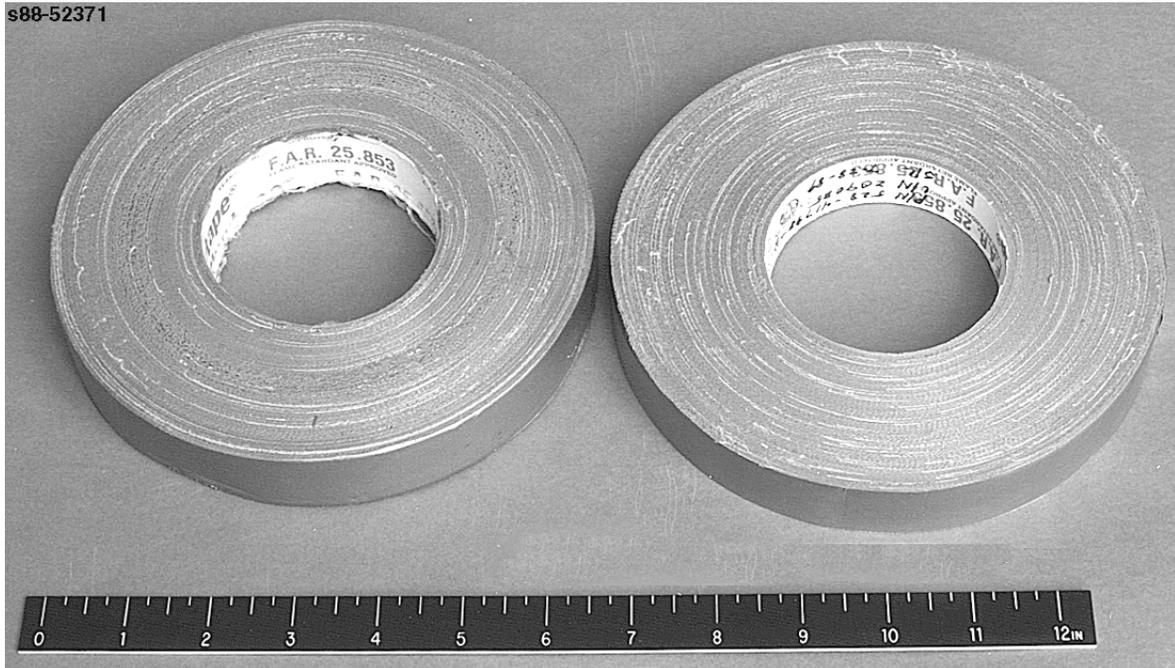
Aluminum tape¹²

COMMENTS

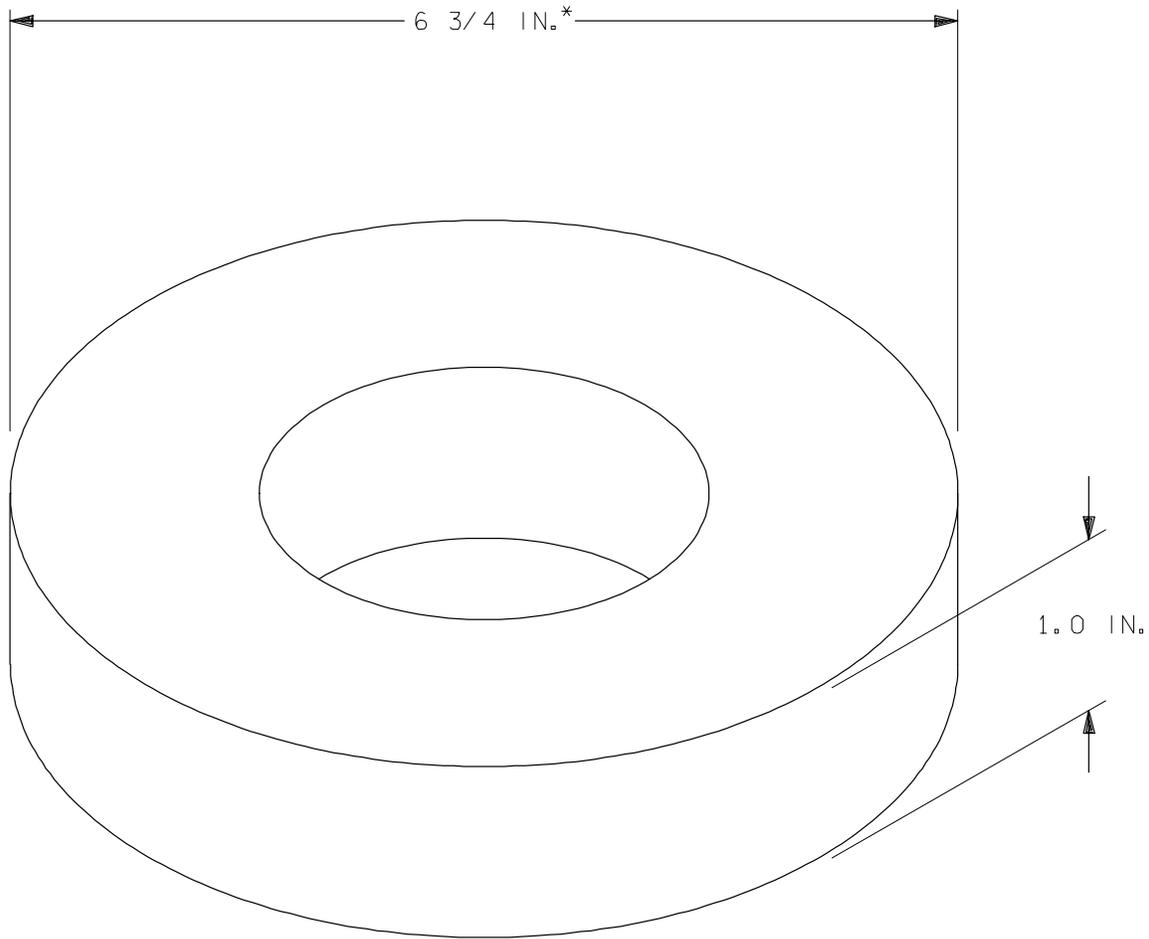
Tape is 2 inches wide by 180 feet; it has sharp edges. The shelf life is 1 year from the date of purchase. This tape could be used to tape over IFM tools or other items that are required for EVA use. The tape provides thermal protection and prevents offgassing.

¹² Postflight Manual for Flight Crew Equipment, JSC-19128, October 1988.

GENERAL PURPOSE TAPE (1-INCH)



Item 34 Technical Information	
Location	IFM tool locker drawer 1
CCCD part number	528-41798-5
CCCD drawing	SED32103000
Other drawings	10104-20013 (general purpose tape, one sheet)/ 528-41798 (tape, polyethylene/cotton)
Manufacturer	Shuford Mills
Manufacturer part number	PC-21F 0.1 in.
Weight	1.2 lb
Quantity flown	One



* THE MINIMUM DIAMETER IS 5-1/2 INCHES.

234460228. ART. 4

General purpose tape (1-inch)¹³

COMMENTS

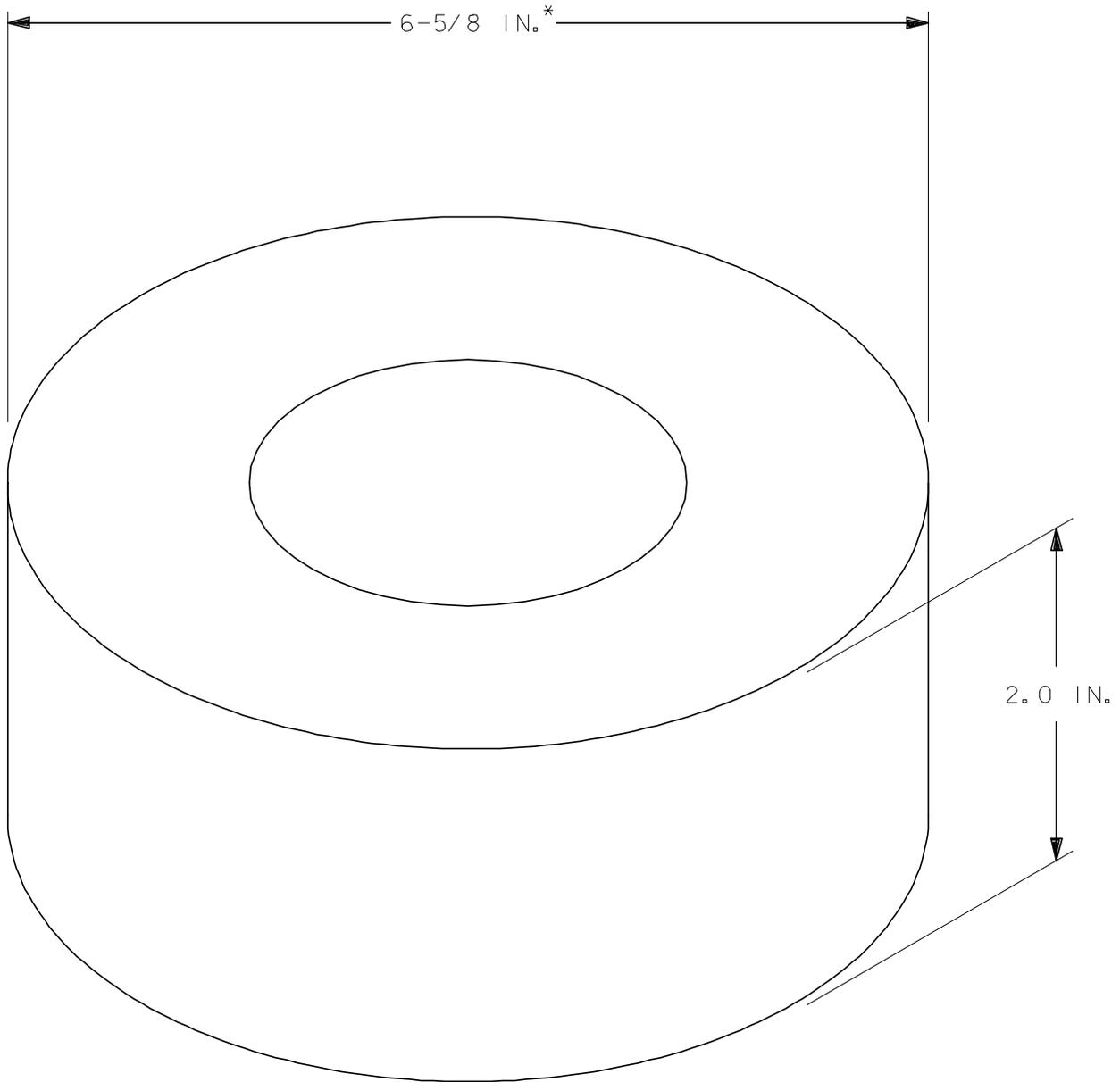
Tape is a 1-inch by 180-foot roll. Shelf life is 1 year from the date of purchase.

¹³ Postflight Manual for Flight Crew Equipment, JSC-19128, October 1988.

GENERAL PURPOSE TAPE (2-INCH)



Item 35 Technical Information	
Location	IFM tool locker drawer 1
CCCD part number	528-41798-6
CCCD drawing	SED32103000
Other drawings	528-40878 (tape, general purpose/three sheets)
Manufacturer	Shuford Mills
Manufacturer part number	PC-21F 0.2 inch
Weight	2.345 lb
Material	Waterproof, polyethylene coated, letter free, silver
Quantity flown	Two



* THE MINIMUM DIAMETER IS 5-1/2 INCHES.

234460229. ART; 4

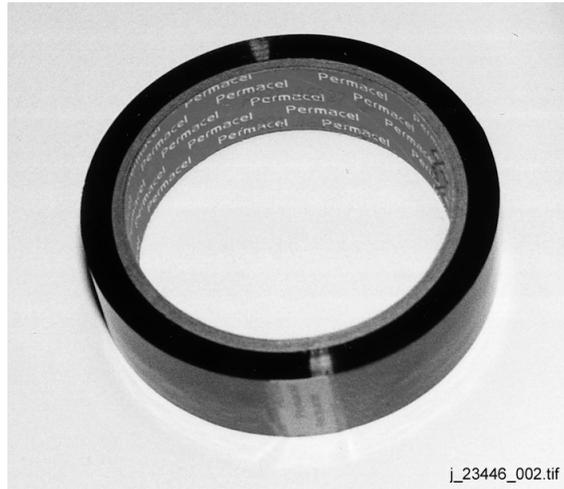
General purpose tape (2-inch)¹⁴

COMMENTS

Tape is a 2-inch by 180-foot roll. Shelf life is 1 year from date of purchase

¹⁴ Postflight Manual for Flight Crew Equipment, JSC-19128, October 1988.

KAPTON TAPE (1-INCH)

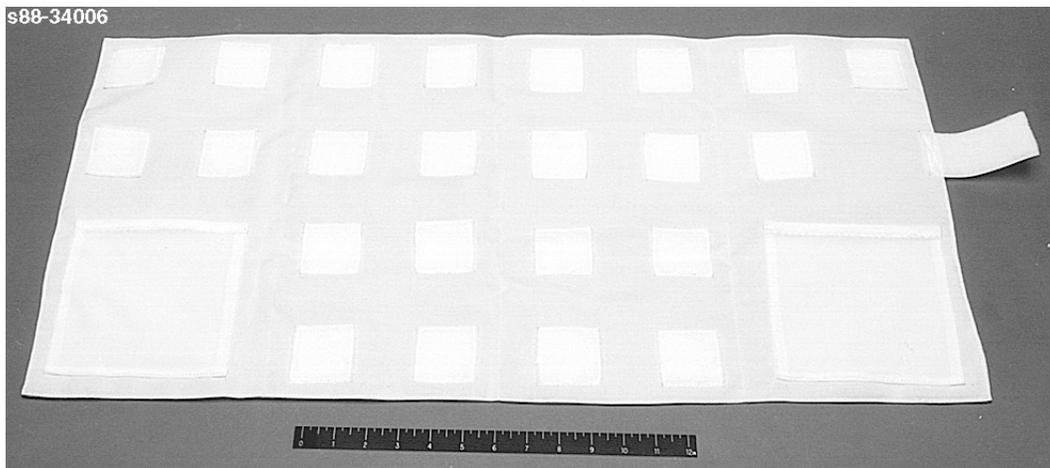
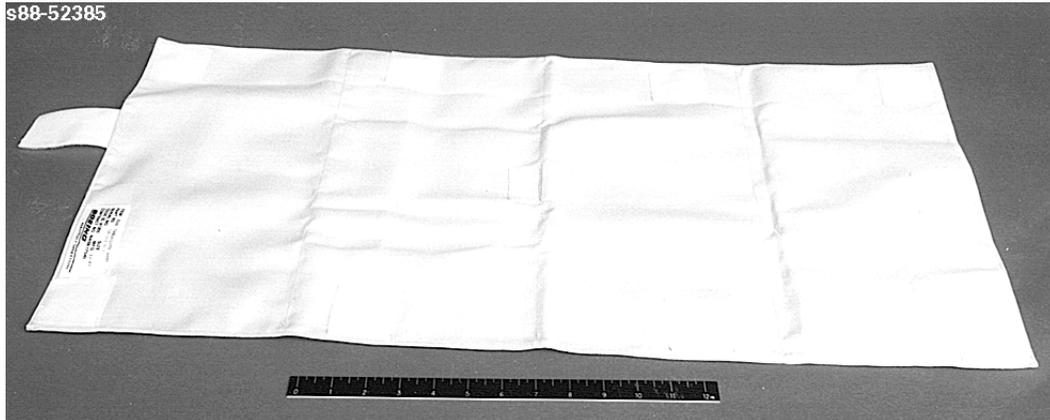


Item 36 Technical Information	
Location	IFM tool locker drawer 1
CCCD part number	528-41353
CCCD drawing	SED32105000
Other drawing	
Manufacture	PERMACEL
Weight	
Quantity Flown	One (36 yd)

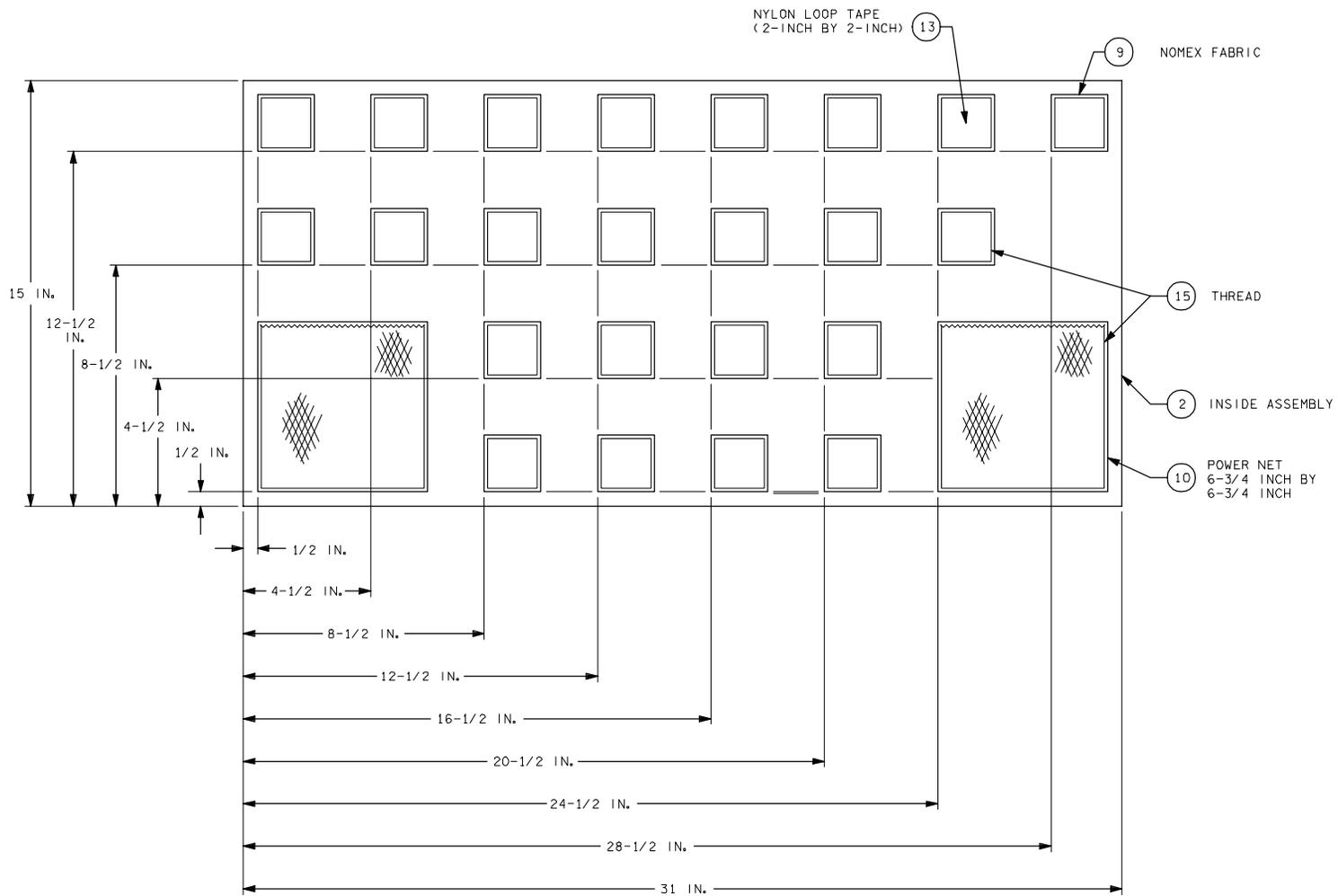
COMMENTS

The Kapton tape was used to repair the standoff cross paint delamination of the Mir Docking Module Axial Target (DMAT) during STS-79 (STS-79 CHIT 015). However, it was officially added to the IFM tool locker for STS-86 and subs. It has a shelf life of 18 months from date of manufacture, and the supplier part number is PERMACEL P221.

TOOL TABLECLOTH (TOOL CADDY)



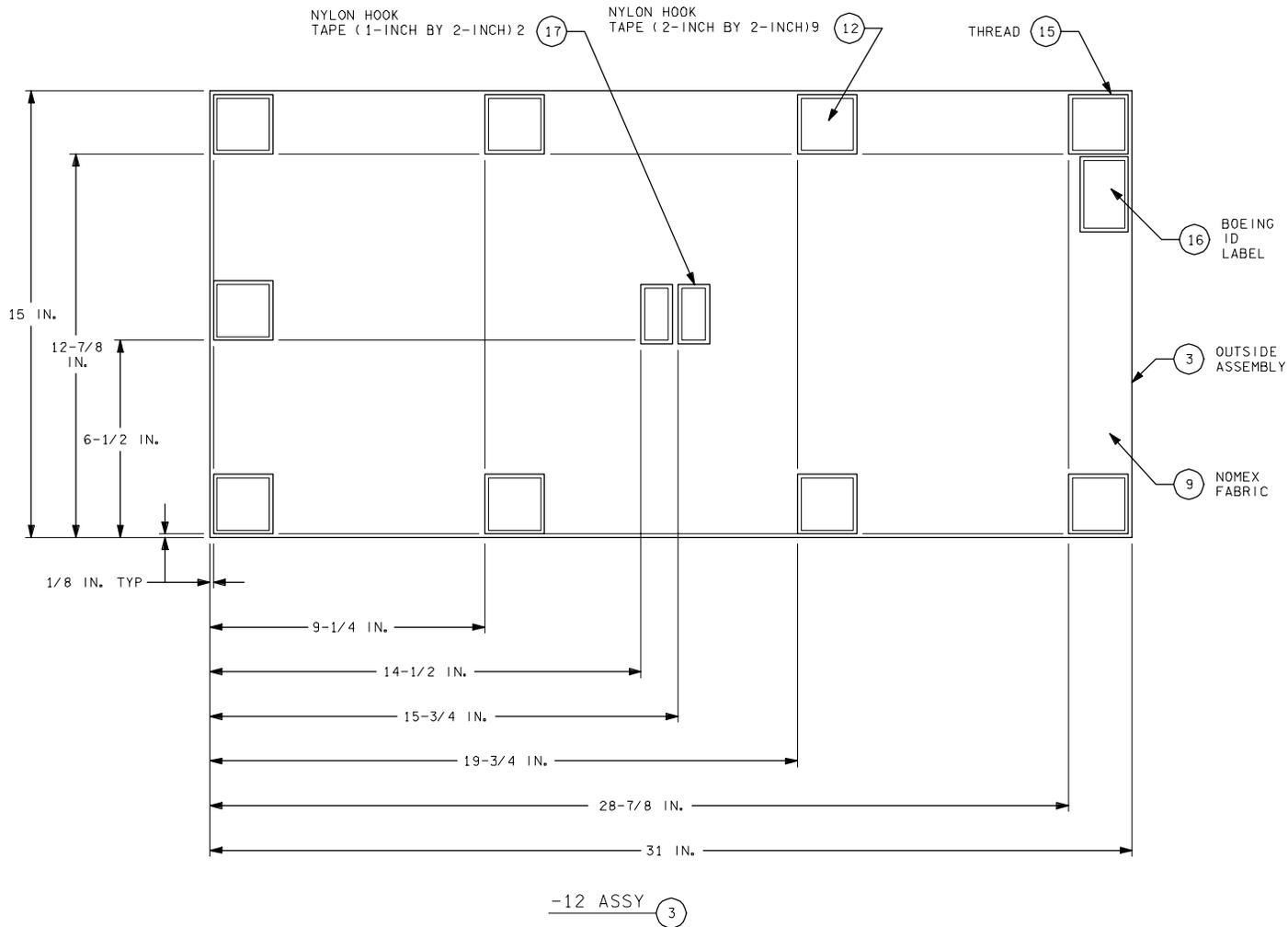
Item 37 Technical Information	
Location	IFM tool locker drawer 1
CCCD part number	528-20158-1
CCCD drawing	SED32103900
Other drawings	528-20158 tool tablecloth assembly (IFM tool kit/four sheets)
Manufacturer	Boeing
Weight	7.3 oz
Quantity flown	One



-11 ASSY (2)

234460231, ART, 5

Tool tablecloth (front side, to which tools attach)



234460230, ART. 4

Tool tablecloth (back side, which attaches to orbiter loop tape)

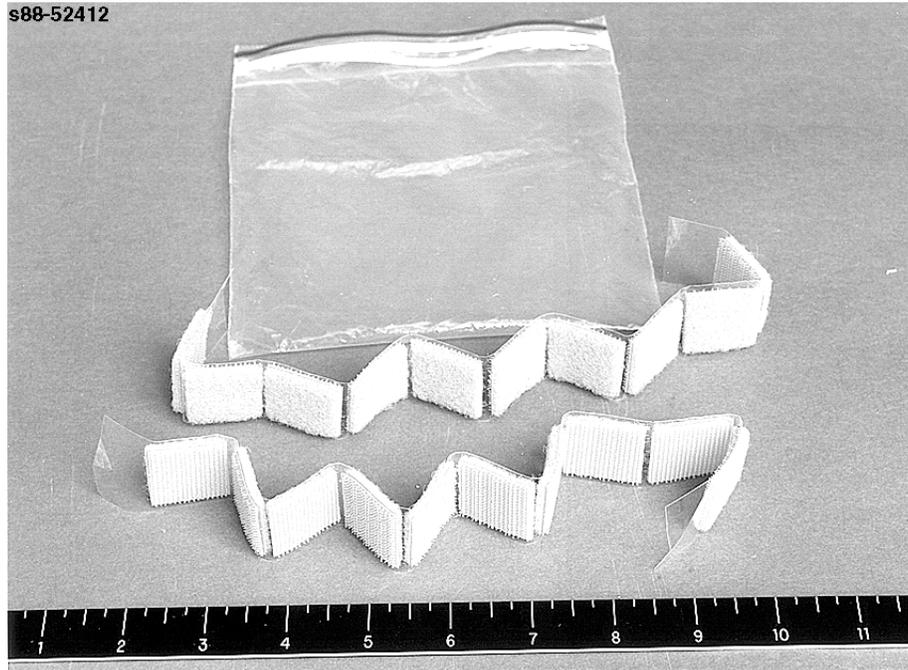
Qty req'd			Find number	Part or identifying number	Nomenclature or description	Material and specification
-12	-11	-1				
			①	528-20158-1	Tablecloth assembly	
		1	②	528-20158-11	Inside assembly	
		1	③	528-20158-12	Outside assembly	
1	1	-	⑨	528-20158-21	Fabric, Nomex	15-1/2 in. by 31-1/2 in. made from 526-40701-1
-	2	-	⑩	528-20158-22	Power net	6-3/4 in. by 6-3/4 in. made from 528-41032-2
-	2	-	⑪	528-40813-1	Braid elastic	1/4 in. by 6-3/4 in. polyester
9	-	-	⑫	528-40219-4	Hook tape	2-in. by 2-in. nylon
-	23	-	⑬	528-40818-11	Loop tape	2-in. by 2-in. nylon
1	-	-	⑭	528-20158-23	Loop tape	0.1 in. by 3-7/8 in. nylon made from 528-408180-11
A/R	A/R	A/R	⑮	528-40814-2	Thread	Size E, nylon
1	-	-	⑯	528-20003-1	Boeing label	
2	-	-	⑰	528-40819-1	Hook tape	1-in. by 2-in. nylon

COMMENTS

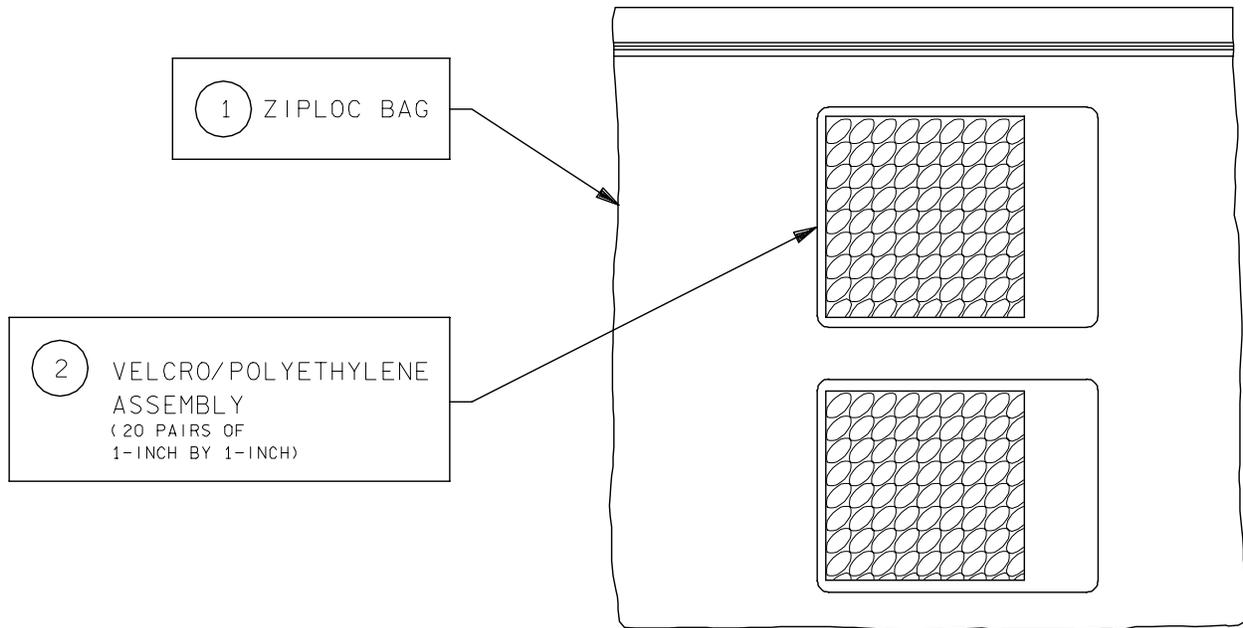
This tablecloth can be used as a tool caddy while performing an IFM task to secure IFM tools.

Note: More Velcro could not be placed on the tool tablecloth because of flammability requirements.

VELCRO KIT (1-INCH BY 1-INCH)



Item 38 Technical Information	
Location	IFM tool locker drawer 1
CCCD part number	10104-20004-04
CCCD drawing	SED32103900
Other drawings	10104-20004 (Velcro kit/two sheets)
Manufacturer	Boeing (responsibility transferred from ILC)
Weight	0.9 oz
Quantity flown	One



23446232A. ART# 2

Velcro kit (1-inch by 1-inch)

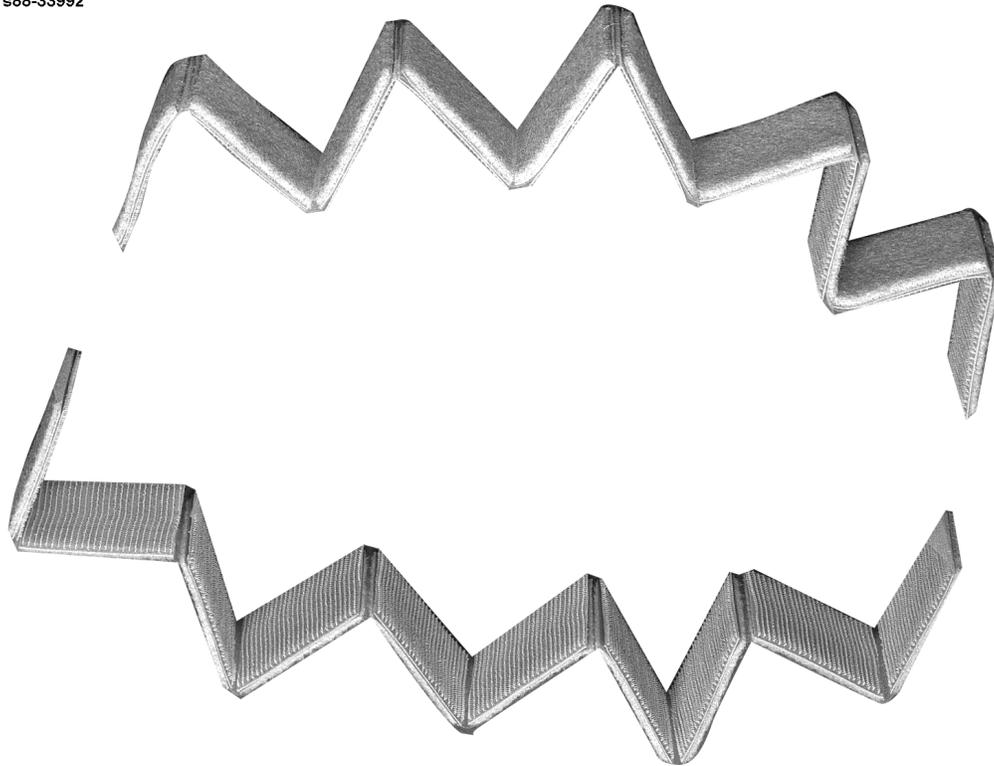
Qty per assembly -04	Item	Description	Part number/ specification
	~	Velcro kit (1-in. by 1-in.)	10104-20004-04
1	(1)	Ziploc bag (6-in. by 6-in. by 0.004-in. thick)	528-50000-2
2	(2)	Velcro/polyethylene assembly (1-in.)	10104-20004-11

COMMENTS

The Velcro kit consists of 20 pairs of 1- by 1-inch hook and loop type adhesive-backed yellow Velcro strips. These strips are packaged in 2 bundles of 10 pairs and are stowed inside a Ziploc bag. Each pair consists of 1 hook and 1 loop type (total: 20 hook type and 20 loop type). Shelf life is 1 year.

VELCRO KIT (2-INCH BY 2-INCH)

s88-33992

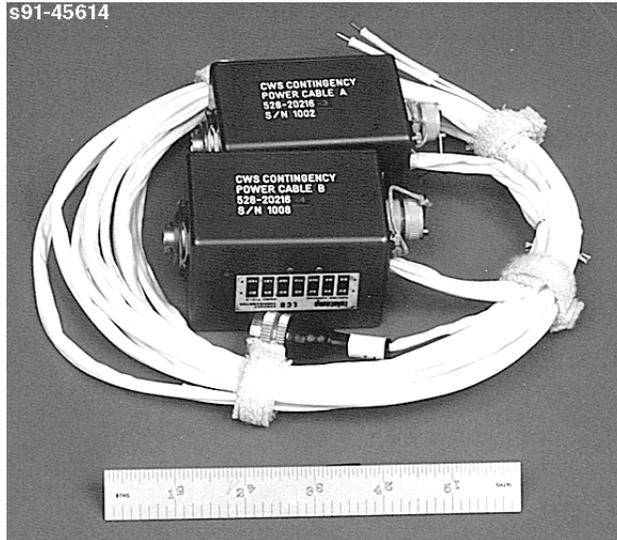


Item 39 Technical Information	
Location	IFM tool locker drawer 1
CCCD part number	10104-20004-05
CCCD drawing	SED32103900
Other drawings	10104-20004 (Velcro kit/two sheets)
Manufacturer	Boeing (responsibility transferred from ILC)
Weight	2.97 oz
Quantity flown	One

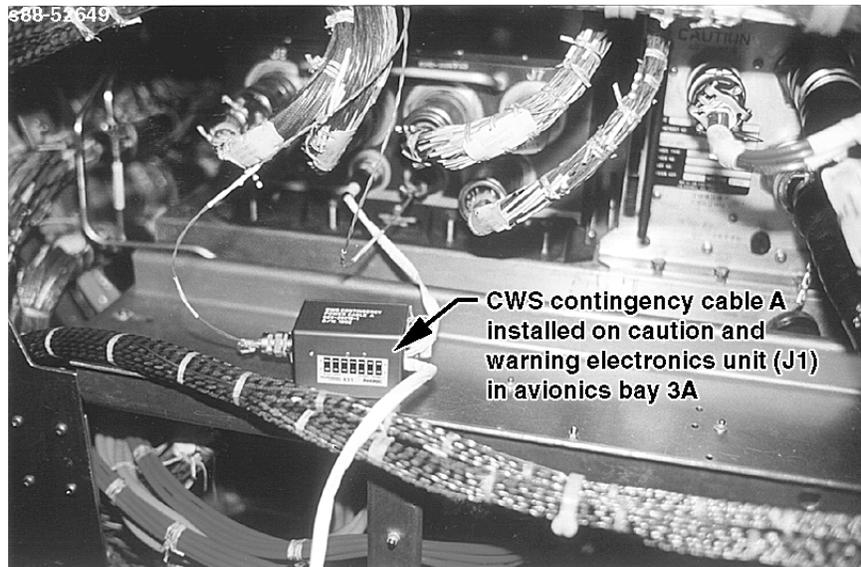
COMMENTS

The Velcro kit consists of 20 pairs of 2- by 2-inch hook and loop type adhesive-backed yellow Velcro strips. The strips are packaged in 2 bundles of 10 pairs and are stowed inside a Ziploc bag. Each pair consists of 1 hook and 1 loop type (total: 20 hook type and 20 loop type). Shelf life is 1 year.

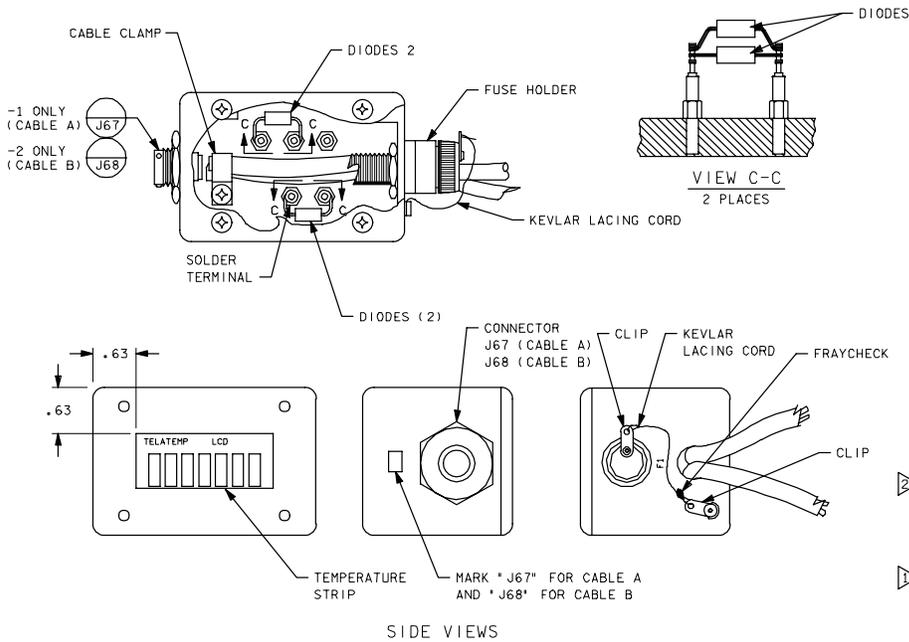
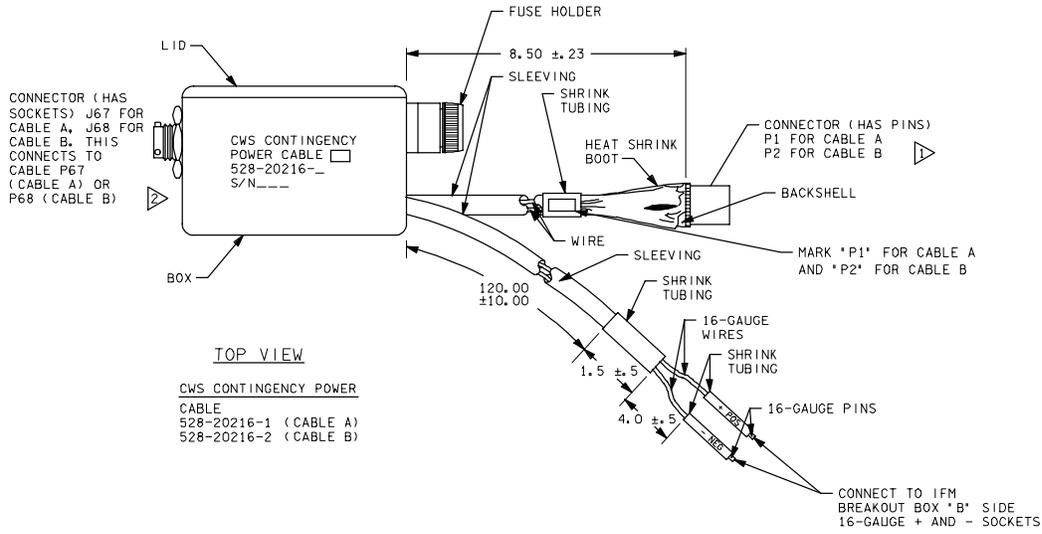
CWS CONTINGENCY POWER CABLES



Item 40 Technical Information	
Location	IFM tool locker drawer 1
CCCD part number	528-20216-3 (cable A)/-4 (cable B)
CCCD drawing	SED32103900
Other drawings	528-20216 (CWS contingency power cable)
Manufacturer	Boeing
Weight	Cable A - 13.74 oz Cable B - 13.64 oz
Quantity flown	Two cables (cable A for caution and warning electronics unit power supply A; cable B for caution and warning electronics unit power supply B) Note: CWS contingency power cable A cannot be interchanged with CWS contingency power cable B.



CWS contingency power cables

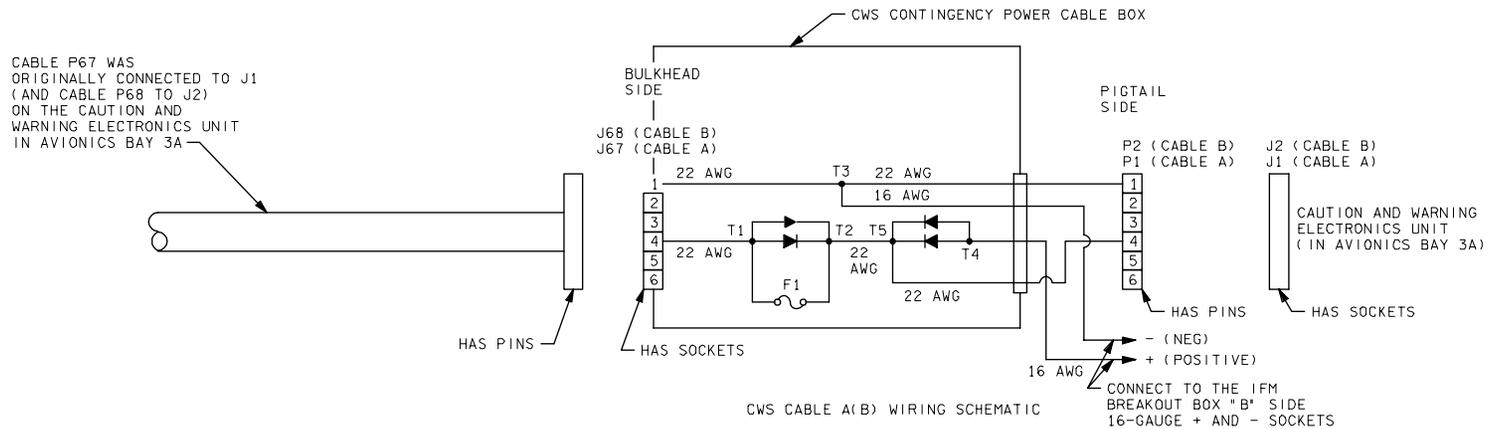
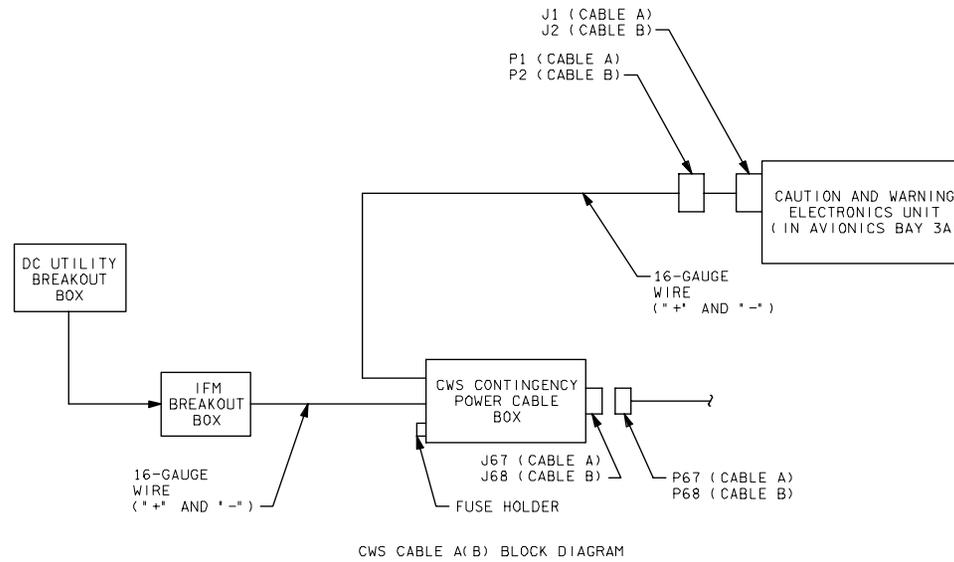


▶ CABLE P67 WAS ORIGINALLY CONNECTED TO J1 (AND CABLE P68 TO J2) ON THE CAUTION AND WARNING ELECTRONICS UNIT IN AVIONICS BAY 3A.

▶ P1 CONNECTS TO J1 (AND P2 CONNECTS TO J2) ON THE CAUTION AND WARNING ELECTRONICS UNIT IN AVIONICS BAY 3A.

234460250. ART 6

Side views of CWS contingency power cable



234460251. ART 6

CWS cable A(B) wiring schematic

DRAWING NOTES

1. Fuse is not part of assembly and should not be installed for flight. If fuse is needed in flight, it will be specified in IFM Checklist.

COMMENTS

The CWS contingency power cables were first manifested on STS-27. They were tested satisfactorily in the SAIL on August 26, 1988. The CWS contingency power cables are used in the Caution and Warning Electronics Unit Contingency Power IFM procedure in the IFM Checklist.

POWER SCREWDRIVER ASSEMBLY



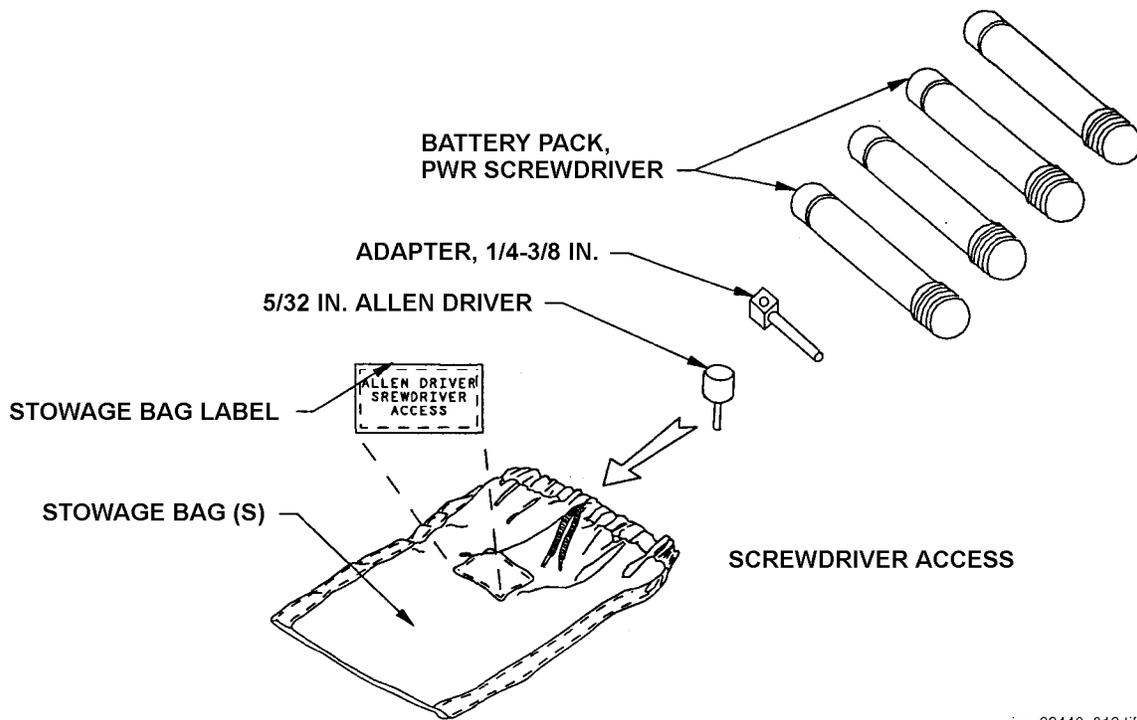
j_23446_007.tif



j_23446_008.tif

Item 41 Technical Information	
Location	IFM tool locker 1
CCCD part number	SED33109793-301 with battery SED33109793-321 with battery
CCCD drawing	SED32105000
Other drawings	
Manufacturer	Black & Decker
B&D part number	VP730
Quantity flown	One power screwdriver; five batteries (four spares and one installed)

Torque Settings	
1	= 8-10 in-lb
2	~10-15 in-lb
3	~15-20 in-lb
4	~20-25 in-lb
5	~25-30 in-lb
Max.	= 35-40 in-lb



jsc_23446_012.tif

HEX DRIVER KIT (1/4-INCH DRIVE)

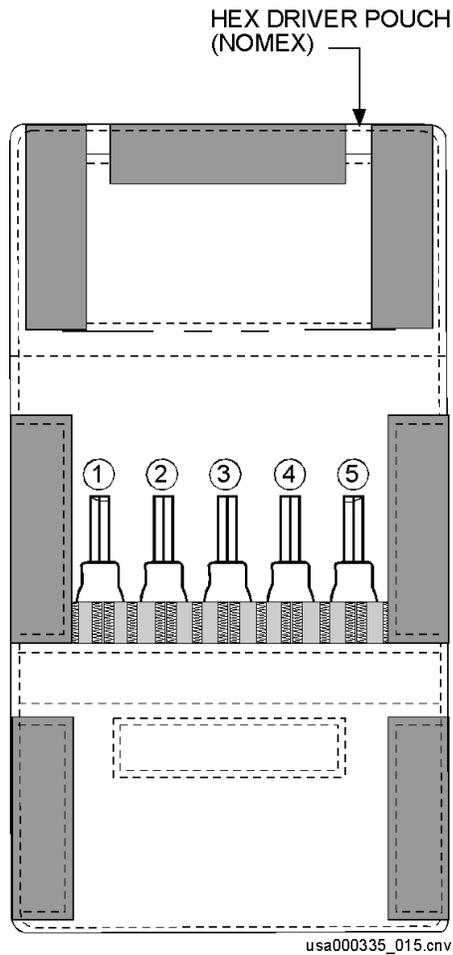


Item 42 Technical Information	
Location	IFM tool locker
CCCD part number	528-21020-1
CCCD drawing	SED32105000
Other drawings	
Manufacturer	Snap-On Tools
Material	Nickel/chrome-plated, high-quality steel bit holder with a black oxide-finished replaceable steel bit
Weight	~0.5 oz each driver
Quantity flown	One kit (five drivers)

Item	Hex head size (in.)	Part number	Manufacturer part number	Total length (in.)	Approx. weight (oz)
①	1/16	528-41013-143	TMA 2	1-7/8	0.5
②	3/32	528-41013-144	TMA 3	1-7/8	0.5
③	5/64	528-41013-145	TMA 2.5	1-7/8	0.5
④	9/64	528-41013-146	TMA 4.5	1-7/8	0.5
⑤	7/32	528-41013-147	TMA 7	1-7/8	0.5

COMMENTS

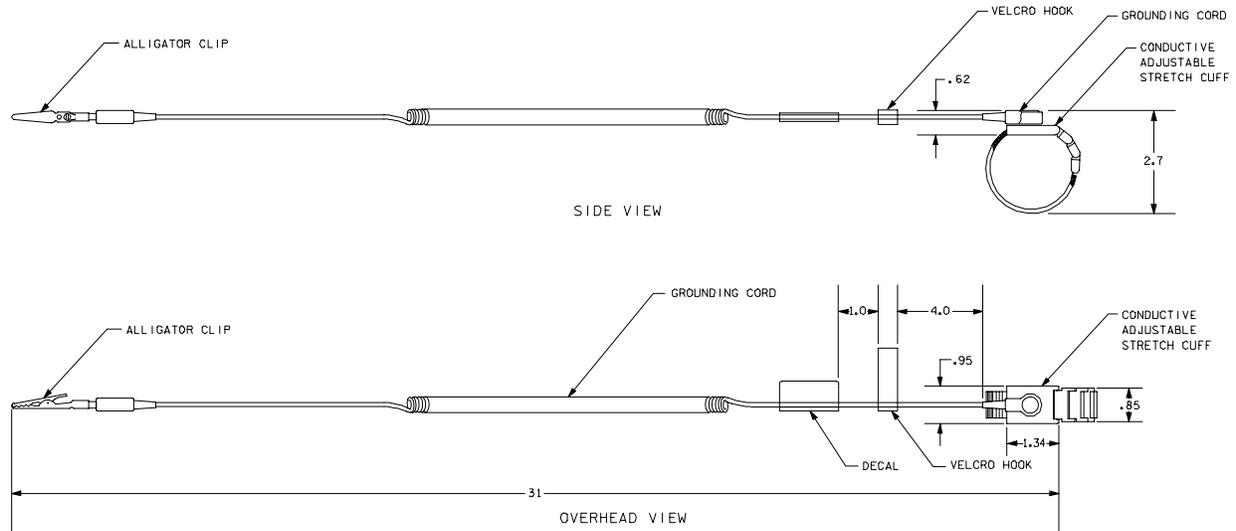
The hex driver kit was manifested to support the MEDS MDU CHANGEOUT IFM for STS-101 and subs.



ANTI-STATIC WRIST TETHERS/RCRS CROWFOOT



Item 43 Technical Information	
Location	IFM tool locker drawer 1
CCCD part number	SED33104192-301
CCCD drawing	SED32103900
Other drawings	SED33104192 (tool assembly, static control)
Manufacturer	NASA
Weight	0.2 lb (total of both)
Quantity flown	Two (one anti-static wrist tether; one 11/16-in. crowfoot)



234460254, ART. 2

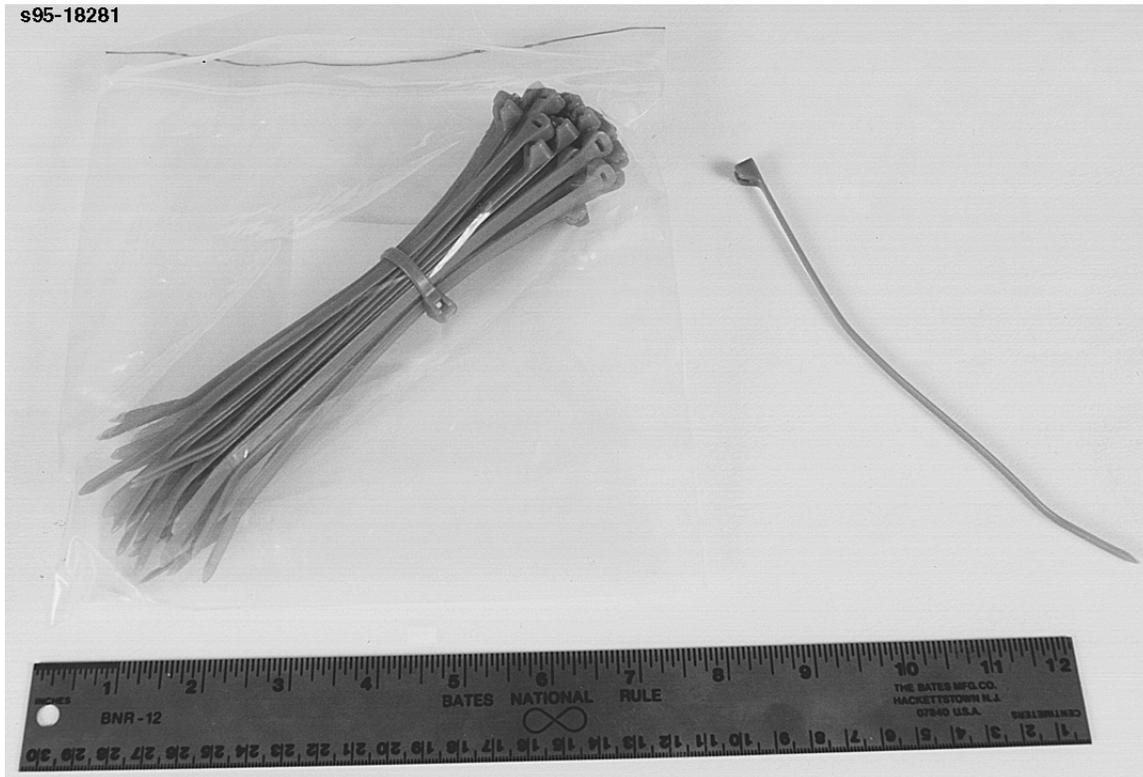
Anti-static wrist tethers

COMMENTS

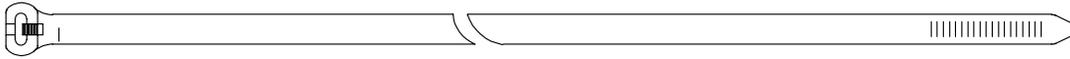
These wrist tethers are used when performing maintenance on any electrical components that are susceptible to damage from static electricity. Maintenance personnel place the tethers around their wrists to ground themselves to the orbiter. This eliminates the possibility of static discharge (since the person performing the maintenance is grounded), thereby preventing damage to the equipment. The wrist tethers were added to the IFM kit for performing the GPC changeout procedure when the enhanced GPCs were first manifested. The new GPCs contain CMOS circuitry that is especially susceptible to static electricity damage. The tethers are stowed in a small blue stowage bag labeled GPC GROUNDING STRAP ASSY.

The 11/16-inch crowfoot tool is used to perform the Regenerative Carbon Removal System (RCRS) Bed Pressure Transducer Swap IFM procedure. The crowfoot tool is required to access the 11/16-inch nut located at the bottom of the bed pressure transducer at the valve module interface.

TIE WRAPS (6-INCH)



Item 44 Technical Information	
Location	IFM tool locker drawer 1
CCCD part number	SDD 13101649-302
CCCD drawing	SED32103900
Other drawings	SDD 13101649 (tie wrap, IV/EV)
Manufacturer	Thomas and Betts Corp.
Manufacturer part number	TYZ25M
Quantity flown	50



TIE WRAP, DUPONT TEFZEL BRAND TY-RAP, SELF-LOCKING
WITH STAINLESS STEEL BARB IN HEAD. COLOR: AQUA.
TEMPERATURE RANGE, -50°F TO +430°F.

23446252A. ART: 2

Tie wraps (6-inch)

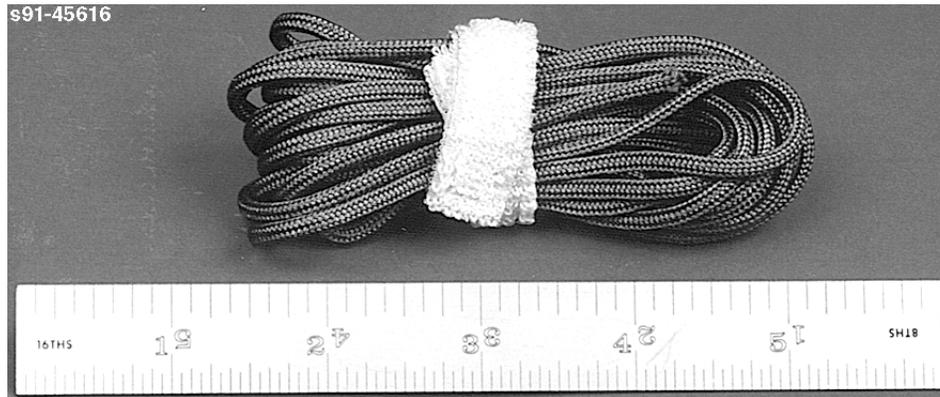
COMMENTS

These are general-purpose tie wraps for IVA or EVA use.

DESCRIPTION

1. DuPont Tefzel brand Ty-rap
2. Self-locking with stainless steel barb in head
3. Color: aqua
4. Temperature range: -50° F to +430° F

PBI BRAIDED CORD (15 FEET)

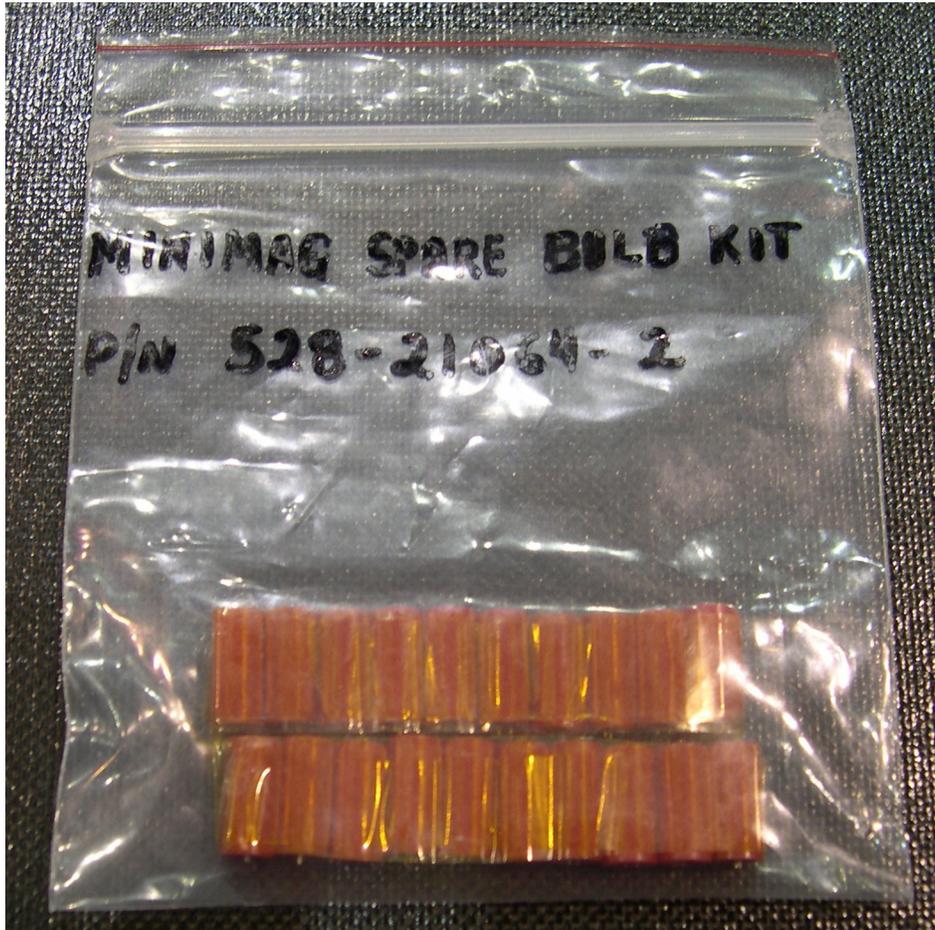


Item 45 Technical Information	
Location	IFM tool locker drawer 1
CCCD part number	528-40953-3
CCCD drawing	SED32103900
Other drawings	528-40953 (cord, PBI)
Manufacturer	Albany International Research Co.
Manufacturer part number	S-206FX (ST14C953-03)
Weight	0.79 oz
Quantity flown	One

COMMENTS

This 15-foot cord is 1/8 inch in diameter. It is a fire retardant cord and is manifested as a general-purpose cord that can be used to secure equipment to the orbiter structure. PBI stands for polybenzimidazole. Under normal shuttle atmospheric conditions, the cord is not prone to burning.

MINIMAG SPARE BULB KIT



Item 46 Technical Information	
Location	IFM tool locker drawer 1
CCCD part number	528-21064-2
CCCD drawing	SED32106300
Quantity flown	12

COMMENTS

The flashlight bulbs are flown as spares for the mini-MAG flashlight. Crewmembers have the capability to change out failed mini-MAG flashlight bulbs using the stowed spares, if necessary.

DYNABAND

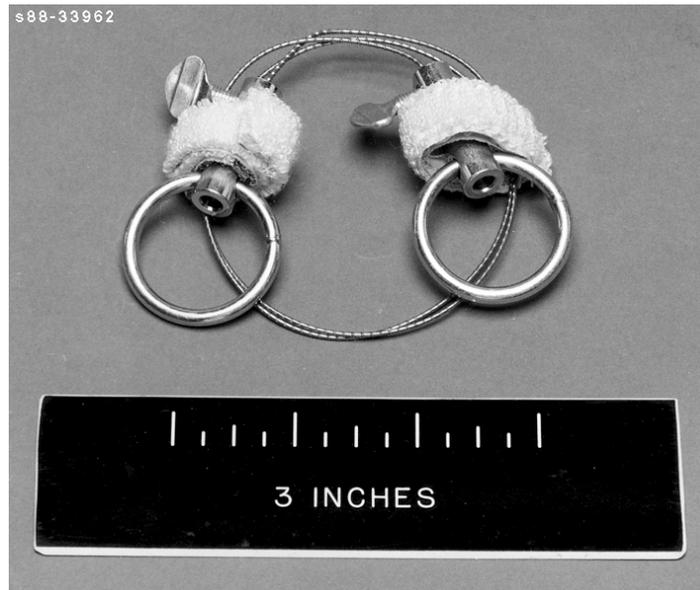


Item 47 Technical Information	
Location	IFM tool locker drawer 1
CCCD part number	PUC-1b
CCCD drawing	SED32105000
Other drawings	
Manufacturer	Simple Solution
Quantity flown	One

COMMENTS

Dynaband is often cut into several pieces and distributed among crewmembers. It has been used to mate/demate connectors throughout the orbiter to configure/reconfigure scheduled flight operations.

BONE SAW (FLEXIBLE HANDSAW)

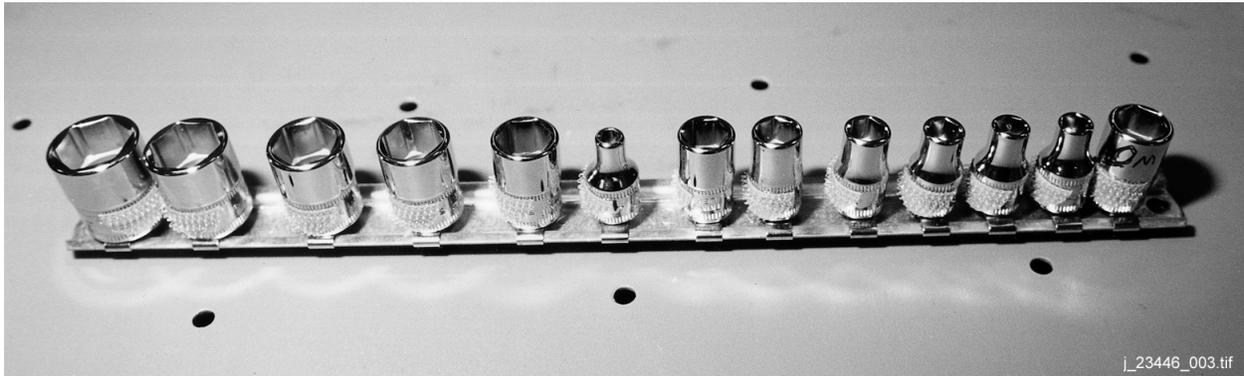


Item 48 Technical Information	
Location	IFM tool locker drawer 1
CCCD part number	528-43021-1
CCCD drawing	SED32102162
Other drawings	528-43021 (saw, survival, hand)
Manufacturer	Bestway Products Company
Boeing spec number	528-43021-1
Manufacturer part number	552
Weight	1.86 oz
Material	Steel
Quantity flown	One

COMMENTS

The bone saw is a 20-inch flexible handsaw and is used as a multipurpose cutting tool. In the IFM procedure for releasing a jammed hatch-side actuator, the bone saw is used to cut the side hatch actuator handle.

METRIC SOCKET SET (1/4-INCH DRIVE)



Item 49 Technical Information	
Location	IFM tool locker drawer 1
CCCD part number	528-41013
CCCD drawing	SED32105000
Other drawings	
Manufacturer	Snap-On 113TMMY set
Weight	
Quantity flown	One set (13 pieces)
Material	Nickel/chrome-plated, high-quality steel

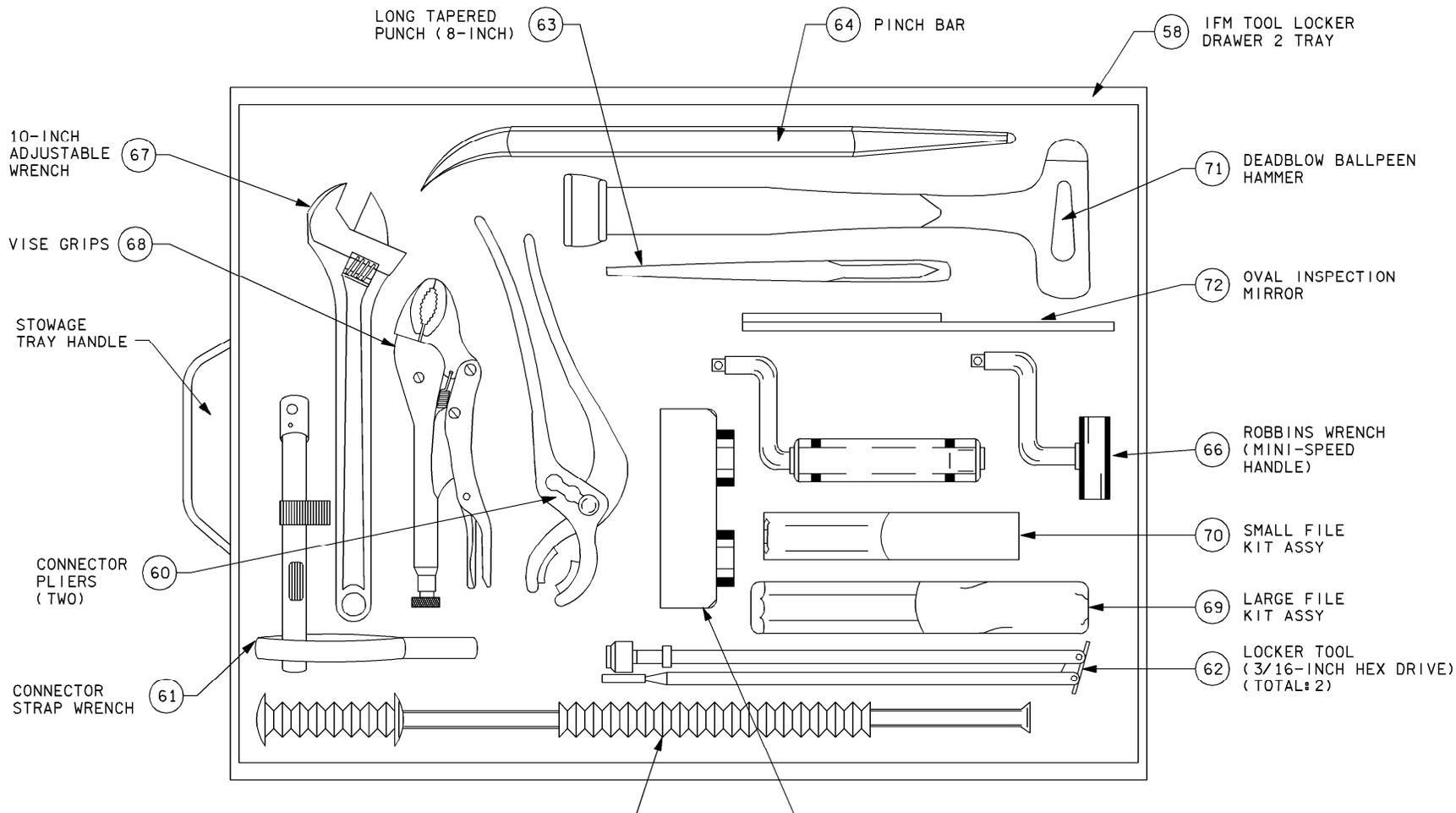
COMMENTS

Standard length, 6-point sockets on socket rail with clips (1/4-inch drive).

Snap-On number	Name	CCD part number
113TMMY	Socket set, metric	
TMM4	4-mm socket, 1/4-inch drive	528-41013-139
TMM5	5-mm socket	
TMM5.5	5.5 mm	
TMM6	6 mm	
TMM7	7 mm	
TMM8	8 mm	
TMM9	9 mm	
TMM10	10 mm	
TMM11	11 mm	
TMM12	12 mm	
TMM13	13 mm	
TMM14	14 mm	
TMM15	15 mm	

IFM TOOL LOCKER DRAWER 2

Item		Page
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50	IFM TOOL LOCKER DRAWER 2 TRAY	3-2
ACCU BYPASS CONNECTOR		
51	ACCU BYPASS CONNECTOR	3-4
52	CONNECTOR PLIERS	3-6
53	CONNECTOR STRAP WRENCH.....	3-8
LOCKER TOOLS		
54	LOCKER TOOL (3/16-INCH HEX DRIVE)	3-10
55	LONG TAPERED PUNCH (8-INCH).....	3-12
56	PINCH BAR	3-14
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57	MECHANICAL FINGERS	3-16
58	ROBBINS WRENCH (MINISPEED HANDLE)	3-18
59	10-INCH ADJUSTABLE WRENCH.....	3-21
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63	DEADBLOW BALLPEEN HAMMER	3-31
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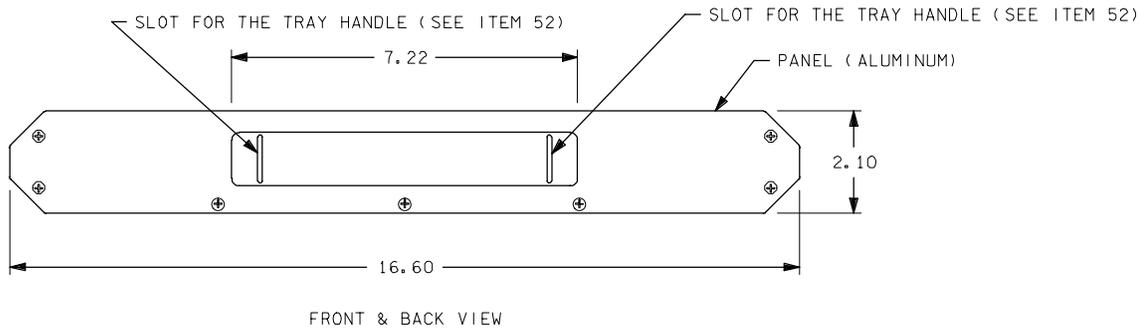
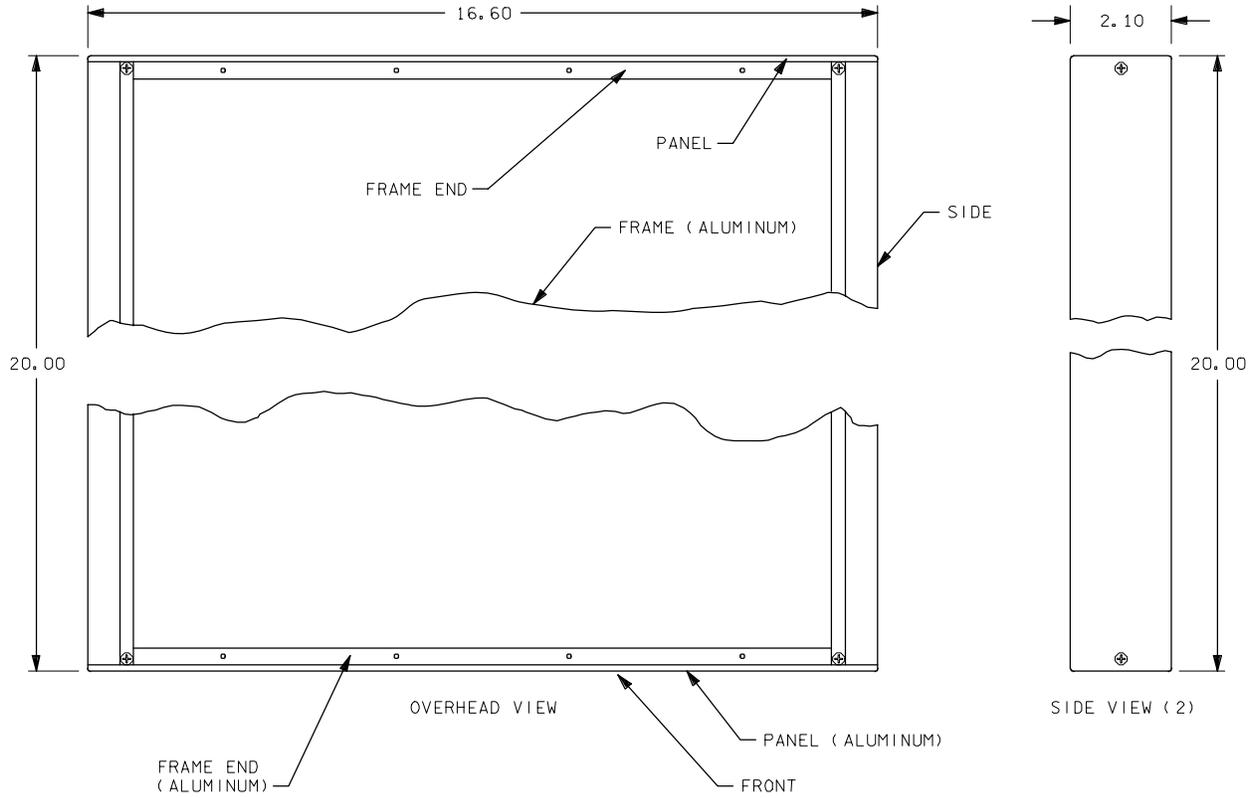


IFM tool locker drawer 2

IFM TOOL LOCKER DRAWER 2 TRAY



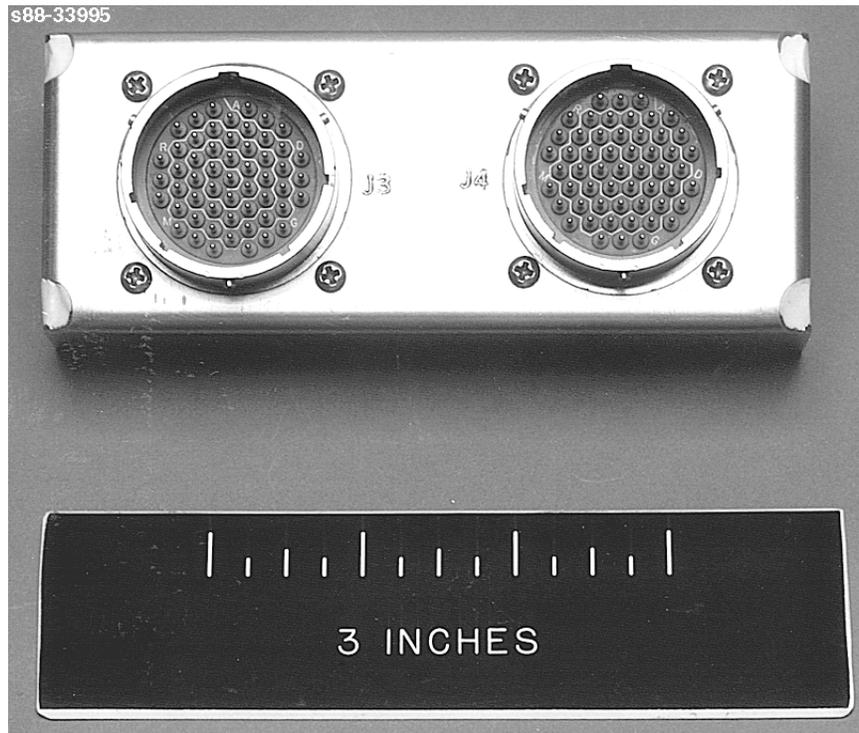
Item 50 Technical Information	
Location	IFM tool locker drawer 2
CCCD part number	V634-661183-001/10105-10064-1
CCCD drawing	SED32102163
Other drawings	V634-661183 (tray - tool stowage, assembly of)
Manufacturer	Rockwell/Boeing (responsibility transferred from ILC)
Weight	2.9 lb
Quantity flown	One



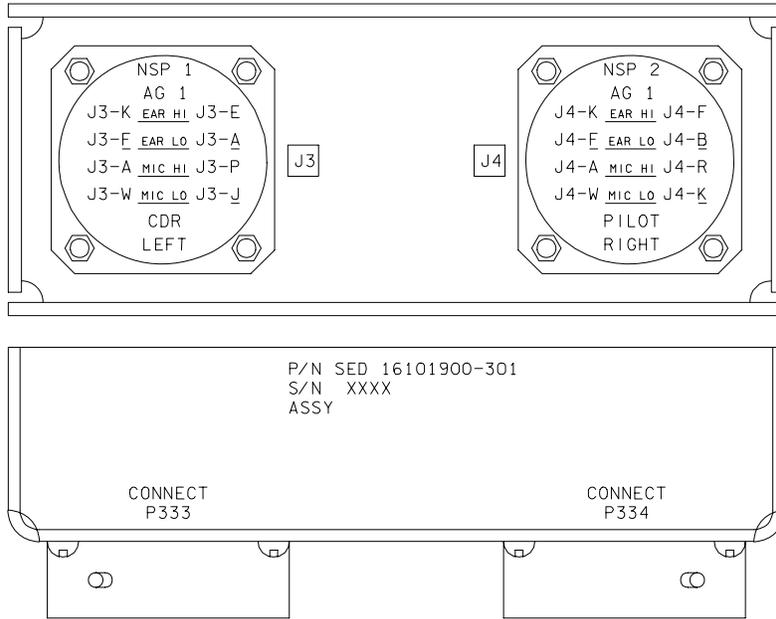
234460302.ORT 3

IFM tool locker tray 2

ACCU BYPASS CONNECTOR



Item 51 Technical Information	
Location	IFM tool locker drawer 2
CCCD part number	SED16101900-301
CCCD drawing	SED32102163
Other drawings	SED16101900 (chassis assembly ACCU bypass connector module)
Manufacturer	Boeing
Weight	11.44 oz
Quantity flown	One



234460305. ART: 1

WIRING LIST

FROM	TO
J3-K _____	J3-E
J3-F _____	J3-A
J3-A _____	J3-P
J3-W _____	J3-J
J4-K _____	J4-F
J4-F _____	J4-B
J4-A _____	J4-R
J4-W _____	J4-K

ACCU bypass connector module

COMMENTS

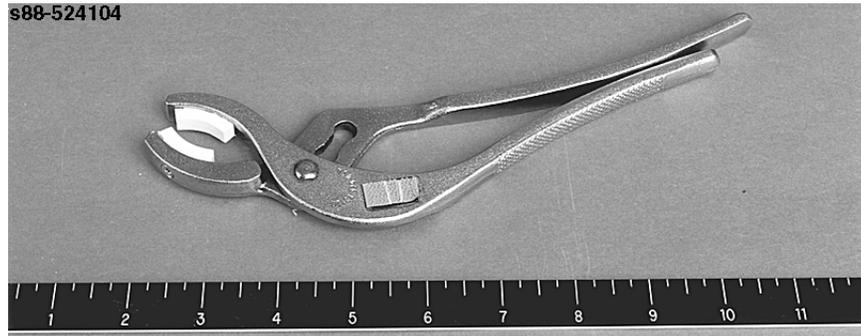
The ACCU bypass connector is used in the ACCU Bypass Connector Installation IFM procedure (see IFM Checklist).

For loss of one ACCU (either ACCU 1 or ACCU 2), a J4 bypass is performed.

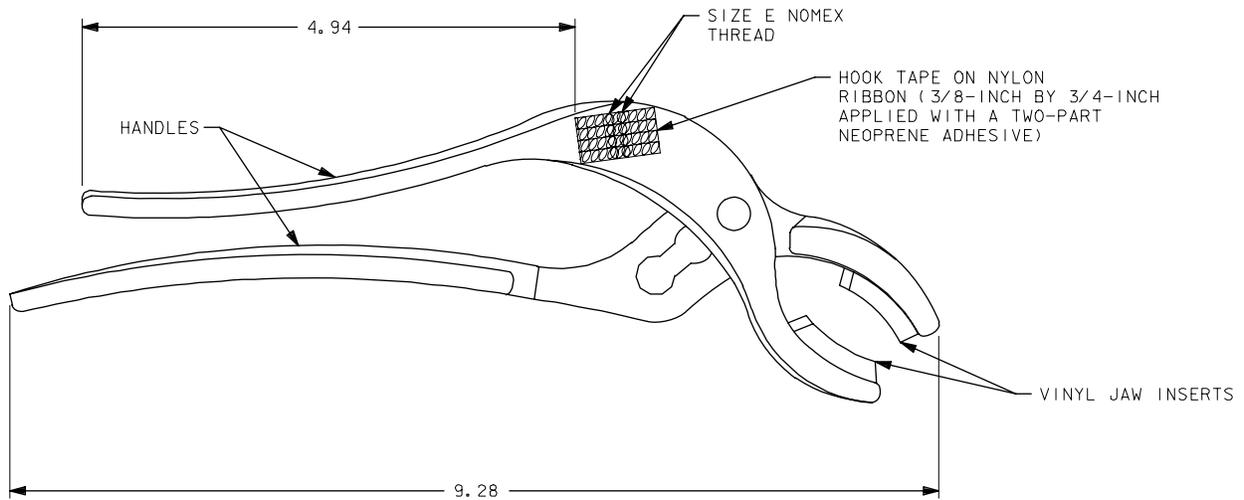
For loss of both ACCUs, a J4 and J3 bypass is performed.

(See INCO Console Handbook ACCU Bypass procedure for ACCU functions and functions remaining after ACCU bypass.)

CONNECTOR PLIERS



Item 52 Technical Information	
Location	IFM tool locker drawer 2
CCCD part number	528-20145-14 (ST20P1176-01)
CCCD drawing	SED32102163
Other drawings	528-20145 (wrench assembly IFM tool kit/sheet 2 of 4)
Manufacturer	Snap-On Tools/Boeing
Boeing spec number	528-41176-1
Snap-On part number	PWC50
Weight	10.34 oz
Material	High-quality steel with a black oxide finish; jaw inserts made of urethane #88A durometer
Quantity flown	Two



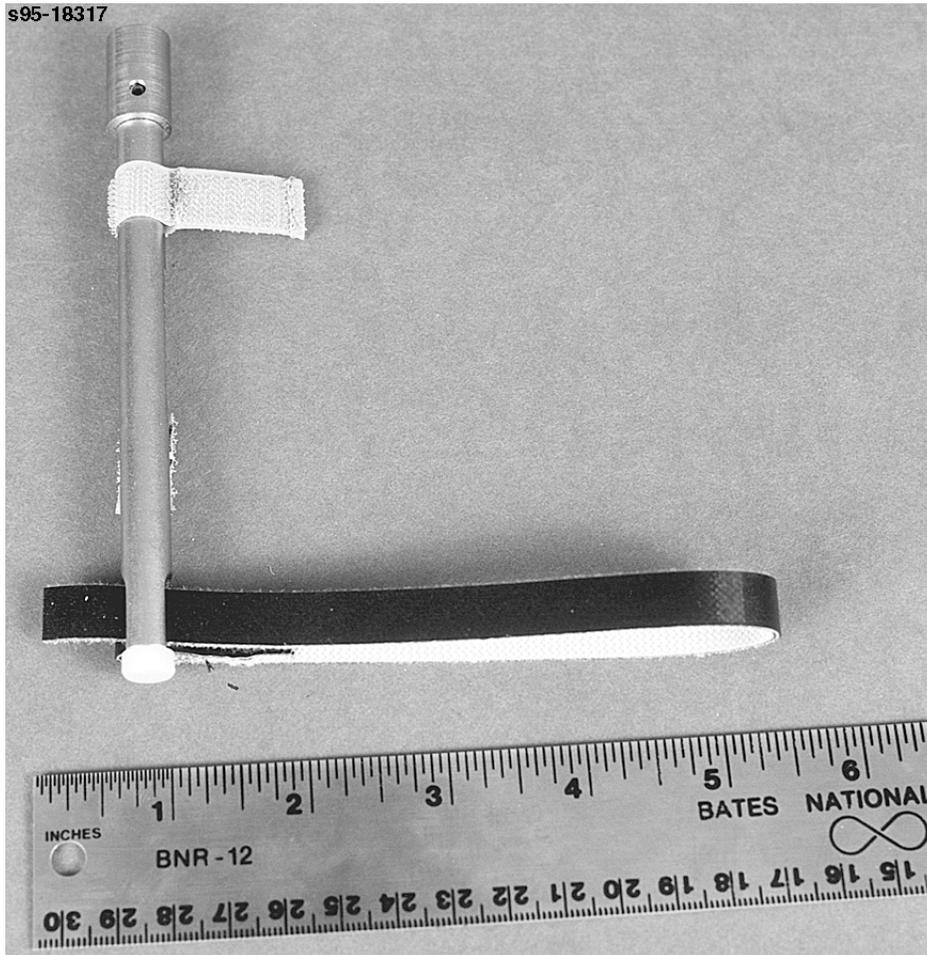
234460306. ART 2

Connector pliers

COMMENTS

The connector pliers can be used to tighten or loosen connectors (or other objects) from 3/4 inch to 2-1/4 inch in diameter. The jaws contain replaceable vinyl insert pads (no replacement vinyl pads are flown).

CONNECTOR STRAP WRENCH

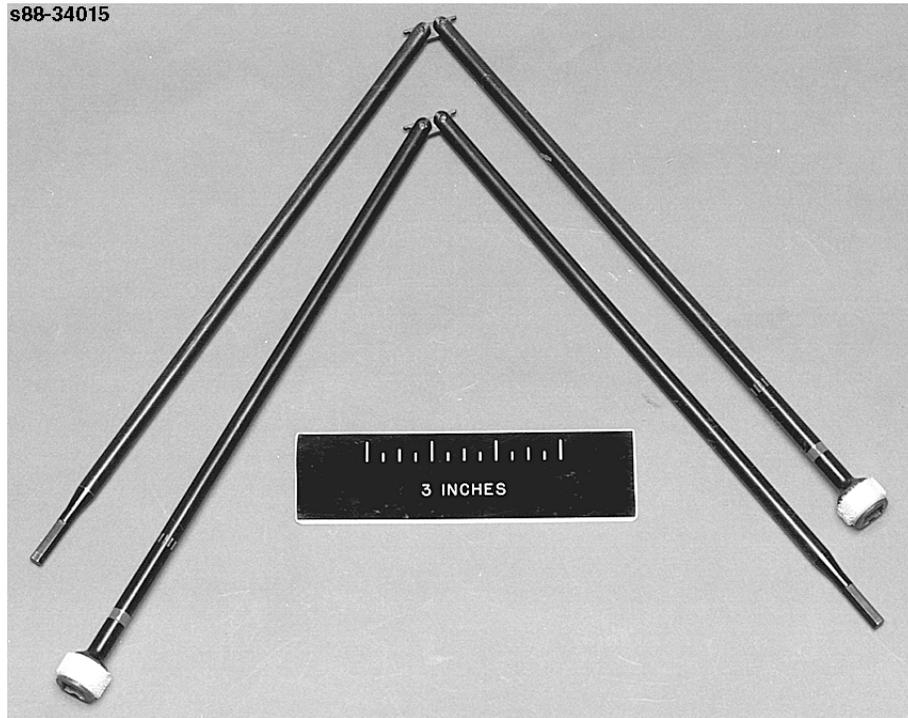


Item 53 Technical Information	
Location	IFM tool locker drawer 2
CCCD part number	528-20145-20
CCCD drawing	SED32102163
Other drawings	528-20145 (wrench assembly IFM tool kit/sheet 2 of 4)
Manufacturer	Boeing
Quantity flown	One

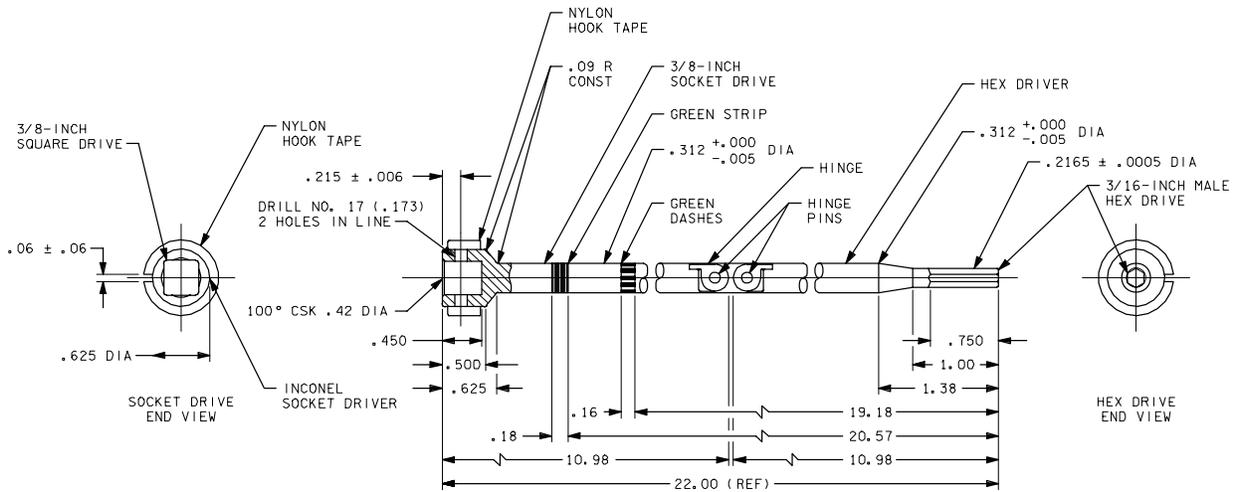
COMMENTS

The connector strap wrench is used to mate/demate connectors (it works similar to an oil filter wrench). The strap portion of the wrench is placed around the connector, and the handle is twisted to produce a torque to mate/demate the connector. Connectors are designed to be mated/demated by hand. The strap wrench is designed for access to connectors in tight areas that cannot be accessed by hand or the connector pliers. Drive is 1/4 inch.

LOCKER TOOL (3/16-INCH HEX DRIVE)



Item 54 Technical Information	
Location	IFM tool locker drawer 2
CCCD part number	V625-650899-011
CCCD drawing	SED32102163
Other drawings	V625-650899 (driver - 3/16 hex, middeck lockers, assembly of)
Manufacturer	Rockwell
Weight	1.06 oz
Material	Inconel 718 (AMS 5664)
Quantity flown	Two



NOTE: WHEN THE GREEN STRIP IS EVEN WITH THE LOCKER FRONT, THE FASTENER IS ENGAGED.

234460308. ART, 2

Locker tool (3/16-inch hex drive)

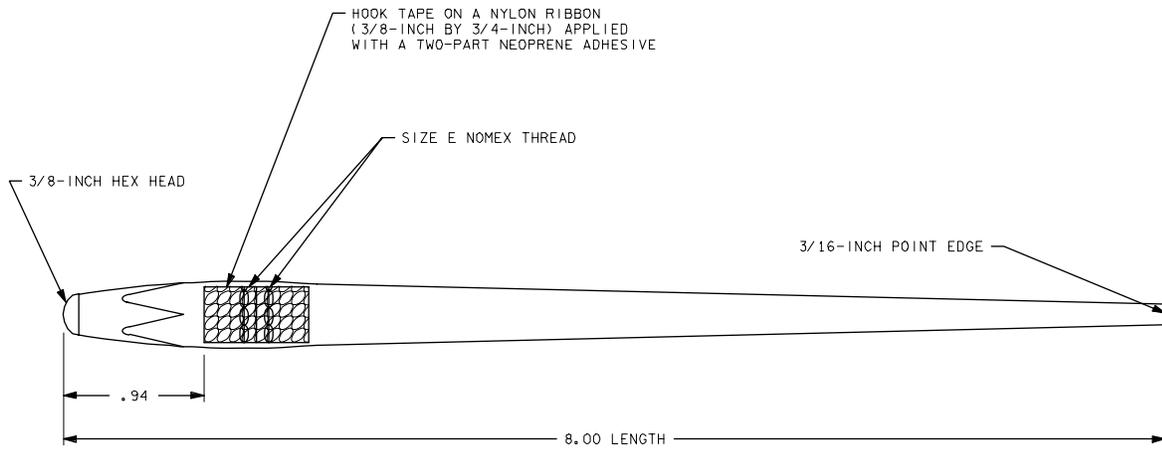
COMMENTS

The locker tool is used any time locker removal/replacement is required on orbit. The hinged design allows the tool (which is longer than the standard locker) to be stowed in the locker drawer.

LONG TAPERED PUNCH (8-INCH)



Item 55 Technical Information	
Location	IFM tool locker drawer 2
CCCD part number	528-20148-4 (ST20T1013-36)
CCCD drawing	SED32102163
Other drawings	528-20148 (misc. tool assembly IFM tool kit/sheet 1 of 2)
Manufacturer	Snap-On Tools/Boeing
Boeing spec number	528-41013-36
Snap-On part number	PPC905A
Weight	0.185 lb
Material	Heat-treated steel (the striking ends are differentially tempered for better wear characteristics)
Quantity flown	One



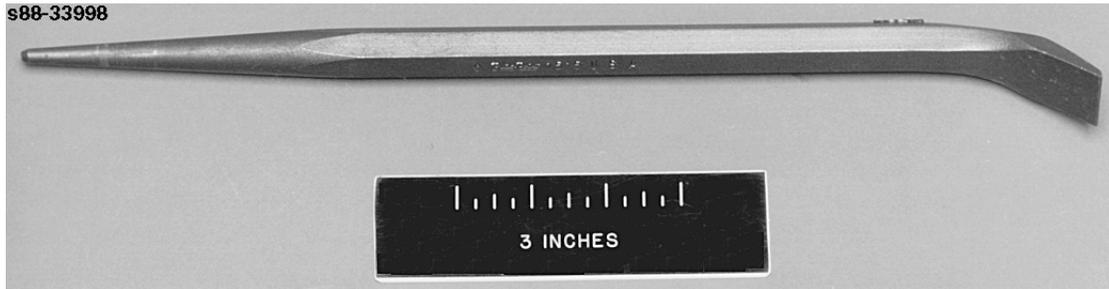
234460309. ART; 4

Long tapered punch (8-inch)

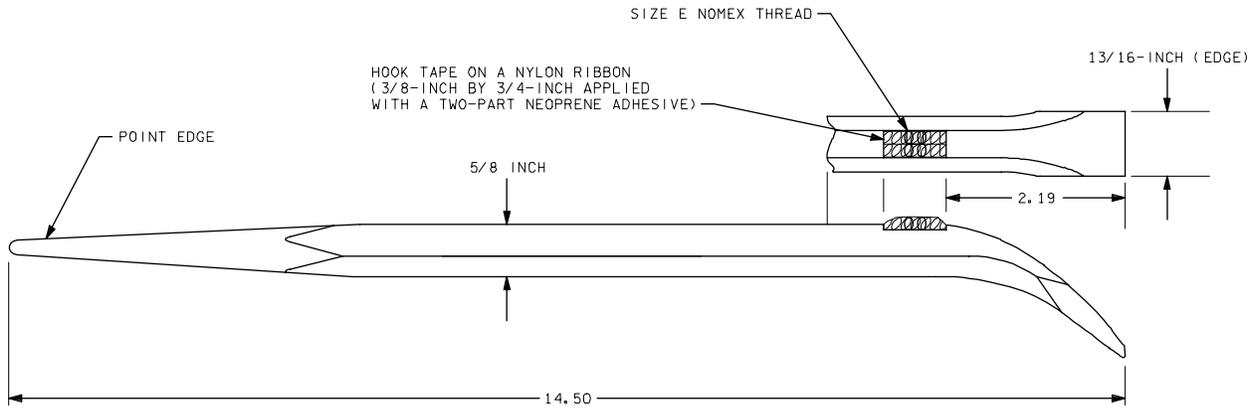
COMMENTS

This punch or the pinch bar (see item 63) can be used to realign lockers or other structures.

PINCH BAR



Item 56 Technical Information	
Location	IFM tool locker drawer 2
CCCD part number	528-20148-5 (ST20T1013-37)
CCCD drawing	SED32102163
Other drawings	528-20148 (misc. tool assembly IFM tool kit/sheet 2 of 2)
Manufacturer	Snap-On Tools/Boeing
Boeing spec number	528-41013-37
Snap-On part number	1515
Weight	1.15 lb
Material	Heat-treated steel
Quantity flown	One



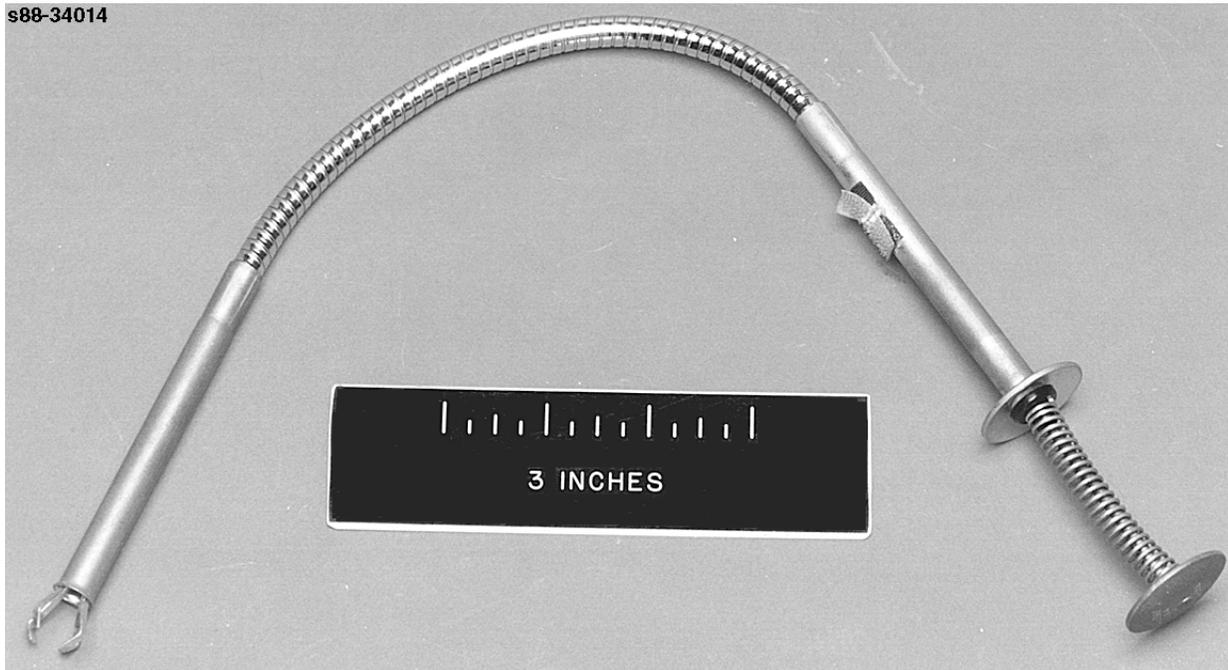
234460310, ART. 3

Pinch bar

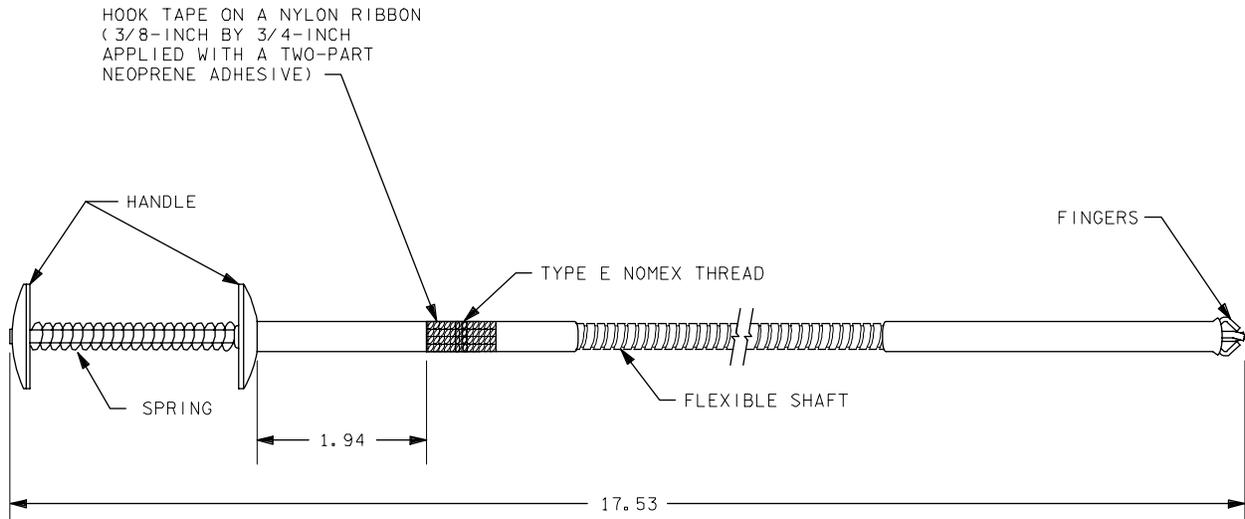
COMMENTS

This pinch bar or the long tapered punch (see item 62) can be used to realign lockers or other structures.

MECHANICAL FINGERS



Item 57 Technical Information	
Location	IFM tool locker drawer 2
CCCD part number	528-20148-1 (ST20T1013-34)
CCCD drawing	SED32102163
Other drawings	528-20148 (misc. tool assembly IFM tool kit/ sheet 1 of 2)
Manufacturer	Boeing
Boeing spec number	528-41013-34
Manufacturer part number	GA353
Weight	0.22 lb
Quantity flown	One



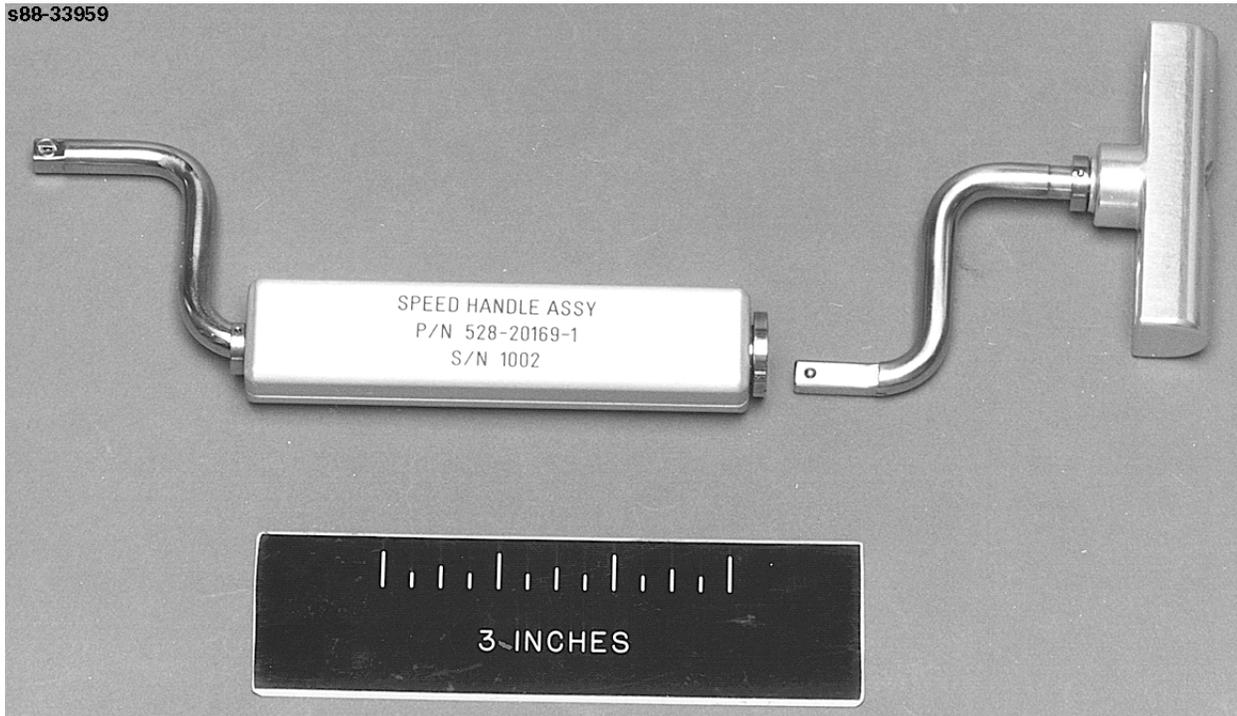
234460311. ART. 3

Mechanical fingers

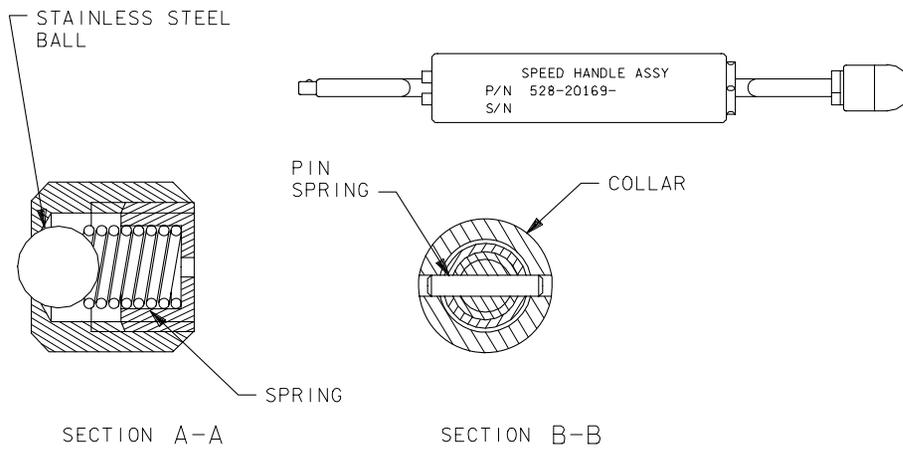
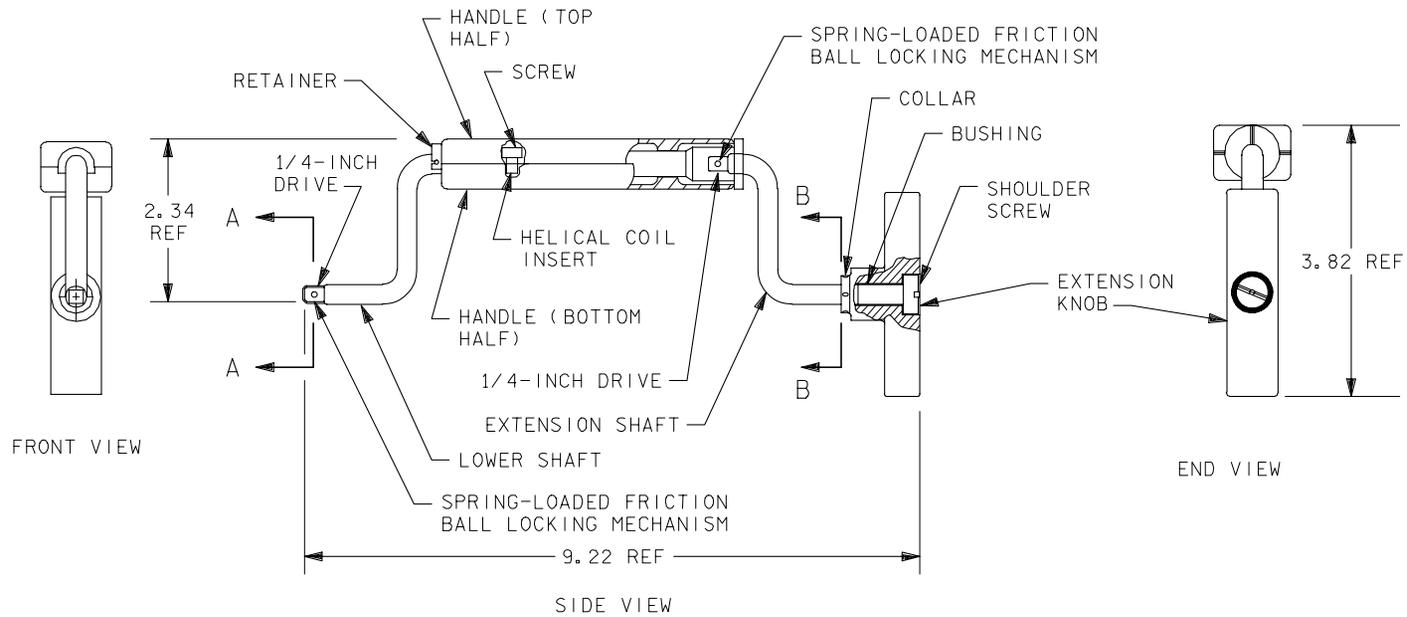
COMMENTS

The mechanical fingers can be used to retrieve small objects that are out of reach.

ROBBINS WRENCH (MINISPEED HANDLE)



Item 58 Technical Information	
Location	IFM tool locker drawer 2
CCCD part number	528-20169-1 (10114-20028-01)
CCCD drawing	SED32102163
Other drawings	528-20169 (minispeed handle assembly/three sheets)
Manufacturer	Boeing
Material	The lower shaft and extension shaft are stainless steel, and the speed handle and extension knob are aluminum
Weight	0.5845 lb
Quantity flown	One



234460312.ORT; 1

Robbins wrench (minispeed handle)

COMMENTS

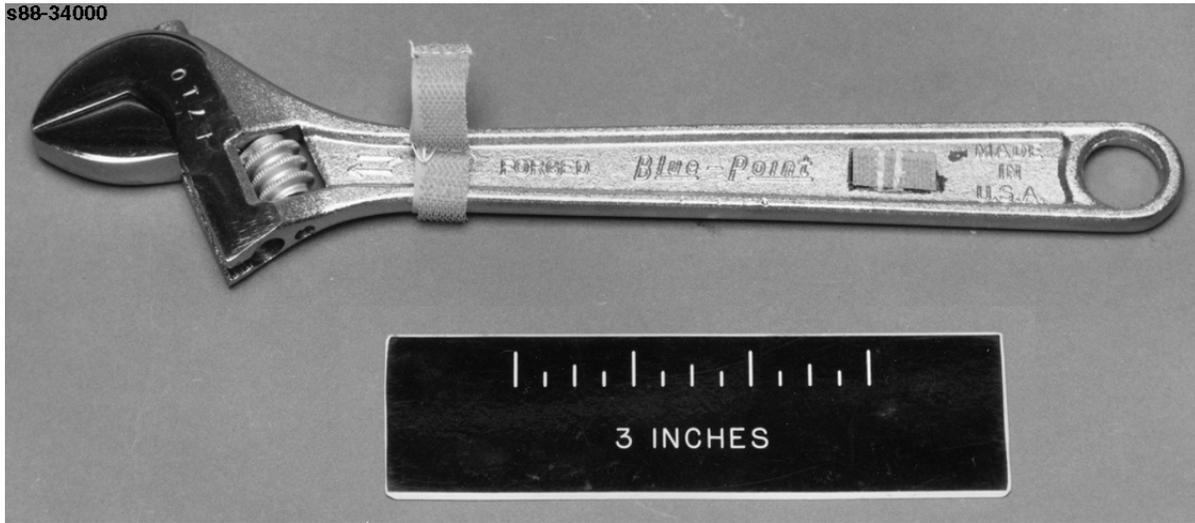
This tool is named for its inventor, Richard L. “Robbie” Robbins, long-time IFM flight controller.

The extension shaft and knob and the speed handle and lower shaft are two separate pieces. Each piece has a 1/4-inch male drive on the end of its shaft. The possible modes of use are as follows:

1. The extension shaft and knob connected to the speed handle and lower shaft (two-handed tool)
2. The speed handle and lower shaft only (one-handed tool)
3. The extension shaft and knob only (one-handed tool)

The Robbins wrench can be used with the applicable drive tools to loosen or tighten fasteners.

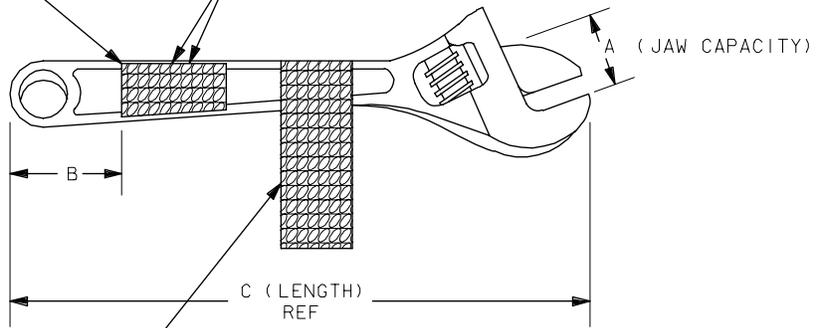
10-INCH ADJUSTABLE WRENCH



Item 59 Technical Information	
Location	IFM tool locker drawer 2
CCCD part number	528-20145-11 (ST20T1013-08)
CCCD drawing	SED32102163
Other drawings	528-20145 (wrench assembly IFM tool kit/sheet 1 of 4)
Manufacturer	Snap-On Tools/Boeing
Boeing spec number	528-41013-08
Snap-On part number	AD10
Weight	0.74 lb
Material	Nickel/chrome-plated high-quality steel
Quantity flown	One

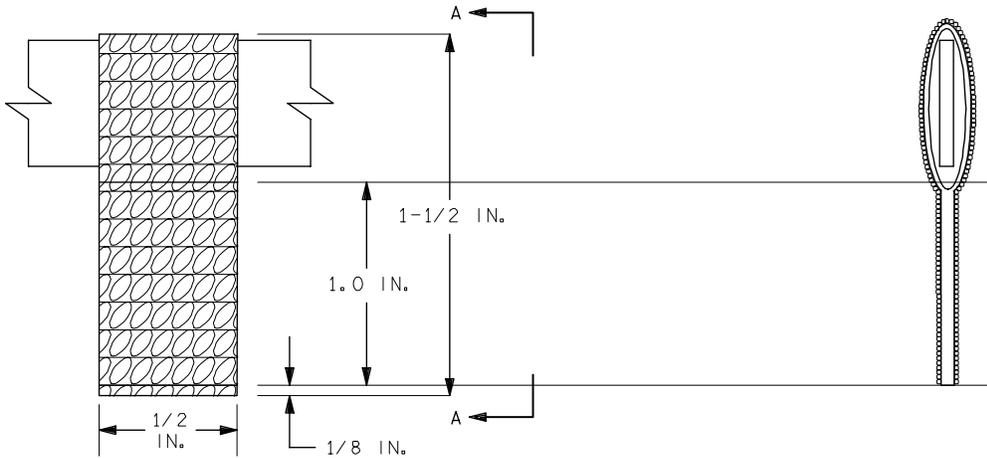
HOOK TAPE ON A NYLON RIBBON
(3/8-INCH BY 3/4-INCH
APPLIED WITH A TWO-PART
NEOPRENE ADHESIVE)

SIZE E NOMEX THREAD



NYLON HOOK TAPE
SEE DETAIL A

DIMENSIONS (INCHES)		
A	B	C
1-1/8	2.02	10.0



DETAIL A
NYLON HOOK TAPE

VIEW A-A

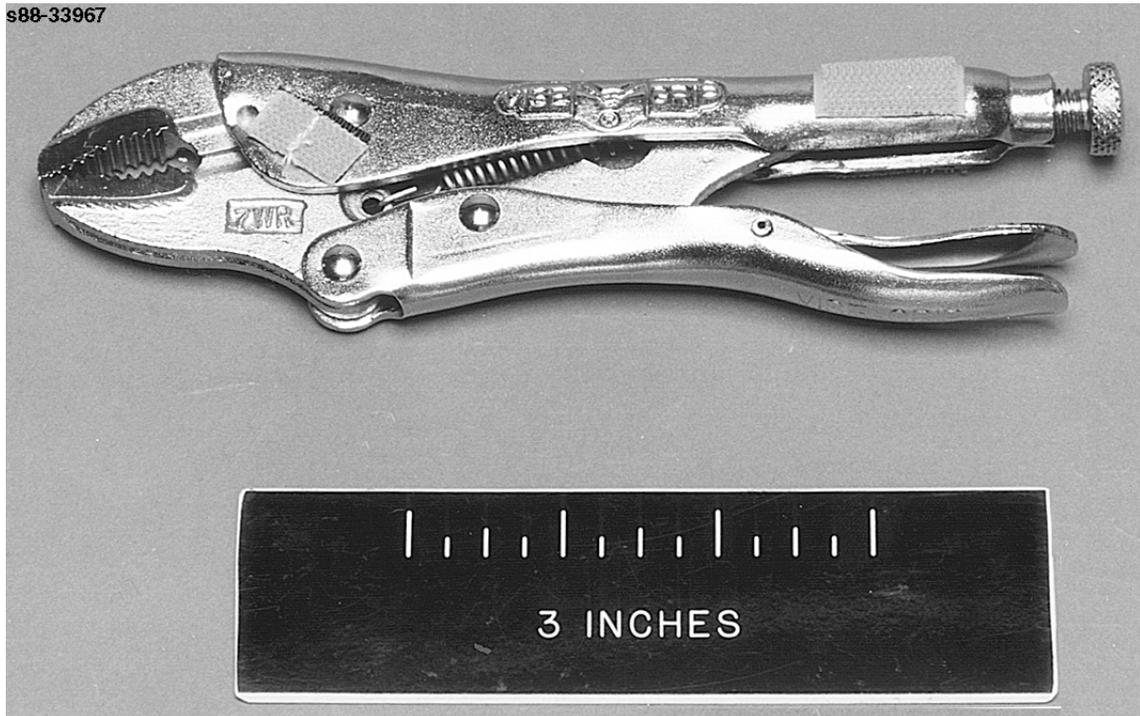
234460313. ART 3

10-inch adjustable wrench

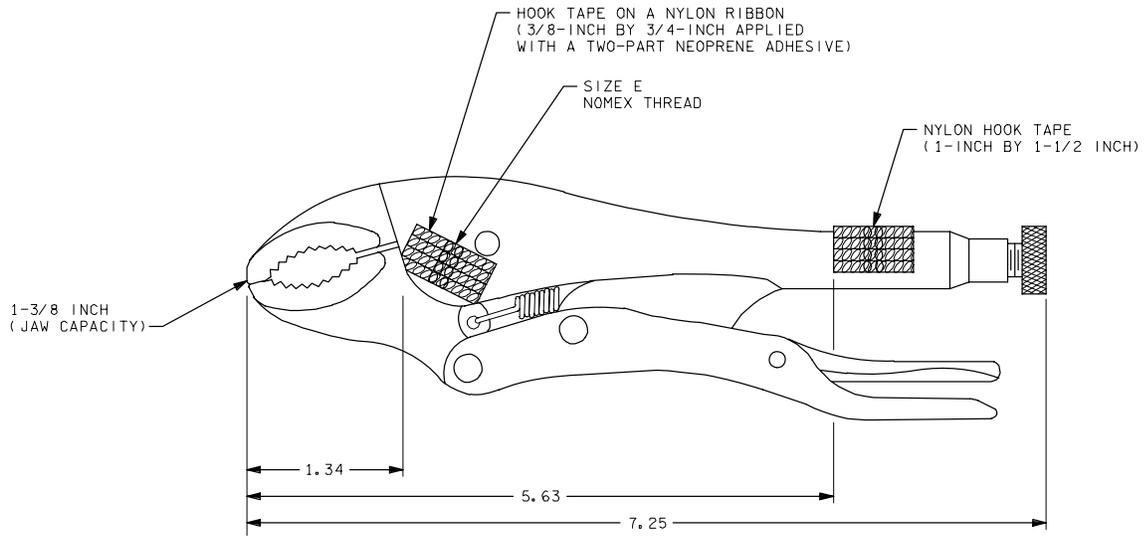
COMMENTS

A 4-inch adjustable wrench is also in IFM tool locker drawer 4 (see item 96).

WISE GRIPS



Item 60 Technical Information	
Location	IFM tool locker drawer 2
CCCD part number	528-20145-13 (ST20T1013-02)
CCCD drawing	SED32102163
Other drawings	528-20145 (wrench assembly IFM tool kit/sheet 2 of 4)
Manufacturer	Snap-On Tools/Boeing
Boeing spec number	528-41013-02
Snap-On part number	VP7WR
Weight	0.73 lb
Material	Nickel/chrome-plated, high-quality steel
Quantity flown	One



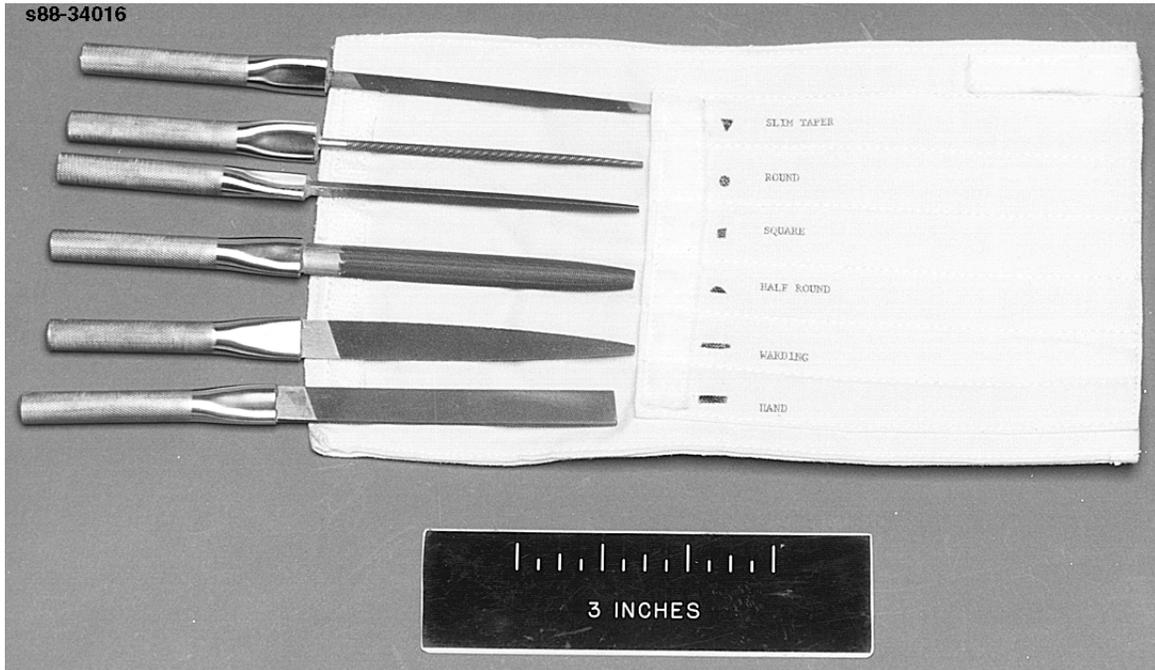
234460314. ART 2

Vise grips

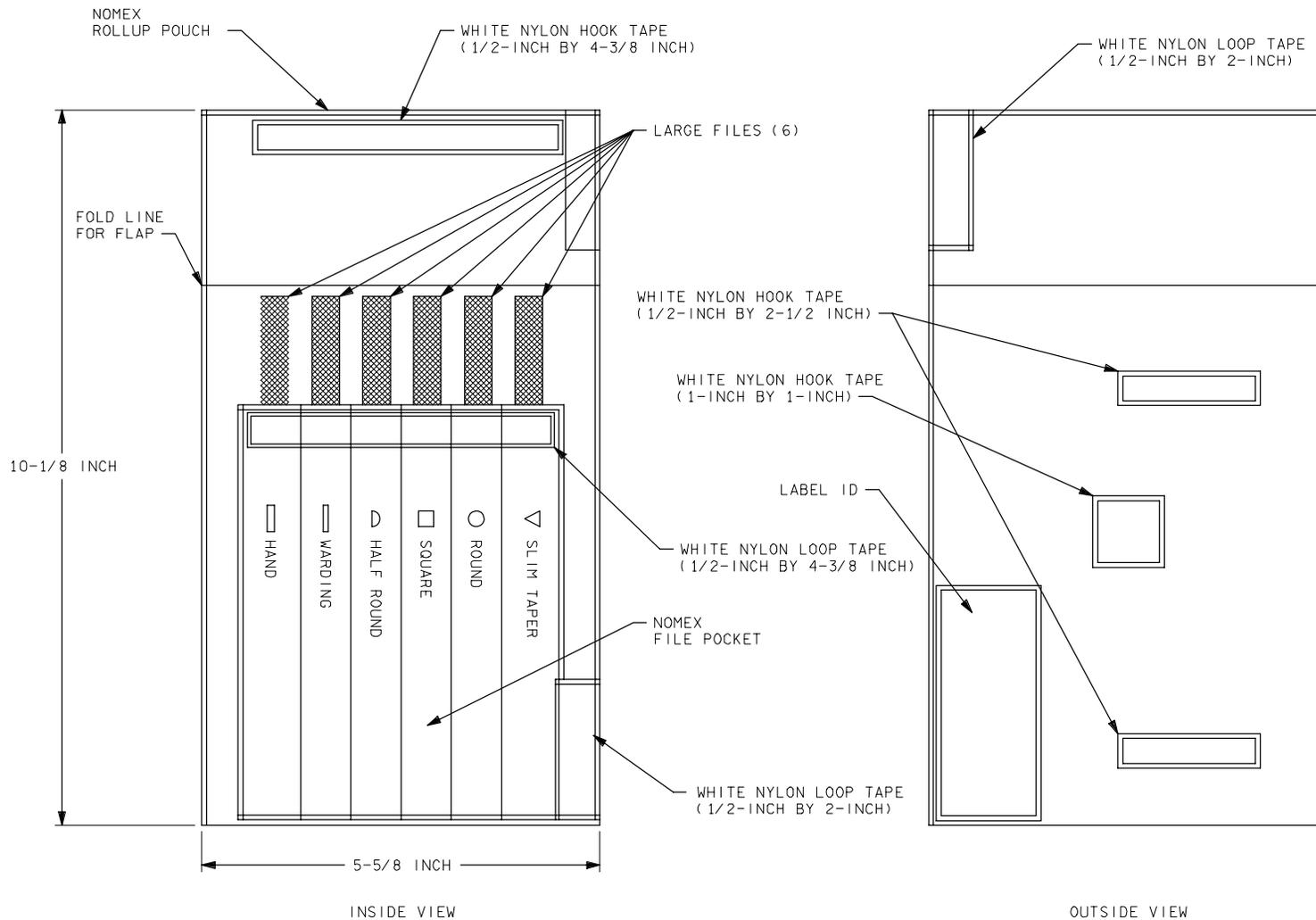
COMMENTS

The jaw of the vise grips has a wire cutter.

LARGE FILE KIT

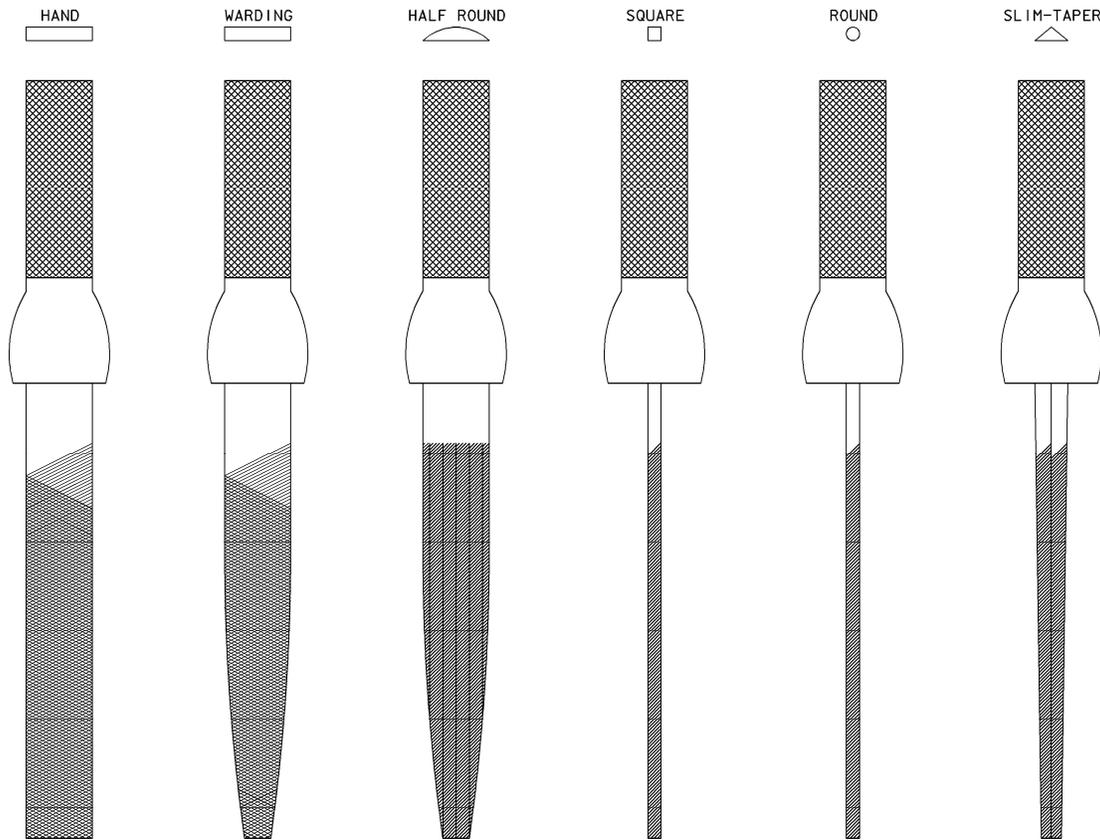


Item 61 Technical Information	
Location	IFM tool locker drawer 2
CCCD part number	528-20155-1
CCCD drawing	SED32102163
Other drawings	528-20155 (large file assembly IFM/two sheets), 528-20164 (altered items/one sheet)
Manufacturer	Snap-On Tools/Boeing
Snap-On part number	HB100
Weight	7.72 oz
Material	The files are case hardened steel with steel handles; the rollup pouch is Nomex
Quantity flown	One pouch containing six files



234460315. ART3

Large file kit



6 LARGE FILES

0033518.ART:1
234460316.ART:2

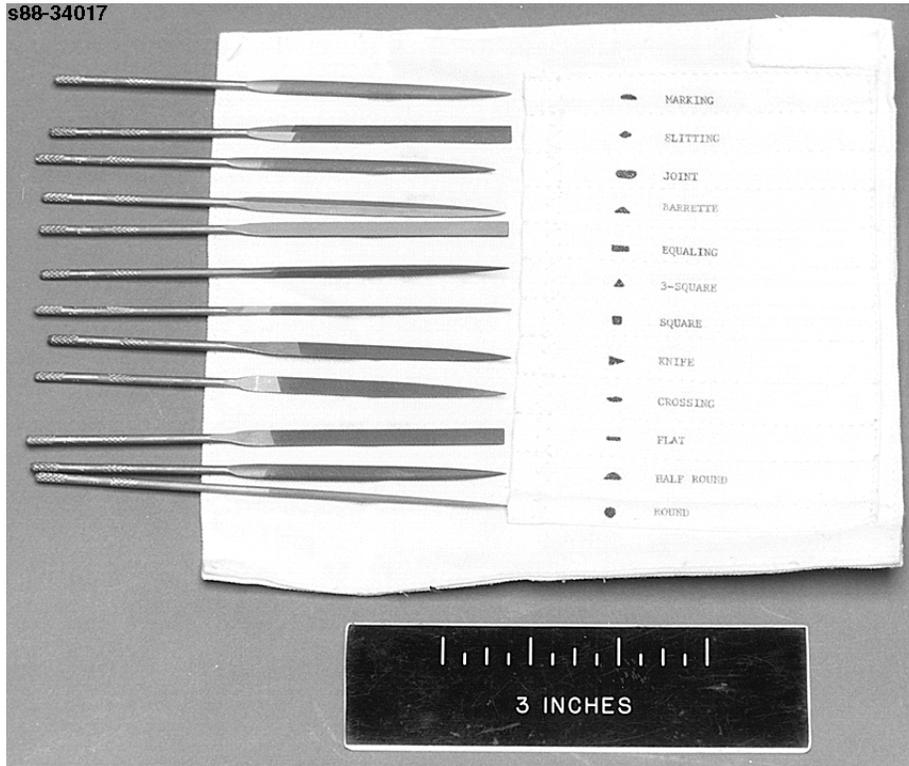
Six large files

Number	File type	Snap-On Tools part number
1	Hand	HB 4MA
2	Warding	HB 4W
3	Half round	HB 4HR
4	Square	HB 4SQ
5	Round	HB 4R
6	Slim taper	HB 4T

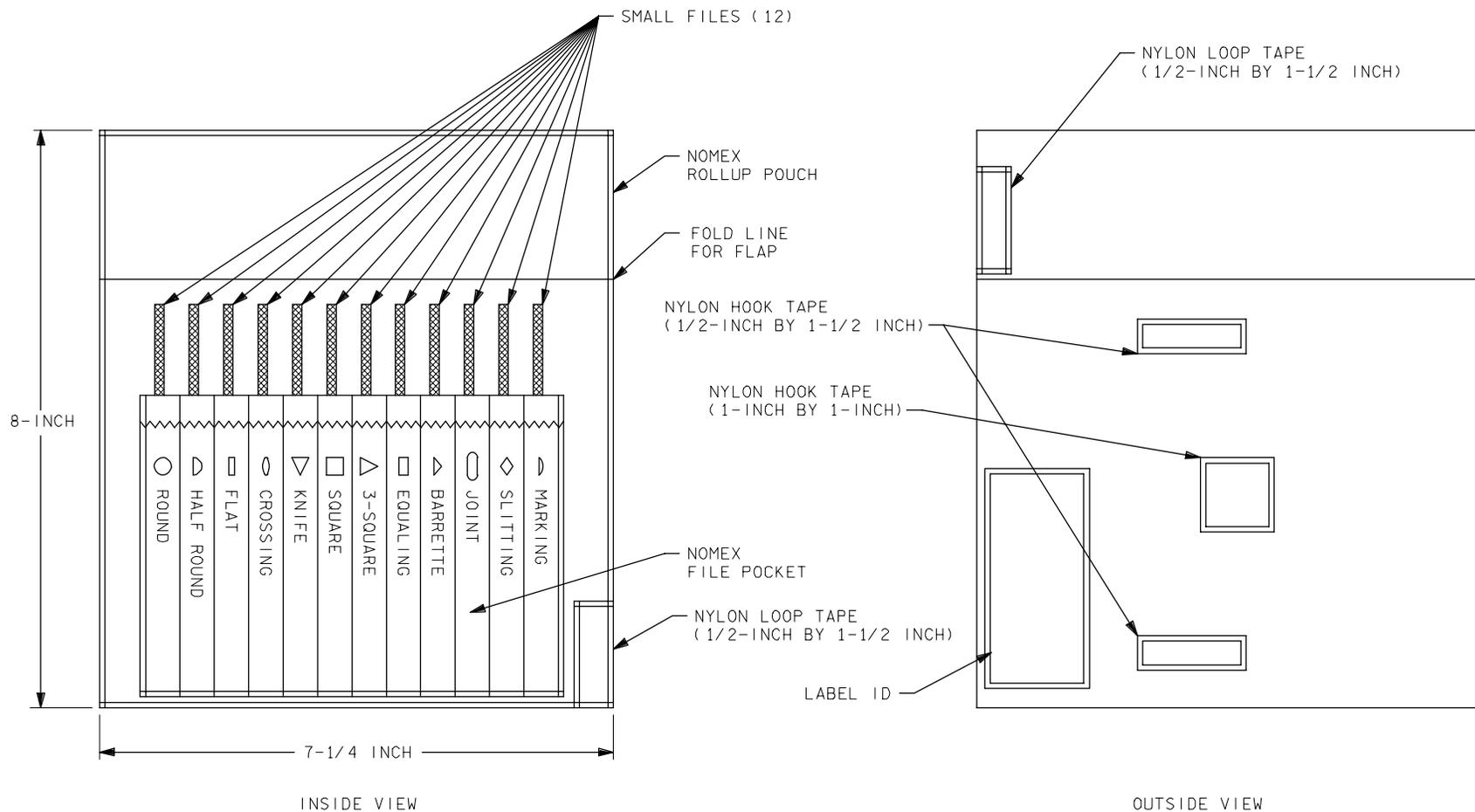
COMMENTS

The large file kit assembly consists of six files in a rollup pouch. The files have been modified by replacing their wooden twist-on handles with permanent knurled steel handles.

SMALL FILE KIT



Item 62 Technical Information	
Location	IFM tool locker drawer 2
CCCD part number	528-20156-1
CCCD drawing	SED32102163
Other drawings	528-20156 (small files assembly IFM tool kit/five sheets)
Manufacturer	Snap-On Tools (files)/Boeing (container)
Snap-On part number	HBN 120
Weight	3.55 oz
Material	The files are case hardened steel; the rollup pouch is Nomex
Quantity flown	One pouch containing 12 files



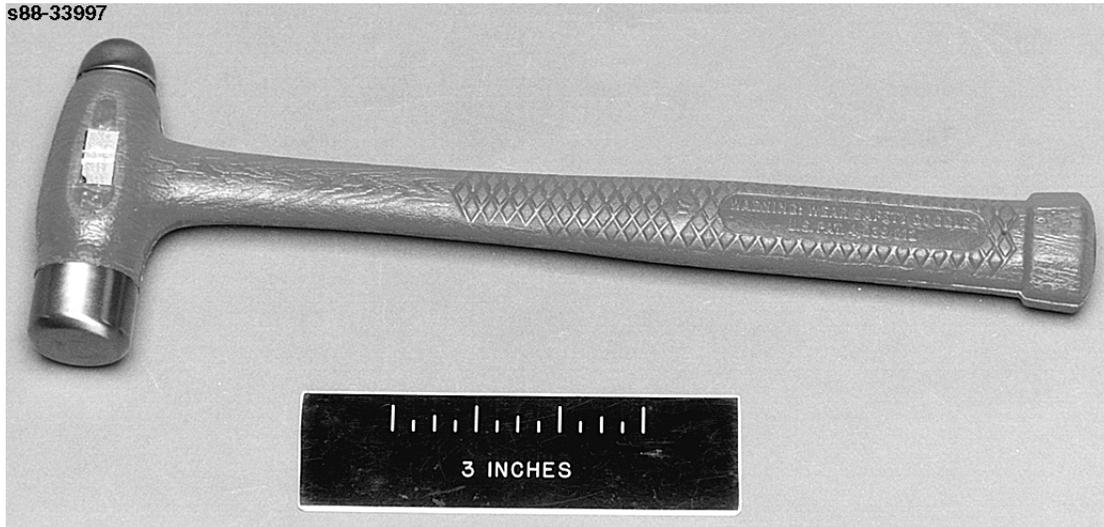
Small file kit

Number	File type	Snap-On Tools part number
1	Round	5NR
2	Half round	5N HR
3	Flat	5NF
4	Crossing	5NC
5	Knife	5NK
6	Square	5NSQ
7	3-square	5NTS
8	Equaling	5NE
9	Barrette	5NB
10	Joint	5NJ
11	Slitting	5NS
12	Marking	5NM

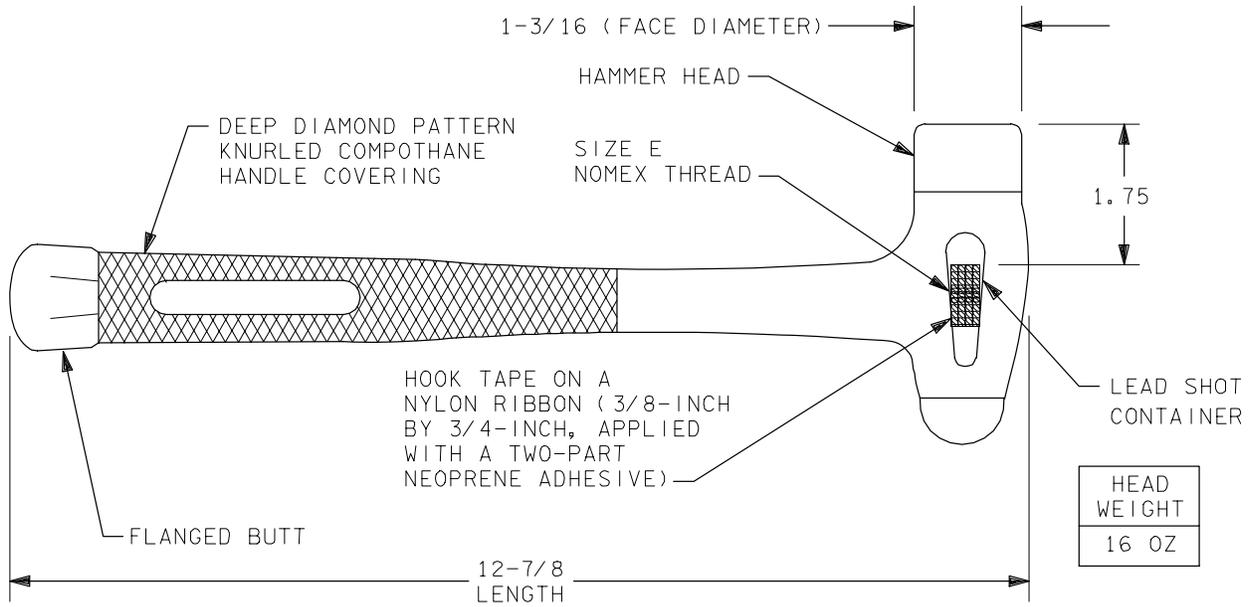
COMMENTS

The small file kit assembly consists of 12 files in a rollup pouch. Each file is 5-1/2 inches long and has a round, knurled handle.

DEADBLOW BALLPEEN HAMMER



Item 63 Technical Information	
Location	IFM tool locker drawer 2
CCCD part number	528-20148-3 (ST20T1013-66)
CCCD drawing	SED32102163
Other drawings	528-20148 (misc. tool assembly IFM tool kit/sheet 1 of 2)
Manufacturer	Snap-On Tools/Boeing
Boeing spec number	528-41013-66
Snap-On part number	BPD 16A
Weight	1.58 lb
Material	The hammer is high-quality steel with a natural finish. It has a compothane covering, and its head has a steel container filled with lead shot
Quantity flown	One



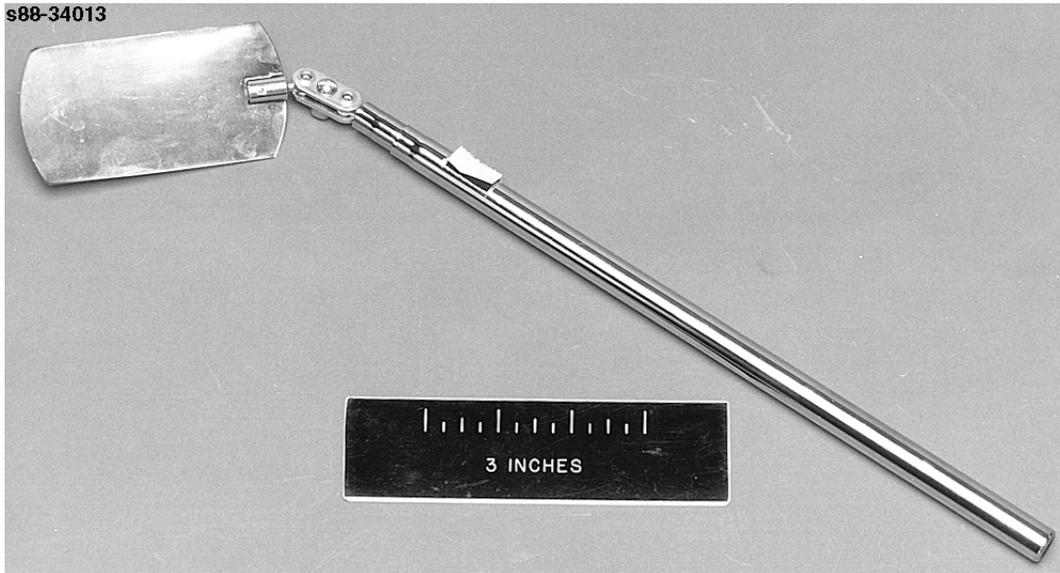
234460318. ART. 3

Deadblow ballpeen hammer

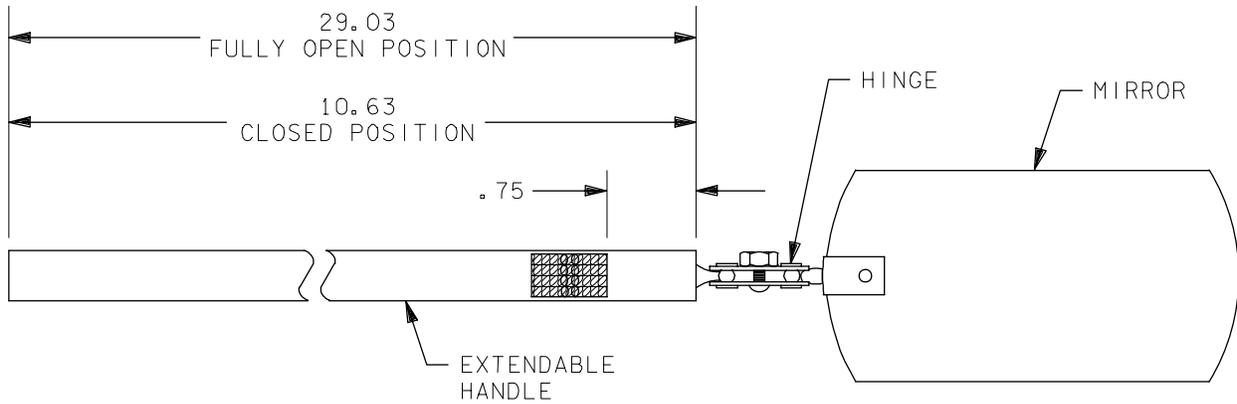
COMMENTS

The "lead shot" in the hammer head significantly reduces rebound.

INSPECTION MIRROR



Item 64 Technical Information	
Location	IFM tool locker drawer 2
CCCD part number	528-20168-1 (ST20T1013-35)
CCCD drawing	SED32102163
Other drawings	528-20168 (inspection mirror IFM tool kit/one sheet)
Manufacturer	McMaster/Carr
Boeing spec number	528-41013-35
McMaster Carr part number	GF157A
Weight	6.62 oz
Material	The handle is chrome-plated brass, and the mirror is stainless steel
Quantity flown	One



234460319. ART. 1

Oval inspection mirror

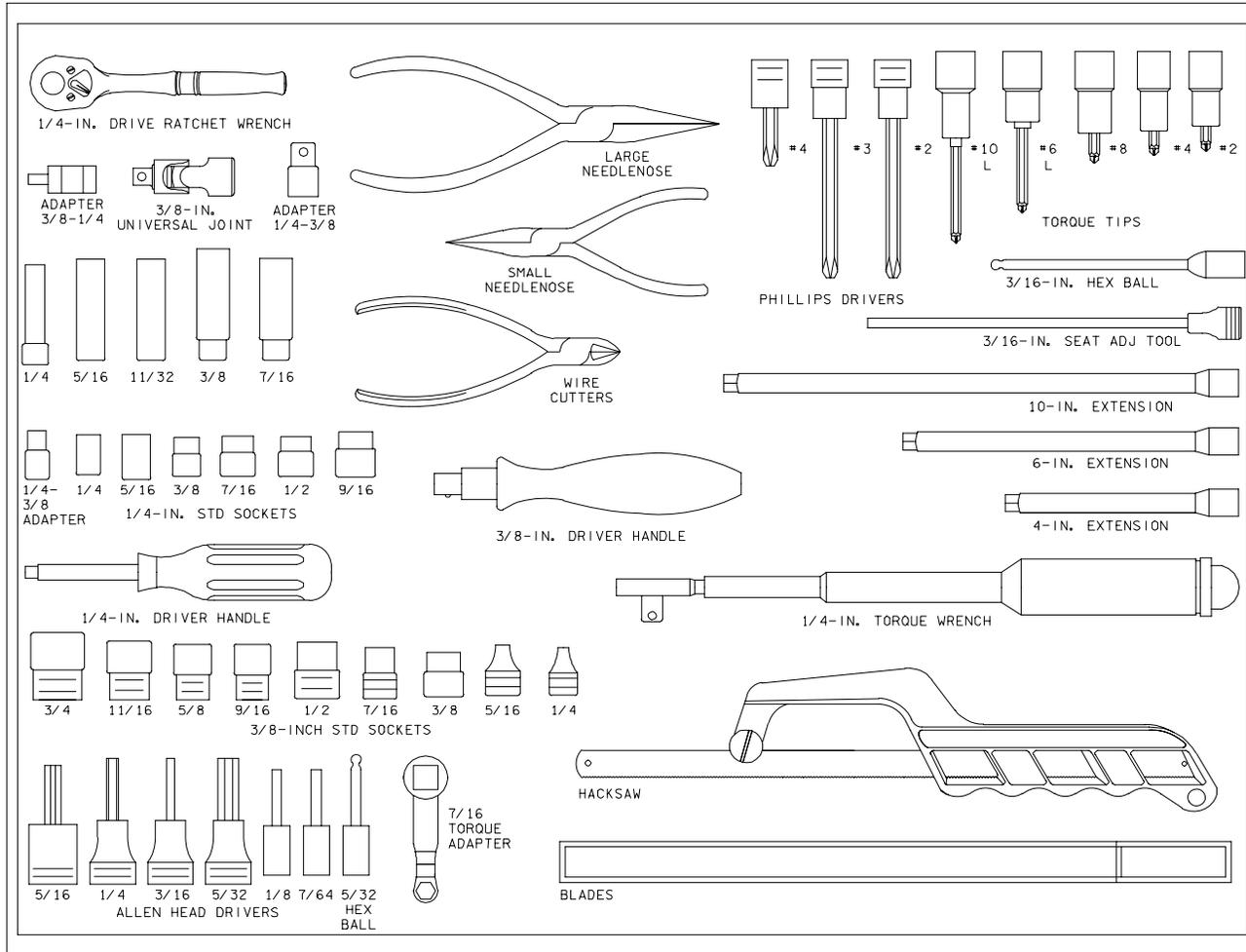
COMMENTS

The inspection mirror is used with a penlight to inspect the ARS duct interface between the air duct and an LRU (to ensure proper alignment of the sealing ring with the receptacle following an LRU changeout). It can be used in any application requiring remote viewing.

IFM TOOL LOCKER DRAWER 3

Item		Page
TRAY		
65	IFM TOOL LOCKER DRAWER 3 TRAY	4-2
DRIVE TOOLS		
66	4-INCH RATCHET WRENCH	4-4
67	1/4-INCH TORQUE WRENCH (40-200 IN/LB).....	4-6
68	1/4-INCH DRIVER HANDLE	4-8
3/8-INCH DRIVERS		
69	3/8-INCH DRIVER HANDLE	4-10
1/4-INCH DRIVE TOOLS		
70	1/4-INCH TO 3/8-INCH ADAPTER (1/4-INCH DRIVE)	4-12
71	4-, 6-, AND 10-INCH EXTENSIONS (1/4-INCH DRIVE)	4-14
72	HEX HEAD DRIVERS: 5/16, 1/4, 5/32, 3/16, 7/64, 1/8-INCH	4-16
73	BALL TIP HEX HEAD DRIVER (1/4-INCH DRIVE): 5/32-INCH (3/8-INCH DRIVE): 3/16-INCH	4-19
74	12-POINT DEEPWELL SOCKETS (1/4-INCH DRIVE): 1/4, 5/16, 11/32, 3/8, 7/16-INCH	4-20
3/8-INCH DRIVE TOOLS		
75	12-POINT STANDARD SOCKETS (1/4-INCH DRIVE): 1/4, 5/16, 3/8, 7/16, 1/2, 9/16-INCH	4-22
76	3/8-INCH TO 1/4-INCH ADAPTER (3/8-INCH DRIVE)	4-24
77	UNIVERSAL JOINT (3/8-INCH DRIVE)	4-26
78	12-POINT STANDARD SOCKETS (3/8-INCH DRIVE): 1/4, 5/16, 3/8, 7/16, 1/2, 9/16, 5/8, 11/16, 3/4-INCH.....	4-28
79	SEAT ADJUSTMENT TOOL (3/16-INCH HEX HEAD DRIVER; 3/8-INCH DRIVE)	4-30
80	PHILLIPS HEAD DRIVERS #2, #3, #4 (3/8-INCH DRIVE).....	4-32
81	TORQUE TIP DRIVERS #2, #4, #6L, #8, #10L (3/8-INCH DRIVE).....	4-34
82	TORQUE ADAPTER (7/16-INCH; 3/8-INCH DRIVE)	4-36

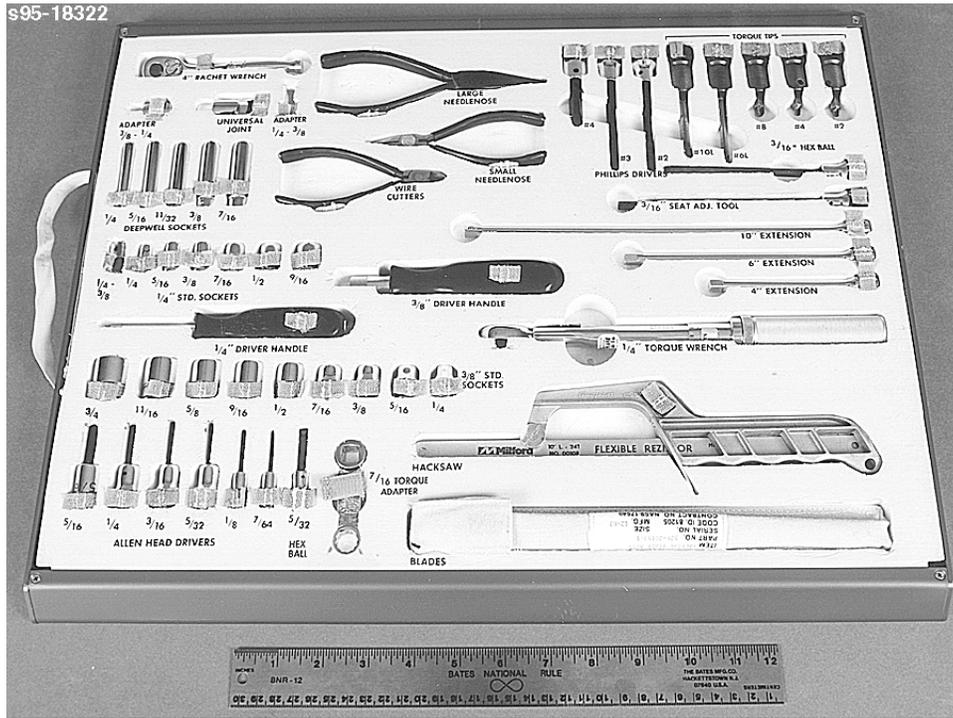
Item		Page
MISCELLANEOUS		
83	NEEDLENOSE PLIERS: LARGE (6 INCHES) AND SMALL (4-1/2 INCHES)	4-37
84	4-1/2 INCH DIAGONAL CUTTERS	4-39
HACKSAW		
85	HACKSAW	4-41
86	HACKSAW BLADE KIT	4-43



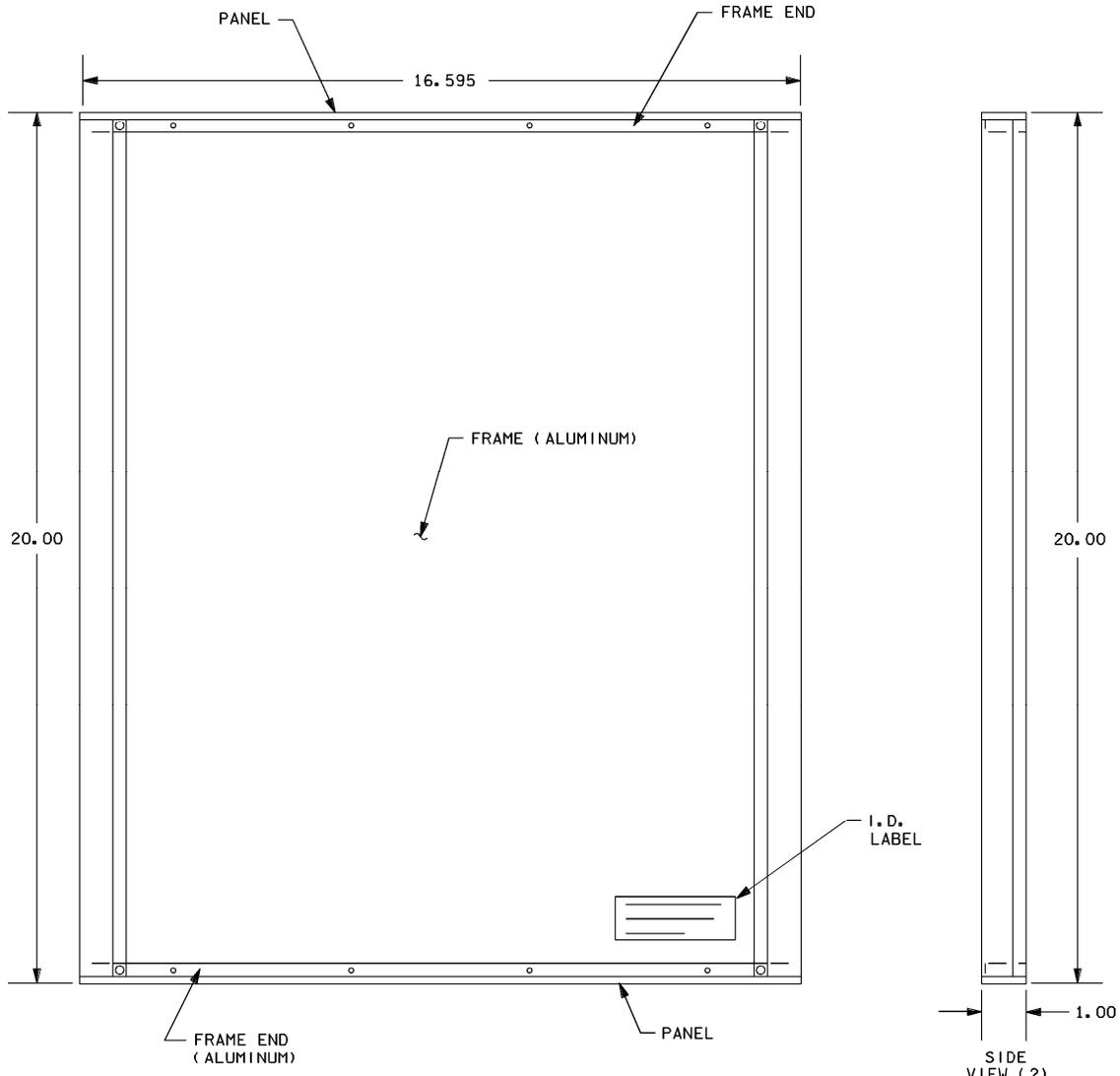
23446400A. ART. 10

IFM tool locker drawer 3

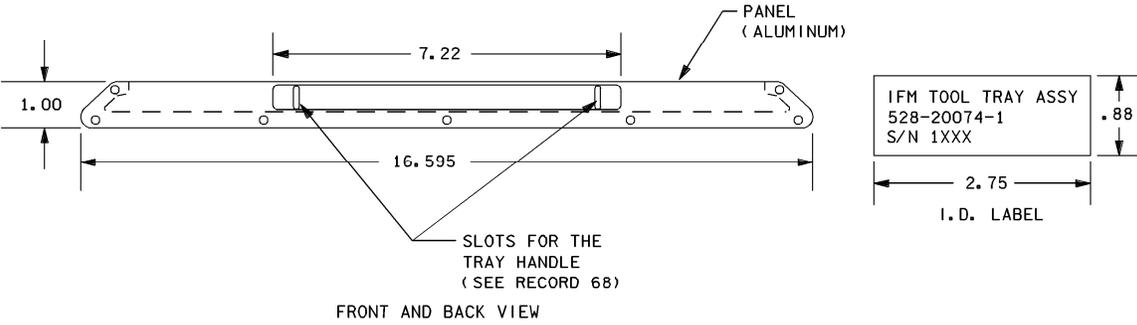
IFM TOOL LOCKER DRAWER 3 TRAY



Item 65 Technical Information	
Location	IFM tool locker drawer 3
CCCD part number	528-20074-1
CCCD drawing	SED32102161
Other drawings	528-20074 (IFM tool tray assembly/seven sheets)
Manufacturer	Boeing
Weight	2.11 lb
Quantity flown	One



OVERHEAD VIEW

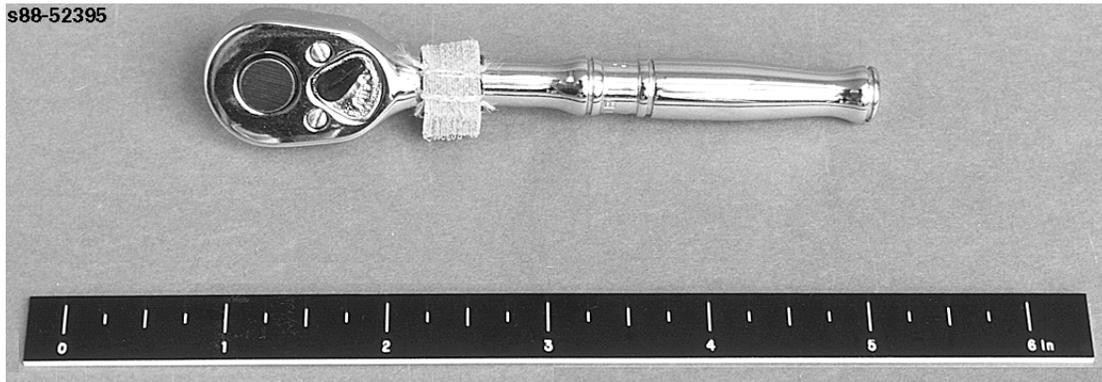


FRONT AND BACK VIEW

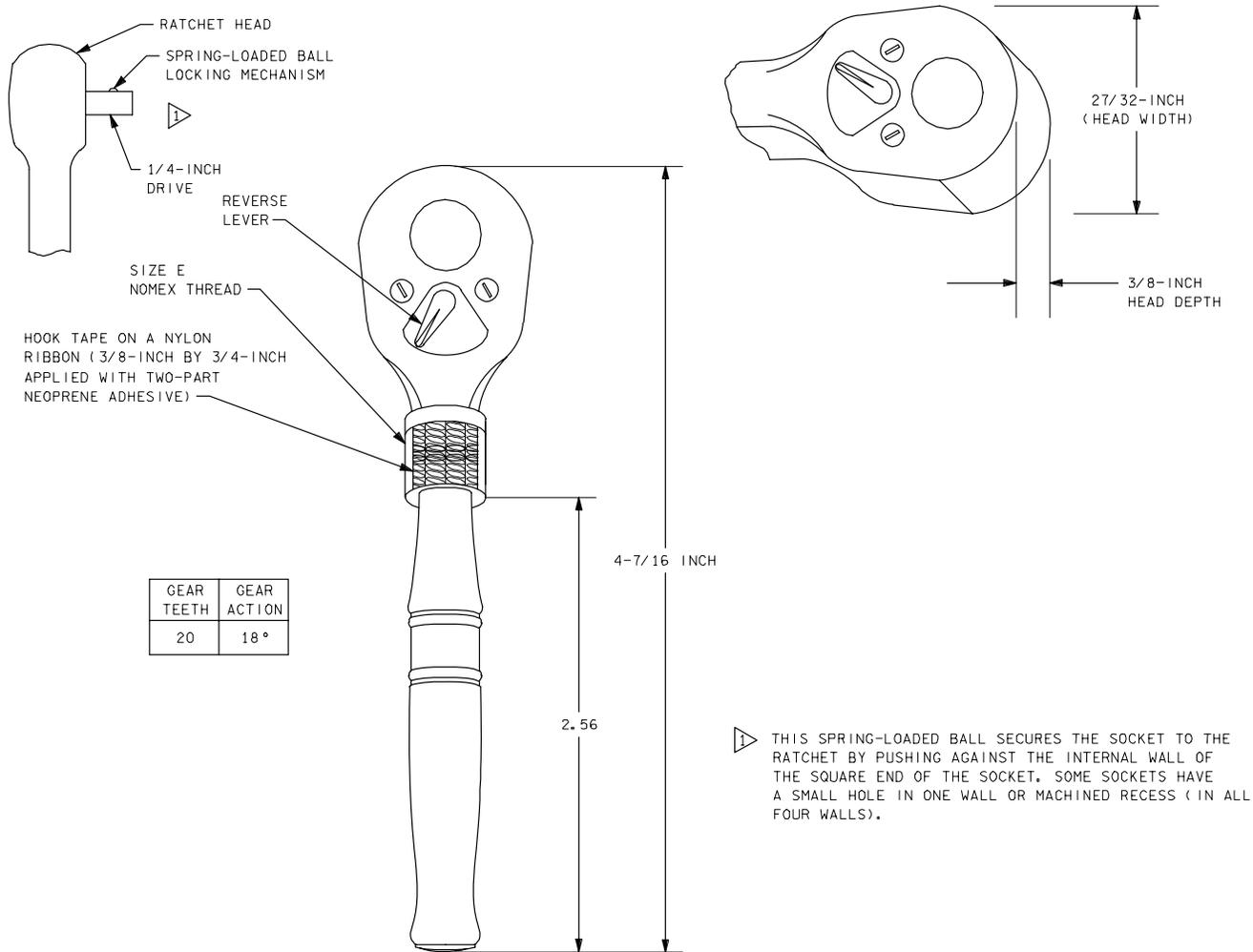
0033511. ART, 1

IFM tool locker tray 3

4-INCH RATCHET WRENCH



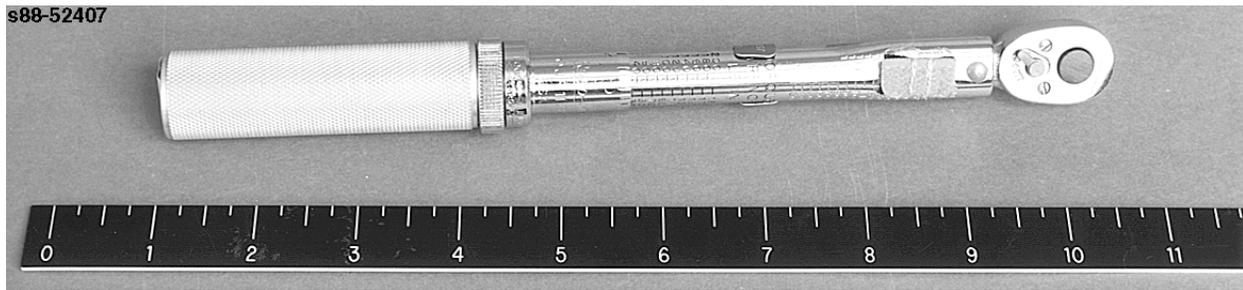
Item 66 Technical Information	
Location	IFM tool locker drawer 3
CCCD part number	528-20145-18 (ST20T1013-70)
CCCD drawing	SED32102161
Other drawings	528-20145 (wrench assembly IFM tool kit/sheet 3 of 4)
Manufacturer	Snap-On Tools/Boeing
Boeing spec number	528-41013-70
Snap-On part number	TM70B
Weight	2.7 oz
Material	Nickel/chrome-plated, high-quality steel
Quantity flown	One



234460403, ART# 3

4-inch ratchet wrench (1/4-inch drive)

1/4-INCH TORQUE WRENCH (40-200 IN/LB)

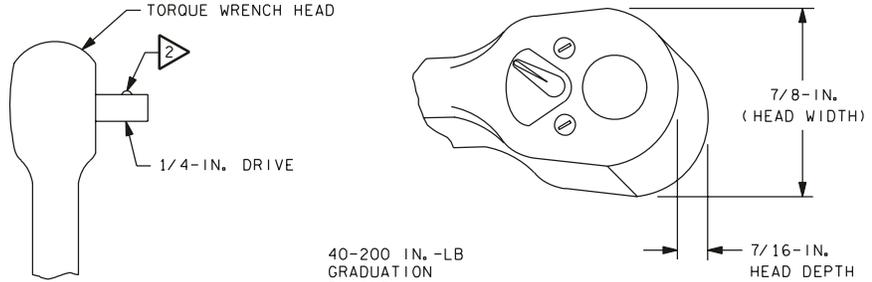


Item 67 Technical Information	
Location	IFM tool locker drawer 3
CCCD part number	528-20145-19 (ST20T1013-96)
CCCD drawing	SED32102161
Other drawings	528-20145
Manufacturer	Snap-On Tools/Boeing
Boeing spec number	528-41013-96
Snap-On part number	QD1R200
Weight	10.93 oz
Material	Nickel/chrome-plated, high-quality steel with an aluminum knurled handle covering
Quantity flown	One

COMMENTS

The 1/4-inch torque wrench is not to be used as a standard ratchet wrench. The head clicks to indicate when the proper torque is attained.

If used in conjunction with the torque adapter, the proper torque is not correctly indicated by the setting on the handle.

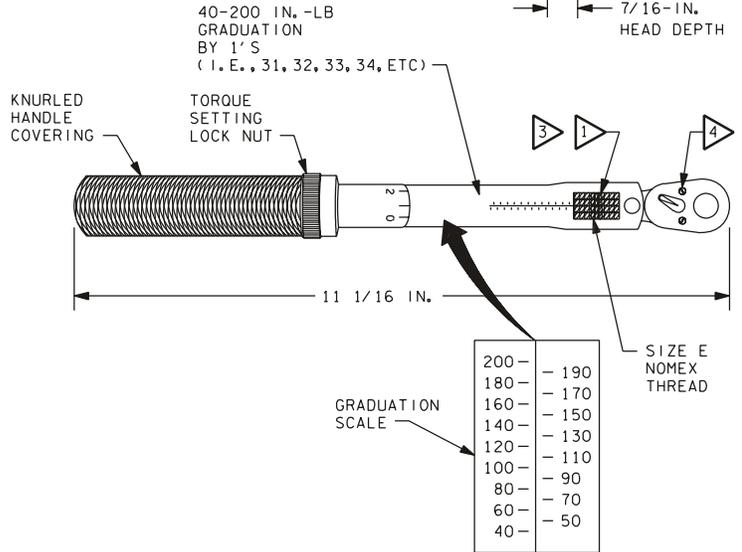


4 REMOVE TWO RETAINING SCREWS ON HEAD OF TORQUE WRENCH. DISASSEMBLE AND CLEAN INTERNAL PARTS PER BOEING DOCUMENT NO. 10107-70009, PARA 5.4.2.1. LUBRICATE WITH APPROVED BATCH/LOT CONTROLLED BRAYCOTE 3L-38 RP OR 601, AVAILABLE FROM BRAY PRODUCTS DIV., BURMAH-CASTROL, INC., IRVINE, CA., 92714. AVOID CONTAMINATION FROM EXCESSIVE LUBRICANT OR OTHER FOREIGN MATTER, REASSEMBLE, AND APPLY LOCKTITE GRADE "A" TO END OF SCREW AND FASTEN IN PLACE (MANUFACTURED BY LOCKTITE CORP, NEWINGTON, CT, 06111) TORQUE TO 2.3 ±.3 IN.-LB.

3 ATTACHMENT TAB SHALL BE INSTALLED IN AN AREA SO AS NOT TO IMPEDE THE FUNCTIONAL OPERATION OF THE TOOL OR NOT TO COVER THE PART NUMBER (IF POSSIBLE).

2 SPRING-LOADED FRICTION BALL LOCKING MECHANISM. THIS SPRING-LOADED BALL SECURES THE SOCKET TO THE TORQUE WRENCH BY PUSHING AGAINST THE INTERNAL WALL OF THE SQUARE END OF THE SOCKET. SOME SOCKETS HAVE A SMALL HOLE (IN ONE WALL), OR MACHINED RECESSES (IN ALL FOUR WALLS).

1 HOOK TAPE ON A NYLON RIBBON (3/8 BY 3/4-INCH, APPLIED WITH TWO-PART NEOPRENE ADHESIVE).



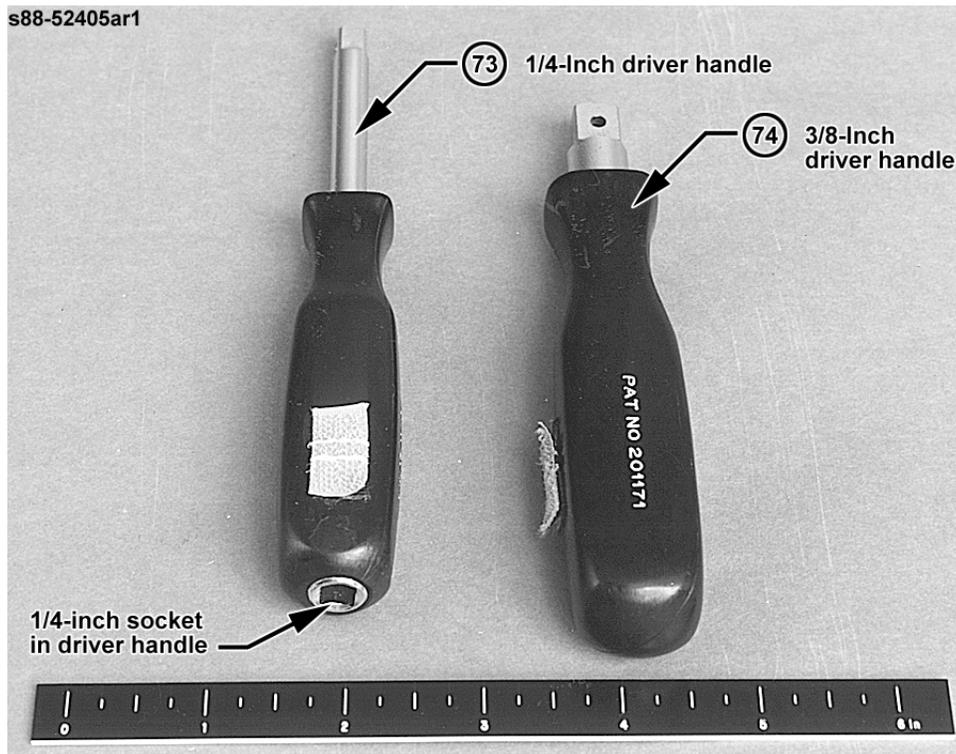
SQUARE DRIVE	HEAD STYLE	RANGE		
		MINIMUM	MAXIMUM	INCREMENTS
1/4-IN.	FIXED-RATCHET	40 IN.-LB	200 IN.-LB	1 IN.-LB

0033561, ART. 1

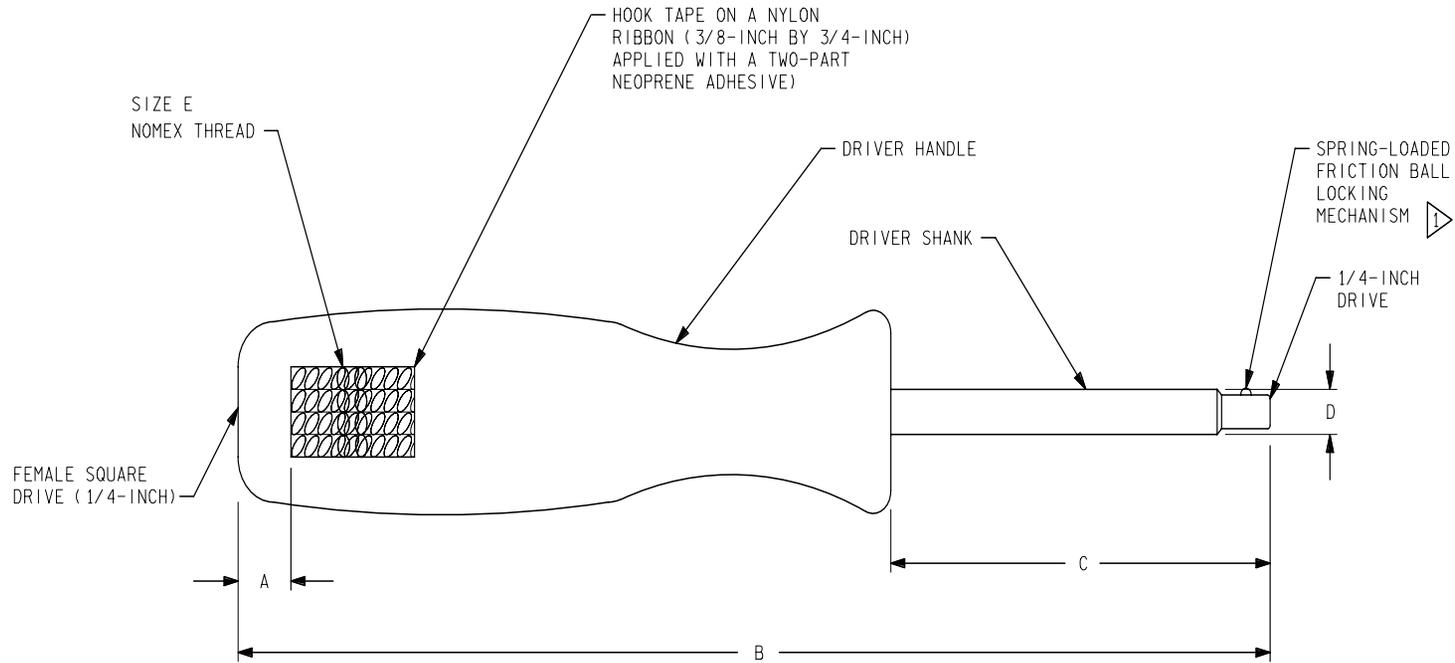
1/4-inch torque wrench (click type)¹⁵

¹⁵ Torque Wrenches Instructions. Snap-On Tools Corporation, Kenosha, Wisconsin.

1/4-INCH DRIVER HANDLE



Item 68 Technical Information	
Location	IFM tool locker drawer 3
CCCD part number	528-20146-6 (ST20T1013-79)
CCCD drawing	SED32102161
Other drawings	528-20146 (screwdriver assembly IFM tool kit/sheet 1 of 1)
Manufacturer	Snap-On Tools/Boeing
Boeing spec number	528-41013-79
Snap-On part number	TM4CS
Weight	3.29 oz
Material	Nickel/chrome-plated, high-quality steel driver shank and a plastic driver handle
Quantity flown	One



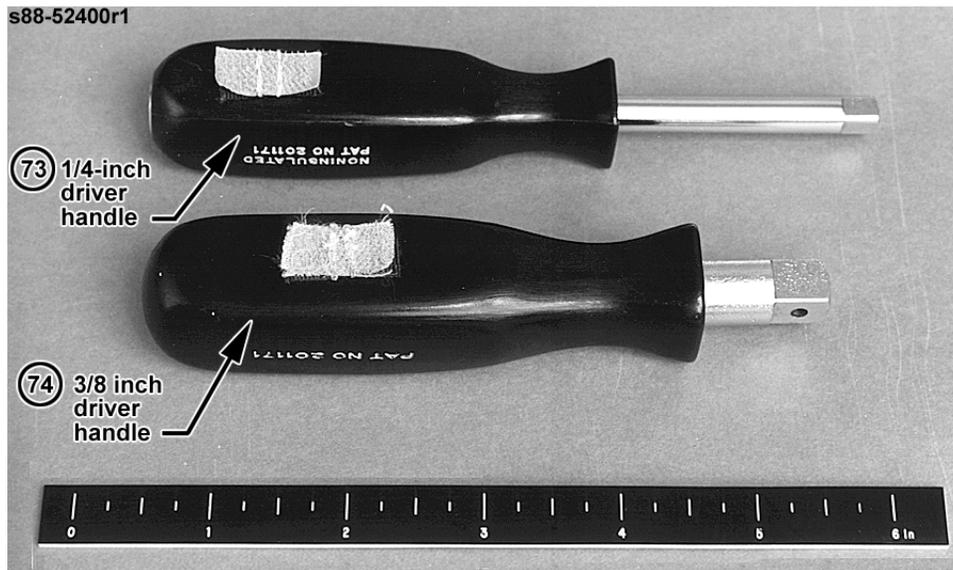
DIMENSIONS (IN INCHES)			
A	B (LENGTH)	C (SHANK LENGTH)	D (SHANK DIAMETER)
0.56	5-3/4	2	5/16

THIS SPRING-LOADED BALL SECURES THE SOCKET TO THE DRIVER HANDLE BY PUSHING AGAINST THE INTERNAL WALL OF THE SQUARE END OF THE SOCKET. SOME SOCKETS HAVE A SMALL HOLE (IN ONE WALL), OR MACHINED RECESSES (IN ALL FOUR WALLS).

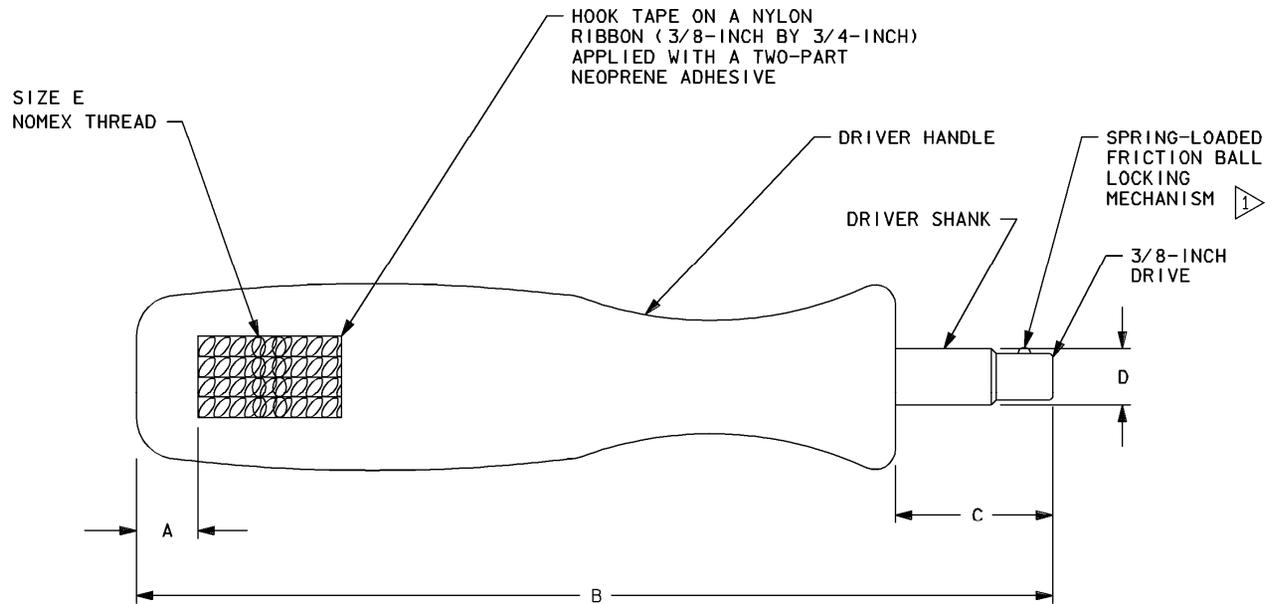
234460405. ART# 3

Driver handle (1/4-inch with a 1/4-inch female square drive in the end of the handle for use as an extension bar)

3/8-INCH DRIVER HANDLE



Item 69 Technical Information	
Location	IFM tool locker drawer 3
CCCD part number	528-20146-7 (ST20T1013-65)
CCCD drawing	SED32102161
Other drawings	528-20146 (screwdriver assembly IFM tool kit/sheet 1 of 1)
Manufacturer	Snap-On Tools/Boeing
Boeing spec number	528-41013-65
Snap-On part number	PIT120
Weight	0.225 lb
Material	Nickel/chrome-plated, high-quality steel driver shank and a plastic driver handle
Quantity flown	One



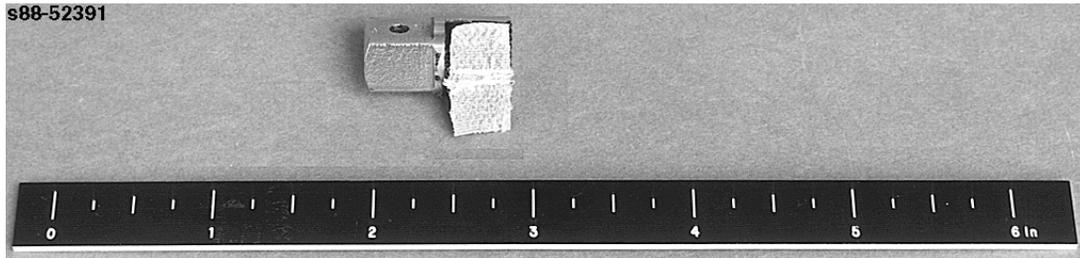
DIMENSIONS (IN INCHES)			
A	B (LENGTH)	C (SHANK LENGTH)	D (SHANK DIAMETER)
1.13	5 - 1/4	1	1/2

1 THIS SPRING-LOADED BALL SECURES THE SOCKET TO THE DRIVER HANDLE BY PUSHING AGAINST THE INTERNAL WALL OF THE SQUARE END OF THE SOCKET. SOME SOCKET SQUARE END WALLS HAVE A SMALL HOLE (IN ONE WALL) OR MACHINED RECESSES (IN ALL FOUR WALLS).

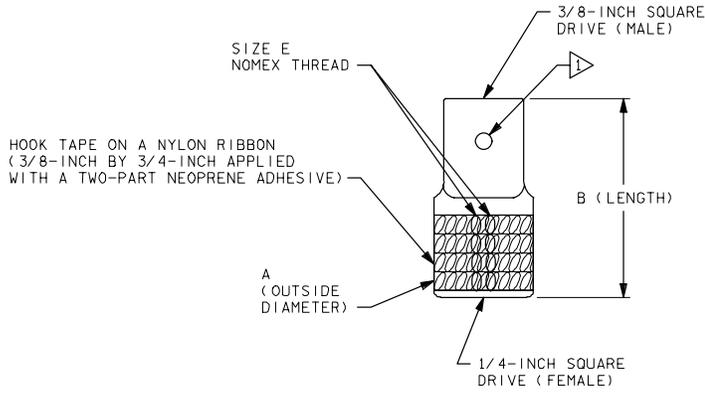
0033512. ART. 1

Driver handle (3/8-inch drive)

1/4-INCH TO 3/8-INCH ADAPTER (1/4-INCH DRIVE)



Item 70 Technical Information	
Location	IFM tool locker drawer 3
CCCD part number	528-20147-27 (ST20T1013-74)
CCCD drawing	SED32102161
Other drawings	528-20147 (sockets IFM tool kit assembly/sheet 2 of 3)
Manufacturer	Snap-On Tools/Boeing
Boeing spec number	528-41013-74
Snap-On part number	TA3
Weight	0.56 oz
Material	Nickel/chrome-plated, high-quality steel
Quantity flown	Two



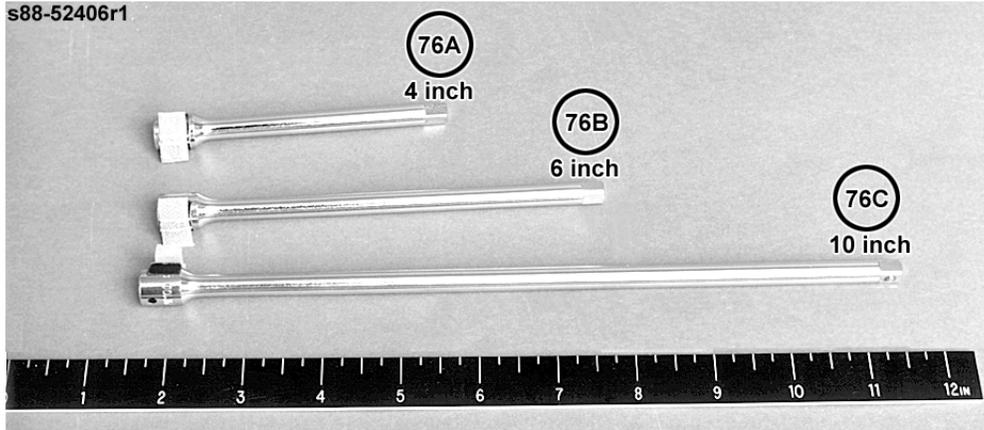
SQUARE DRIVE		DIMENSIONS (INCHES)	
FEMALE END	MALE END	A (OUTSIDE DIAMETER)	B (LENGTH)
1/4-INCH	3/8-INCH	1/2	15/16

1 SPRING-LOADED FRICTION BALL LOCKING MECHANISM (THIS SPRING-LOADED BALL SECURES THE SOCKET TO THE ADAPTER BY PUSHING AGAINST THE INTERNAL WALL OF THE SQUARE END OF THE SOCKET. SOME SOCKET SQUARE END WALLS HAVE A SMALL HOLE (IN ONE WALL) OR MACHINED RECESSES (IN ALL FOUR WALLS).

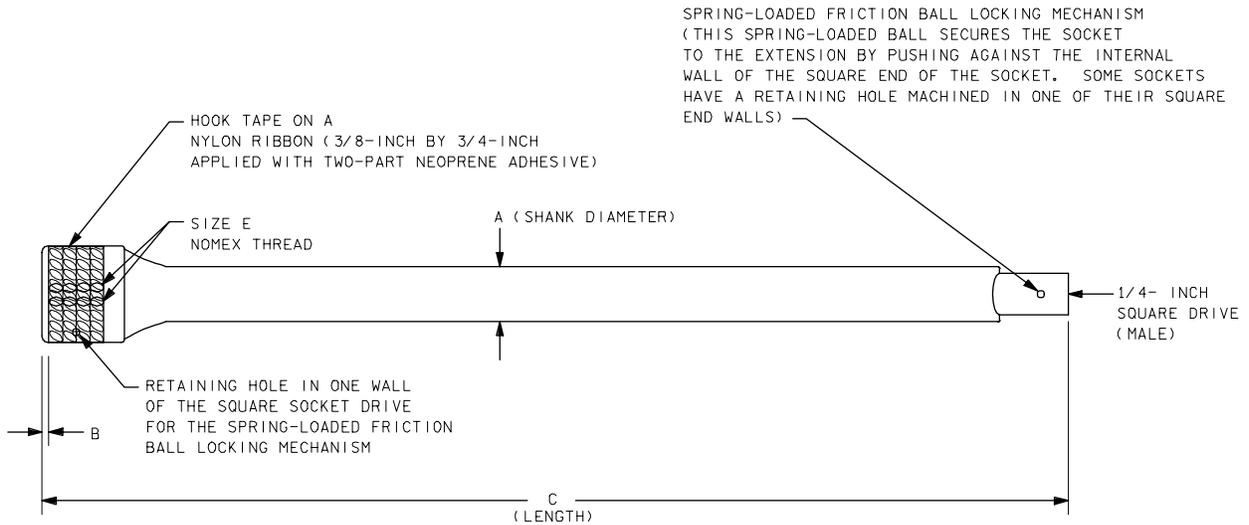
234460407. ART, 3

1/4-inch to 3/8-inch adapter, (1/4-inch drive)

4-, 6-, AND 10-INCH EXTENSIONS (1/4-INCH DRIVE)



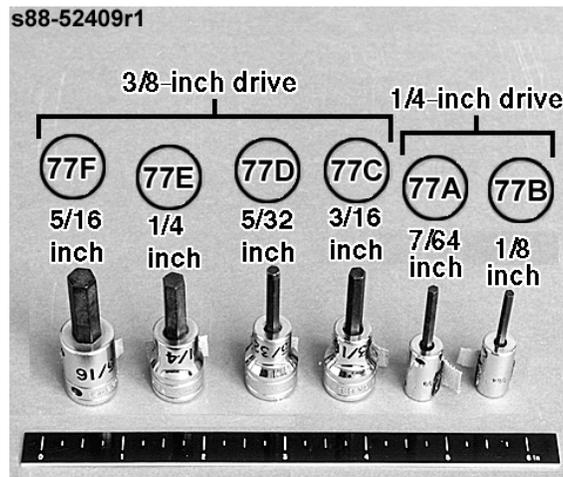
Item 71 Technical Information (A - C)	
Location	IFM tool locker drawer 3
CCCD drawing	SED32102161
Other drawings	528-20147 (sockets IFM tool kit assembly/sheet 3 of 3)
Manufacturer	Snap-On Tools/Boeing
Material	Nickel/chrome-plated, high-quality steel
Quantity flown	One of each (total three)



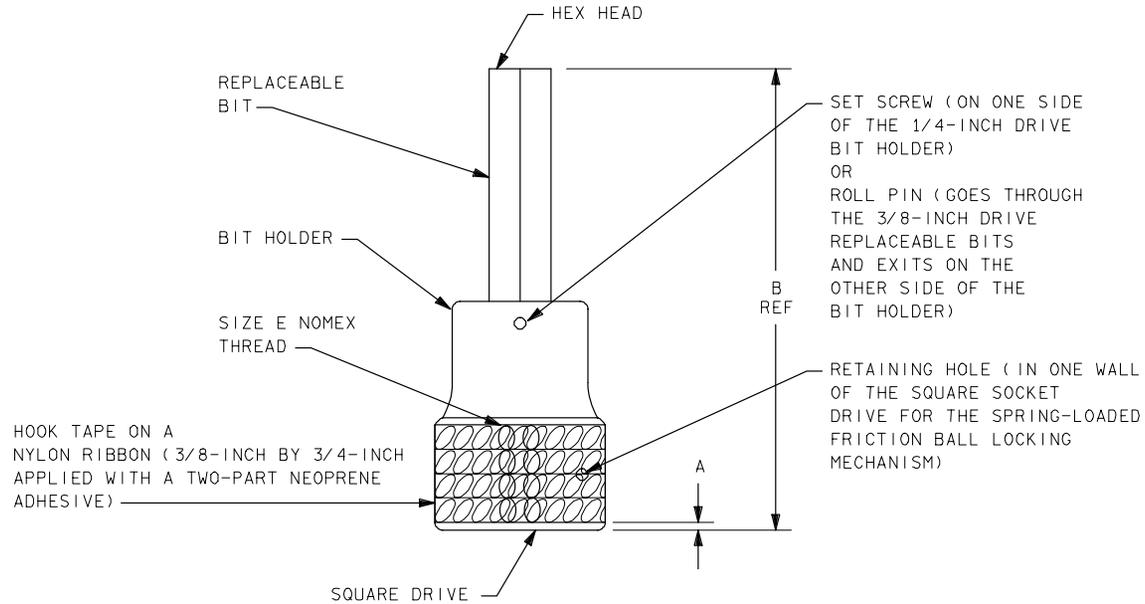
4-, 6-, and 10-inch extensions (1/4-inch drive)

Item number	Snap-On Tools part number	Square drive		Dimensions (in.)			CCCD part number	Boeing spec number	Weight (oz)
		Female end	Male end	A	B	C			
76A	TMX4	1/4	1/4	5/16	0.06	4	528-20147-31 (ST20T1013-71)	528-41013-71	1.50
76B	TMX60	1/4	1/4	5/16	0.06	6	528-20147-32 (ST20T1013-72)	528-41013-72	2.15
76C	TMX100	1/4	1/4	5/16	0.06	10	528-20147-33 (ST20T1013-73)	528-41013-73	3.46

HEX HEAD DRIVERS: 5/16, 1/4, 5/32, 3/16, 7/64, 1/8-INCH



Item 72 Technical Information (A - F)	
Location	IFM tool locker drawer 3
CCCD drawing	SED32102161
Other drawings	528-20147 (sockets IFM tool kit assembly/sheet 1 of 3)
Manufacturer	Snap-On Tools/Boeing
Material	Nickel/chrome-plated, high-quality steel bit holder, with a black oxide finished replaceable steel bit
Quantity flown	One of each (total six)



234460409. ART# 3

Hex head drivers (1/4-inch drive) 7/16, 1/8-inch

Item number	Snap-On Tools part number	Square drive size (in.)	Hex head size (in.)	Dimensions (in.)		Fits these sizes		CCCD part number	Boeing spec number	Weight (oz)
				A	B (length)	Cap screws	Set screws			
77A	TMA 3.5	1/4	7/64	0.19	1-7/8	-	-	528-20147-12 (ST20T1013-98)	528-41013-98	0.5
77B	TMA 4	1/4	1/8	.19	1-7/8	-	1/4	528-20147-13 (ST20T1013-113)	528-41013-113	0.49
77C	FA5A	3/8	3/16	.06	2-1/16	#10	5/16	-	-	-
77D	FA6A	3/8	5/32	.03	2-1/16	1/4	3/8	-	-	-
77E	FA8A	3/8	1/4	.03	2-1/16	5/16	1/2	-	-	-
77F	FA10B	3/8	5/16	.03	2-1/16	3/8	5/8	-	-	-

COMMENTS

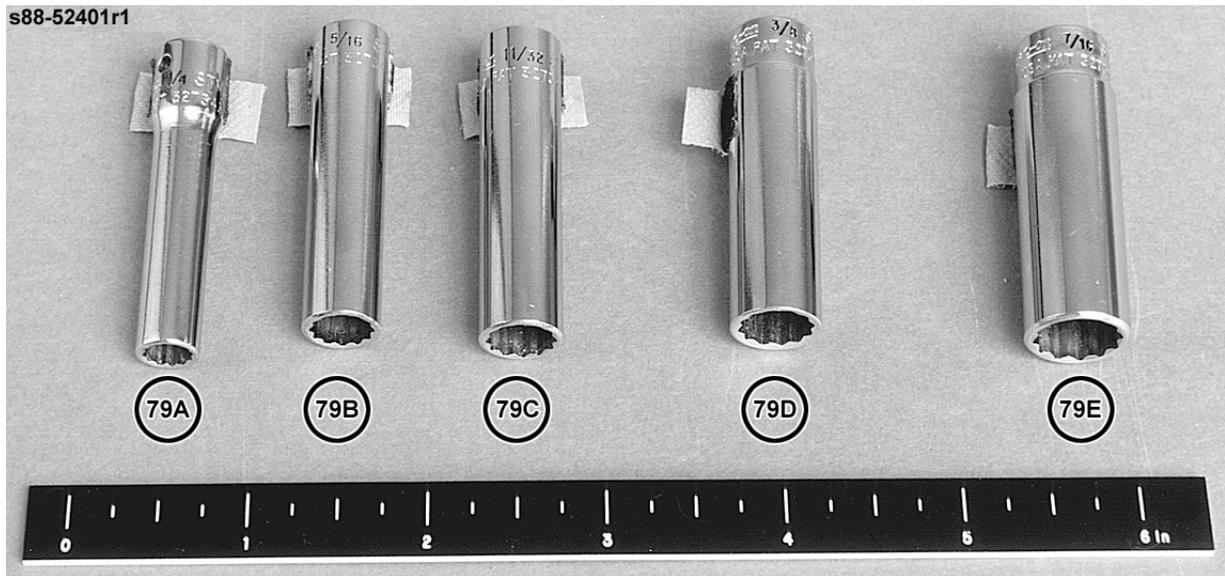
Note: A 1/4-inch drive 5/32-inch hex head driver is in the IFM tool locker, drawer 1 (Allen Driver Screwdriver Batteries Bag).

BALL TIP HEX HEAD DRIVER (1/4-INCH DRIVE): 5/32-INCH
(3/8-INCH DRIVE): 3/16-INCH

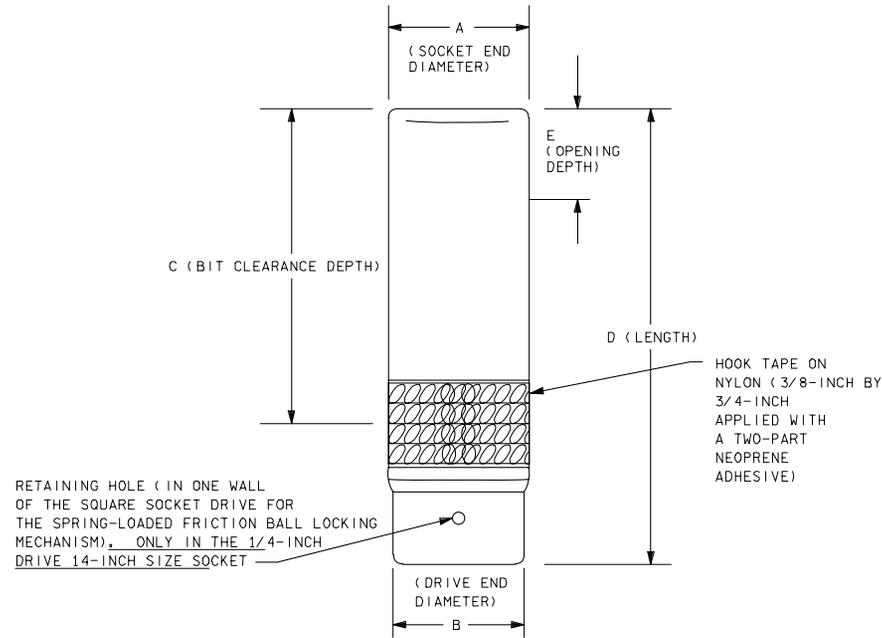


Item 73 Technical Information (A - C)	
Location	IFM tool locker drawer 3
CCCD drawing	SED32102161
Other drawings	SED39121807-301 (3/16-in. ball tip hex head driver) 528-20147-43 (5/32-in. ball tip hex head driver)
Manufacturer	Snap-On Tools/Boeing
Material	Nickel/chrome-plated, high-quality steel bit holder, with black oxide finished replaceable steel bit
Quantity flown	One of each (total two)

**12-POINT DEEPWELL SOCKETS (1/4-INCH DRIVE):
1/4, 5/16, 11/32, 3/8, 7/16-INCH**



Item 74 Technical Information (A - E)	
Location	IFM tool locker drawer 3
CCCD drawing	SED32102161
Other drawings	528-20147 (sockets IFM tool kit assembly/sheet 1 of 3)
Manufacturer	Snap-On Tools/Boeing
Material	Nickel/chrome-plated, high-quality steel
Quantity flown	One of each (total five)

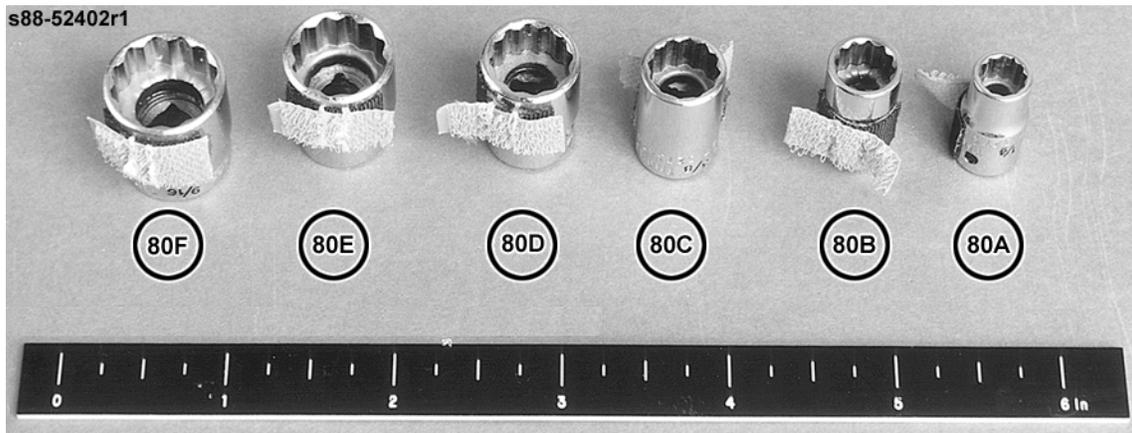


12-point deepwell sockets (1/4-inch drive): 1/4, 5/16, 11/32, 3/8, 7/16-inch

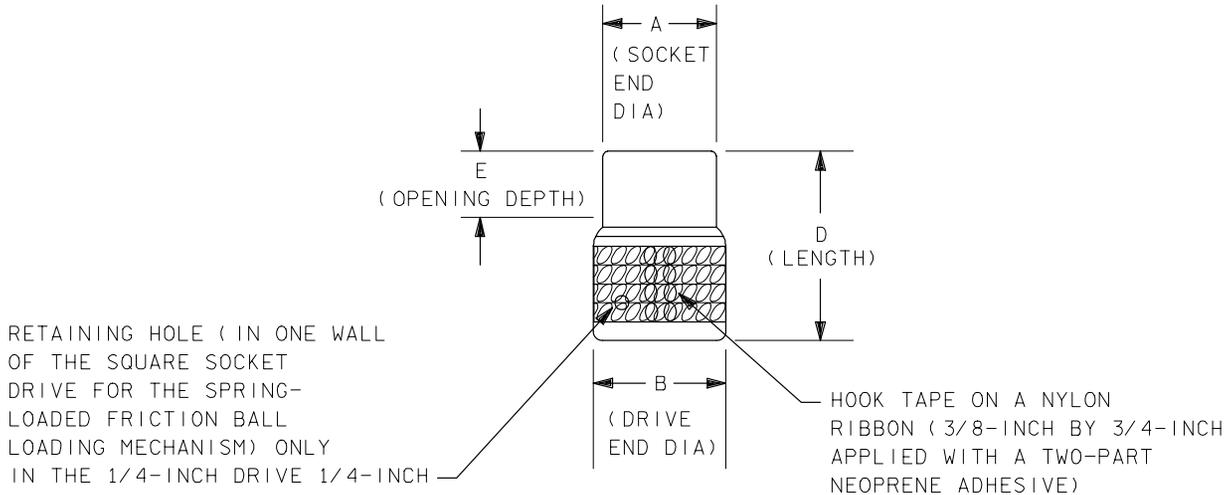
Item number	Snap-On Tools part number	Square drive size (in.)	12-point socket* (wrench) size (in.)	Dimensions (in.)					CCCD part number	Boeing spec number	Weight (oz)
				A	B	C	D	E			
79A	STMD 8	1/4	1/4	3/8	7/16	1-21/32	2	1/4	528-20147-1 (ST20T1013-87)	528-41013-87	0.61
79B	STMD 10	1/4	5/16	7/16	7/16	1-21/32	2	5/16	528-20147-2 (ST20T1013-88)	528-41013-88	0.82
79C	STMD 11	1/4	11/32	1/2	1/2	1-21/32	2	5/16	528-20147-3 (ST20T1013-68)	528-41013-68	0.98
79D	STMD 12	1/4	3/8	9/16	1/2	1-21/32	2	5/16	528-20147-4 (ST20T1013-89)	528-41013-89	1.06
79E	STMD 14	1/4	7/16	5/8	9/16	1-21/32	2	5/16	528-20147-5 (ST20T1013-90)	528-4103-90	1.4

*Flank drive.

**12-POINT STANDARD SOCKETS (1/4-INCH DRIVE):
1/4, 5/16, 3/8, 7/16, 1/2, 9/16-INCH**



Item 75 Technical Information (A - F)	
Location	IFM tool locker drawer 3
CCCD drawing	SED32102161
Other drawings	528-20147 (sockets IFM tool kit assembly/sheet 1 of 3)
Manufacturer	Snap-On Tools/Boeing
Material	Nickel/chrome-plated, high-quality steel
Quantity flown	One of each (total six)



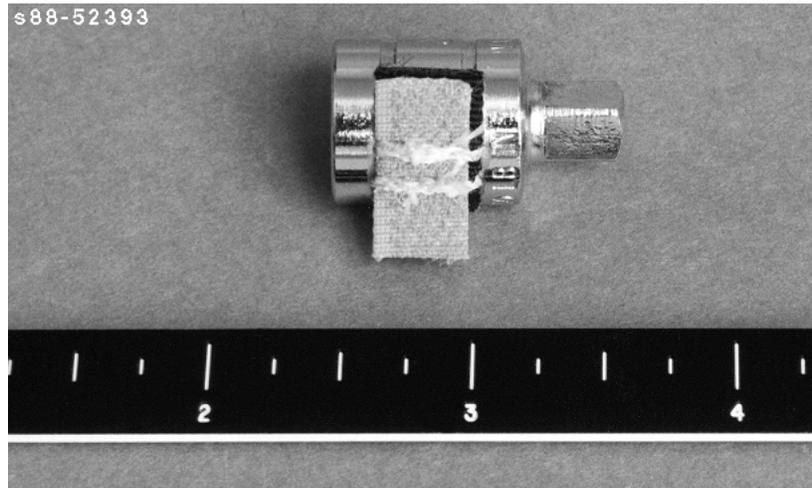
234460411. ART; 3

12-point standard sockets (1/4-inch drive): 1/4, 5/16, 3/8, 7/16, 1/2, 9/16-inch

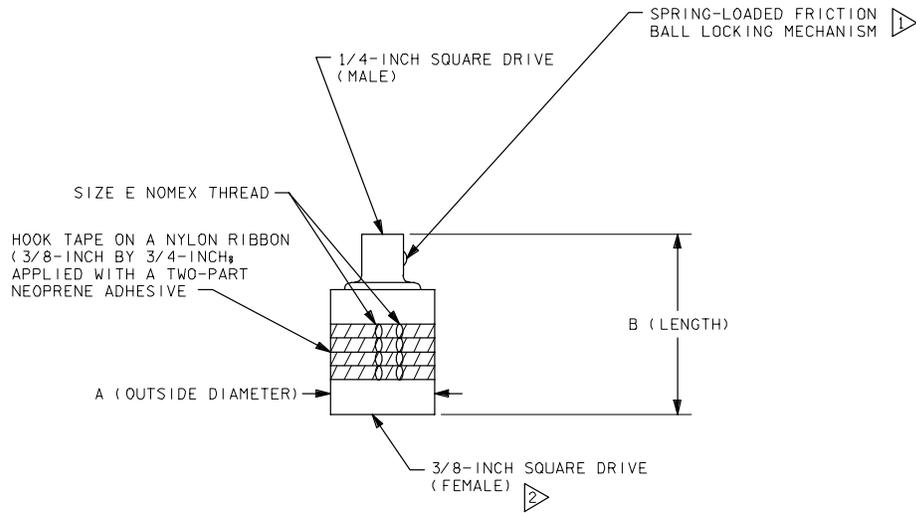
Item number	Snap-On Tools part number	Square drive size (in.)	12-point socket* (wrench) size (in.)	Dimensions (in.)					CCCD part number	Boeing spec number	Weight (oz)
				A	B	C	D	E			
80A	TMD 8	1/4	1/4	3/8	7/16	17/32	7/8	1/4	528-20147-6 (ST20T1013-81)	528-41013-81	0.28
80B	TMD 10	1/4	5/16	7/16	7/16	17/32	7/8	1/4	528-20147-7 (ST20T1013-82)	528-41013-82	0.37
80C	TMD 12	1/4	3/8	9/16	9/16	17/32	7/8	9/32	528-20147-8 (ST20T1013-83)	528-41013-83	0.47
80D	TMD 14	1/4	7/16	5/8	9/16	17/32	7/8	9/32	528-20147-9 (ST20T1013-84)	528-41013-84	0.63
80E	TMD 16	1/4	1/2	11/16	19/32	17/32	7/8	9/32	528-20147-10 (ST20T1013-85)	528-41013-85	0.7
80F	TMD 18	1/4	9/16	25/32	23/32	17/32	7/8	5/16	528-20147-11 (ST20T1013-86)	528-41013-86	0.87

*Flank drive.

3/8-INCH TO 1/4-INCH ADAPTER (3/8-INCH DRIVE)



Item 76 Technical Information	
Location	IFM tool locker drawer 3
CCCD part number	528-20147-29 (ST20T1013-57, 100)
CCCD drawing	SED32102161
Other drawings	528-20147 (sockets IFM tool kit assembly/sheet 2 of 3)
Manufacturer	Snap-On Tools/Boeing
Boeing spec number	528-41013-57, 100
Snap-On part number	TM1
Weight	0.85 oz
Material	Nickel/chrome-plated, high-quality steel
Quantity flown	One



SQUARE DRIVE □		DIMENSIONS (INCHES)	
FEMALE END	MALE END	A	B
3/8-INCH	1/4-INCH	21/32	1-1/8

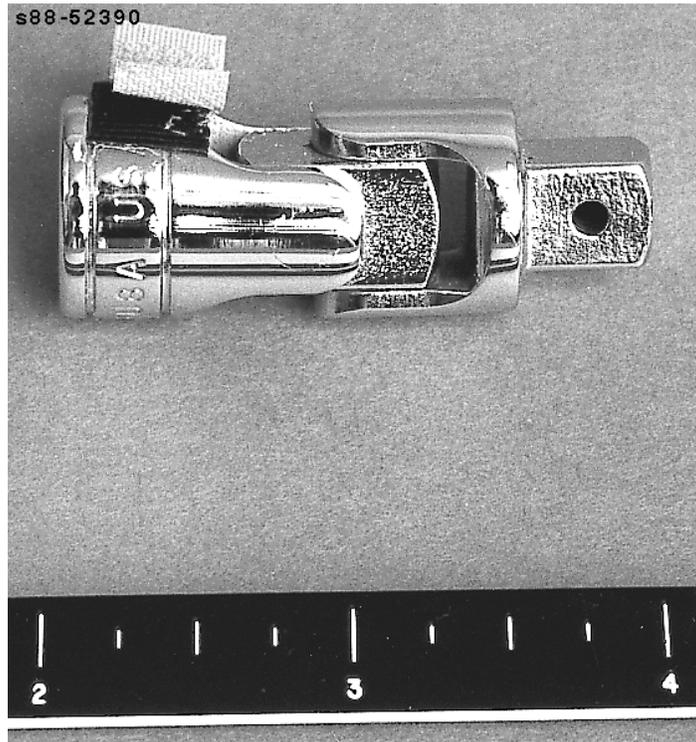
2 THERE ARE RECESSES MACHINED IN EACH OF THE FOUR INTERNAL WALLS OF THE SQUARE DRIVE FOR POSITIVE ENGAGEMENT OF A FRICTION BALL LOCKING MECHANISM.

NOTES: 1 THIS SPRING-LOADED BALL SECURES THE SOCKET TO THE 1/4-INCH SIDE OF THE ADAPTER BY PUSHING AGAINST THE INTERNAL WALL OF THE SQUARE END OF THE SOCKET. SOME SOCKETS HAVE A SMALL HOLE MACHINED IN ONE OF THEIR SQUARE END WALLS.

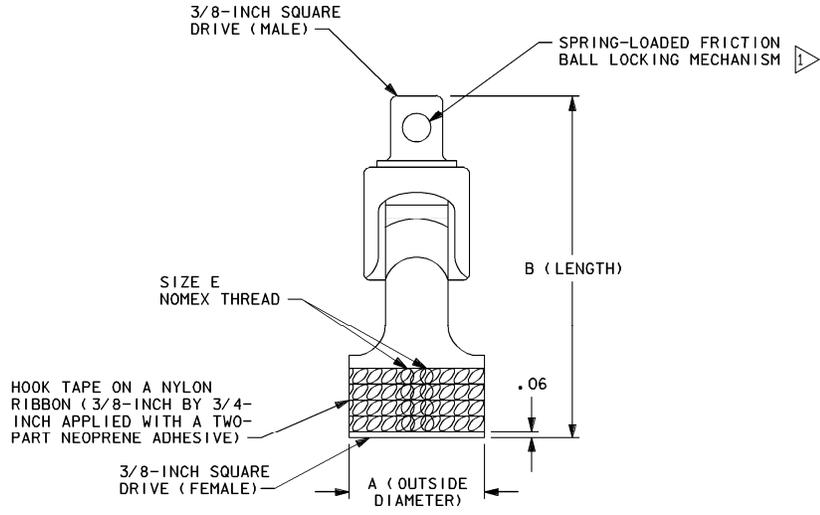
234460412. ART, 3

3/8-inch to 1/4-inch adapter (3/8-inch drive)

UNIVERSAL JOINT (3/8-INCH DRIVE)



Item 77 Technical Information	
Location	IFM tool locker drawer 3
CCCD part number	528-20147-28 (ST20T1013-20)
CCCD drawing	SED32102161
Other drawings	528-20147 (sockets IFM tool kit assembly/sheet 2 of 3)
Manufacturer	Snap-On Tools/Boeing
Boeing spec number	528-41013-20
Snap-On part number	FU8A
Weight	0.130 lb
Material	Nickel/chrome-plated, high-quality steel
Quantity flown	One



SQUARE DRIVE		DIMENSIONS (INCHES)	
FEMALE END	MALE END	A	B
3/8-INCH	3/8-INCH	3/4	1-15/16

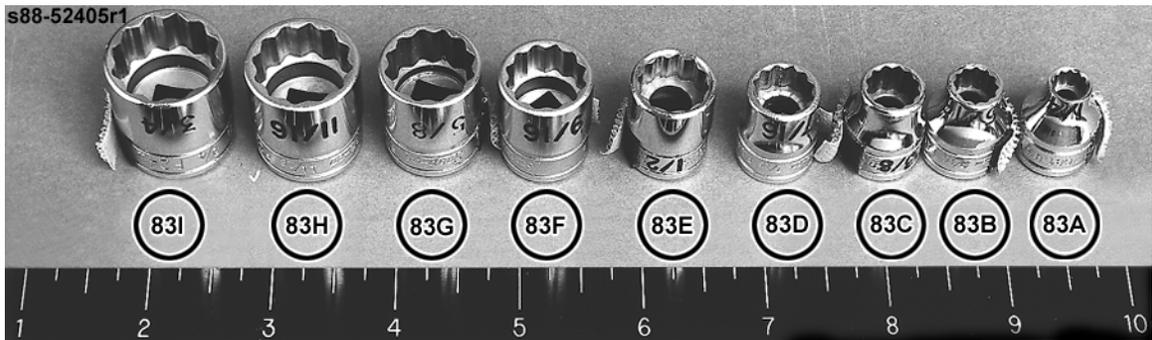
THIS SPRING-LOADED BALL SECURES THE SOCKET TO THE UNIVERSAL JOINT BY PUSHING AGAINST THE INTERNAL WALL OF THE SQUARE END OF THE SOCKET. SOME SOCKET SQUARE END WALLS HAVE A SMALL HOLE (IN ONE WALL) OR MACHINED RECESSES (IN ALL FOUR WALLS).

3/8-INCH UNIVERSAL JOINT

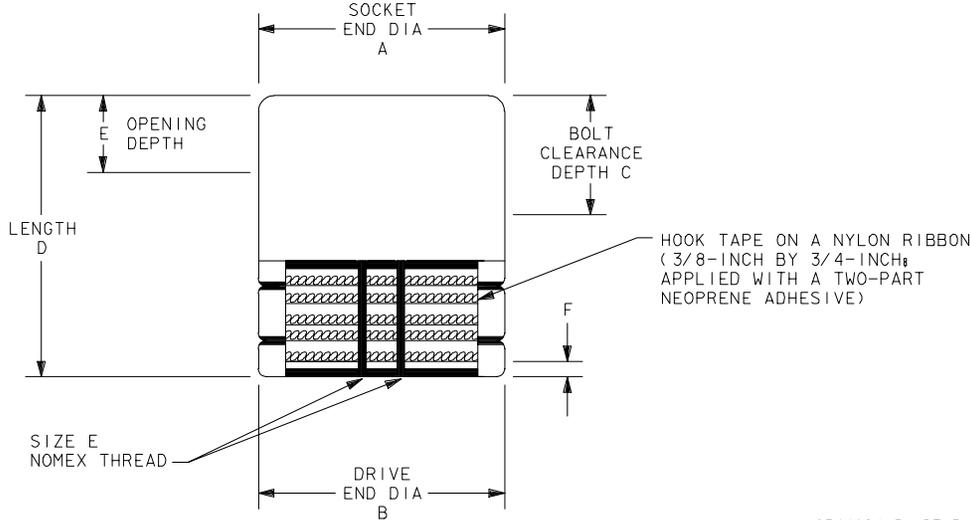
0033508. ART, 1

Universal joint (3/8-inch drive)

**12-POINT STANDARD SOCKETS (3/8-INCH DRIVE):
1/4, 5/16, 3/8, 7/16, 1/2, 9/16, 5/8, 11/16, 3/4-INCH**



Item 78 Technical Information (A - I)	
Location	IFM tool locker drawer 3
CCCD drawing	SED32102161
Other drawings	528-20147 (sockets IFM tool kit assembly/sheet 1 of 3)
Manufacturer	Snap-On Tools/Boeing
Material	Nickel/chrome-plated, high-quality steel
Quantity flown	One of each (total nine)



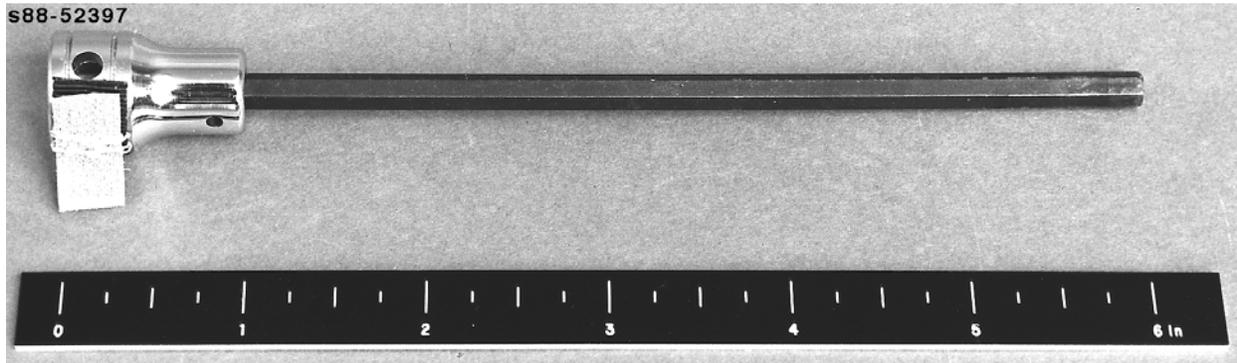
234460415, ART. 3

**12-point standard sockets (3/8-inch drive):
1/4, 5/16, 3/8, 7/16, 1/2, 9/16, 5/8, 11/16, 3/4-inch**

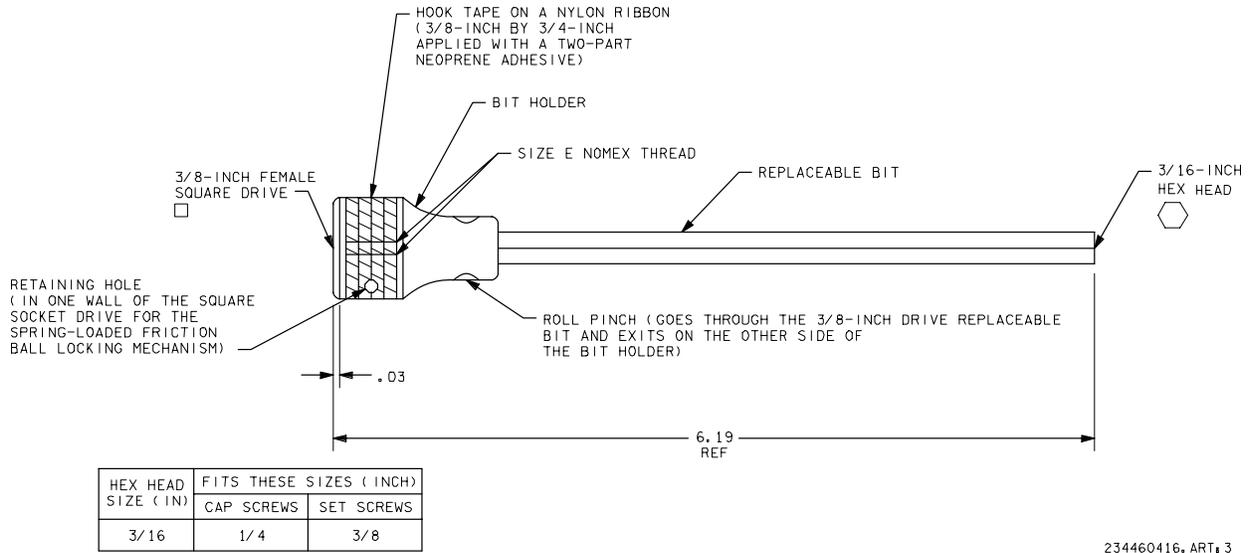
Item number	Snap-On Tools part number	Square drive size (in.)	12-point socket* (wrench) size (in.)	Dimensions (in.)						CCCD part number	Boeing spec number	Weight
				A	B	C	D	E	F			
83A	F081	3/8	1/4	3/8	21/32	7/16	29/32	7/32	0.03	528-20147-18 (ST20T1013-9)	528-41013-9	0.040 lb
83B	F101	3/8	5/16	29/64	21/32	7/16	29/32	9/32	0.03	528-20147-19 (ST20T1013-10)	528-41013-10	0.63 oz
83C	F121	3/8	3/8	35/64	21/32	7/16	29/32	9/32	0.03	528-20147-20 (ST20T1013-11)	528-41013-11	0.67 oz
83D	F141	3/8	7/16	39/64	21/32	7/16	29/32	9/32	0.03	528-20147-21 (ST20T1013-12)	528-41013-12	0.75 oz
83E	F161	3/8	1/2	23/32	21/32	1/2	15/16	5/16	0.03	528-20147-22 (ST20T1013-13)	528-41013-13	0.055 lb
83F	F181	3/8	9/16	25/32	23/32	1/2	15/16	11/32	0.03	528-20147-23 (ST20T1013-14)	528-41013-14	0.060 lb
83G	F201	3/8	5/8	27/32	51/64	9/16	1 1/32	3/8	0.03	528-20147-24 (ST20T1013-15)	528-41013-15	0.075 lb
83H	F221	3/8	11/16	15/16	7/8	5/8	1 1/16	13/32	0.03	528-20147-25 (ST20T1013-16)	528-41013-16	1.65 oz
83I	F241	3/8	3/4	1	15/16	5/8	1 3/32	13/32	0.03	528-20147-26 (ST20T1013-17)	528-41013-17	0.110 lb

*Flank drive.

**SEAT ADJUSTMENT TOOL (3/16-INCH HEX
HEAD DRIVER; 3/8-INCH DRIVE)**



Item 79 Technical Information	
Location	IFM tool locker drawer 3
CCCC part number	528-20147-42 (ST20T1013-40)
CCCD drawing	SED32102161
Other drawings	528-20147 (sockets IFM tool kit assembly/sheet 3 of 3)
Manufacturer	Snap-On Tools/Boeing
Boeing spec number	528-41013-40
Snap-On part number	FA6L
Weight	0.105 lb
Material	Nickel/chrome-plated, high-quality steel bit holder, with a black oxide finished replaceable steel bit
Quantity flown	One



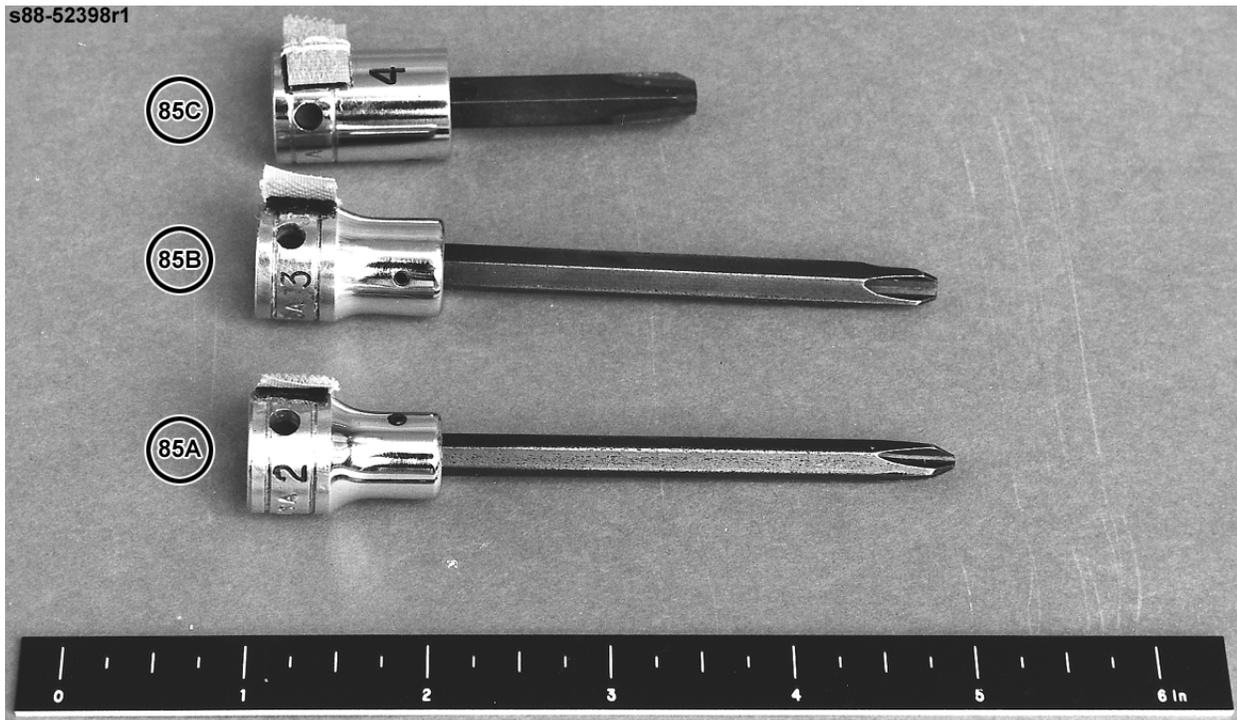
234460416, ART. 3

Seat adjustment tool (3/16-inch hex head driver; 3/8-inch drive)

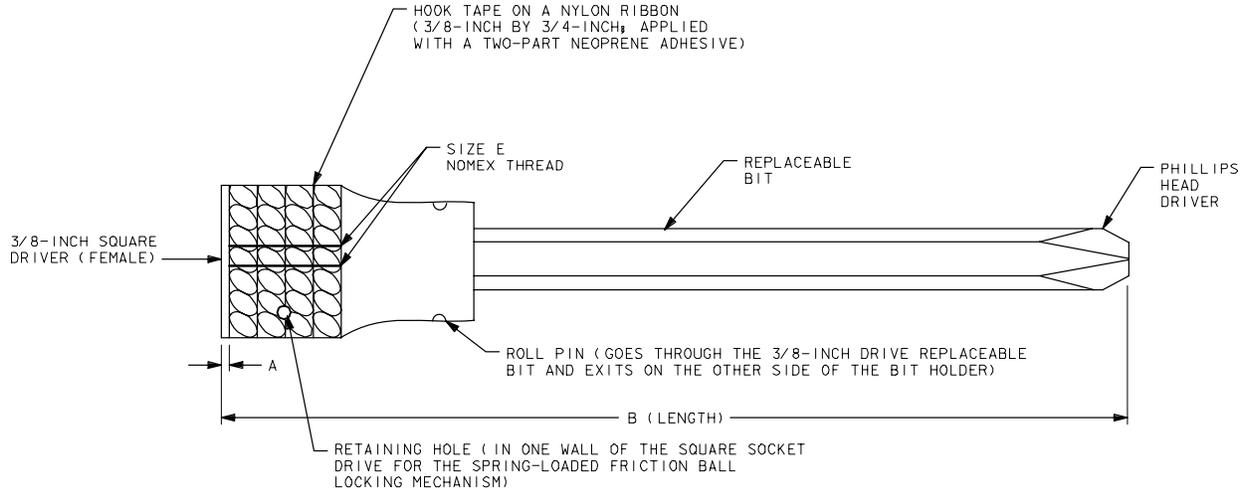
COMMENTS

The drive is 3/8 inch. The seat adjustment tool can be used to manually adjust the CDR or PLT seat (fwd/aft or up/down). The tool is normally used with the Robbins wrench (minispeed handle) with 1/4-inch to 3/8-inch adapter.

PHILLIPS HEAD DRIVERS #2, #3, #4 (3/8-INCH DRIVE)



Item 80 Technical Information (A - C)	
Location	IFM tool locker drawer 3
CCCD part number	SED32102161
CCCD drawing	528-20147 (sockets IFM tool kit assembly/sheet 3 of 3)
Other drawings	Snap-On Tools/Boeing
Manufacturer	Nickel/chrome-plated, high-quality steel bit holder, with a black oxide finished replaceable steel bit
Quantity flown	One of each (total three)



234460417, ART. 3

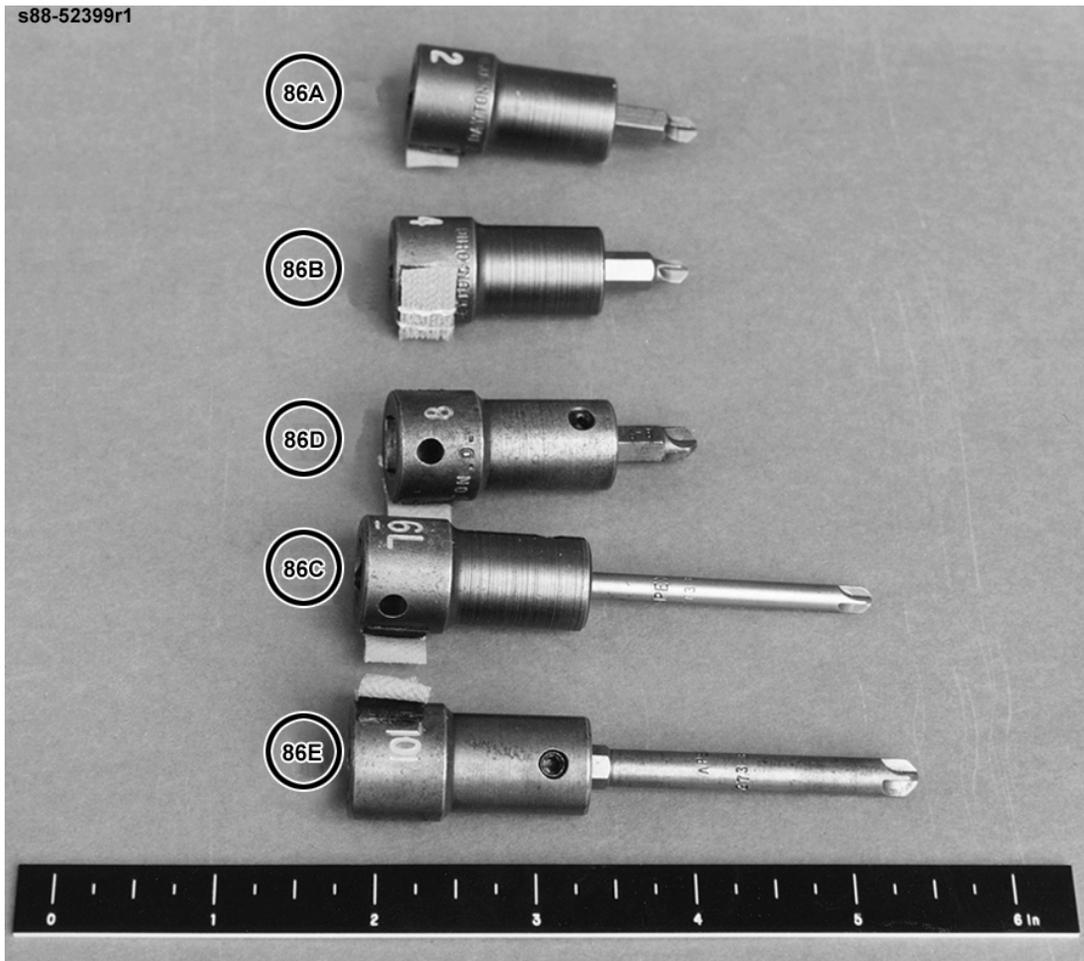
Phillips head drivers #2, #3, #4 (3/8-inch drive)

Item number	Snap-On Tools part number	Square drive (female) end (in.)	Phillips head size	Dimensions (in.)		CCCD part number	Boeing spec number	Weight
				A	B			
85A	FP24	3/8	#2	0.03	4.00	528-20147-34 (ST20T1013-31)	528-41013-31	0.09 lb
85B	FP34	3/8	#3	0.03	3.96	528-20147-35	-	0.11 lb
85C	FP41B	3/8	#4	0.03	2.56	528-20147-36	-	1.82 oz

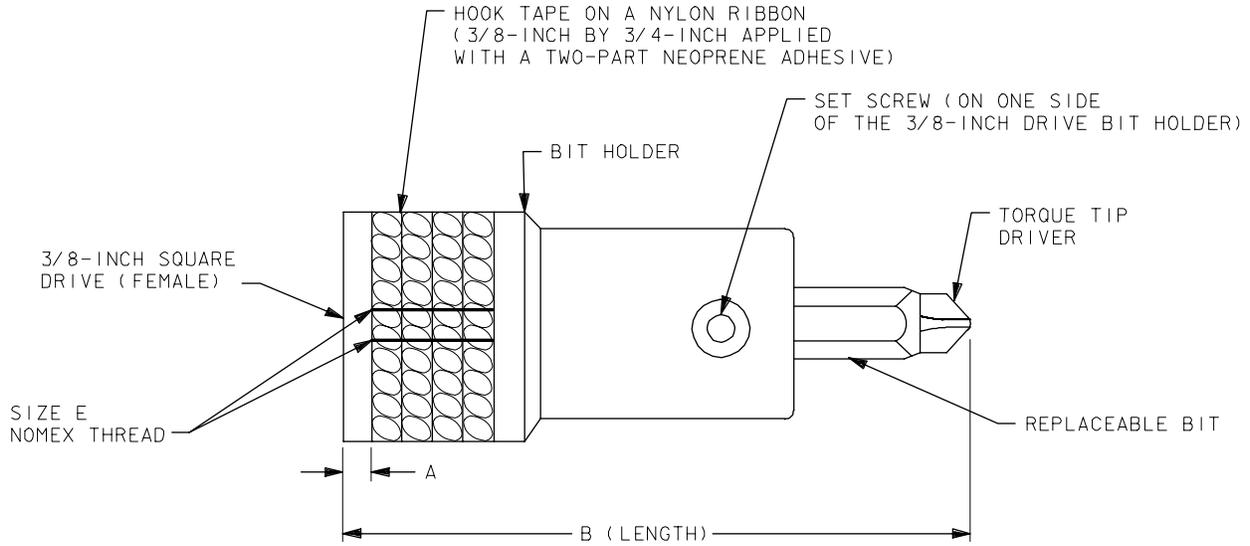
COMMENTS

Phillips head screwdrivers #0 and #1 are also in IFM tool locker drawer 4 (see items 92A and 92B).

TORQUE TIP DRIVERS #2, #4, #6L, #8, #10L (3/8-INCH DRIVE)



Item 81 Technical Information (A - E)	
Location	IFM tool locker drawer 3
CCCD part number	528-20147 (sockets IFM tool kit assembly/sheet 3 of 3)
CCCD drawing	SED32102161
Other drawings	Apex (Dayton, Ohio)/Boeing
Manufacturer	High-quality steel bit holder, with a replaceable steel bit
Quantity flown	One of each (total five)



234460418, ART. 3

Torque tip driver (3/8-inch drive)¹⁶

Item number	Apex* (replaceable bit) part number	Square drive (female) end (in.)	Torque tip (Apex bit) size	Dimensions (in.)		CCCD part number	Weight
				A	B		
86A	170-2	3/8	#2	0.03	2.13	528-20147-39 (10114-20007-01)	2.0 oz
86B	170-4	3/8	#4	0.03	2.13	528-20147-40 (10114-20006-01)	0.12 lb
86C	273B-6	3/8	#6L	0.03	3.63	528-20147-37 (10114-20005-02)	2.13 oz
86D	170-8	3/8	#8	0.003	2.13	528-20147-41 (10114-20004-01)	0.12 lb
86E	273B-10	3/8	#10L	0.03	3.63	528-20147-38 (10114-20004-02)	2.33 oz

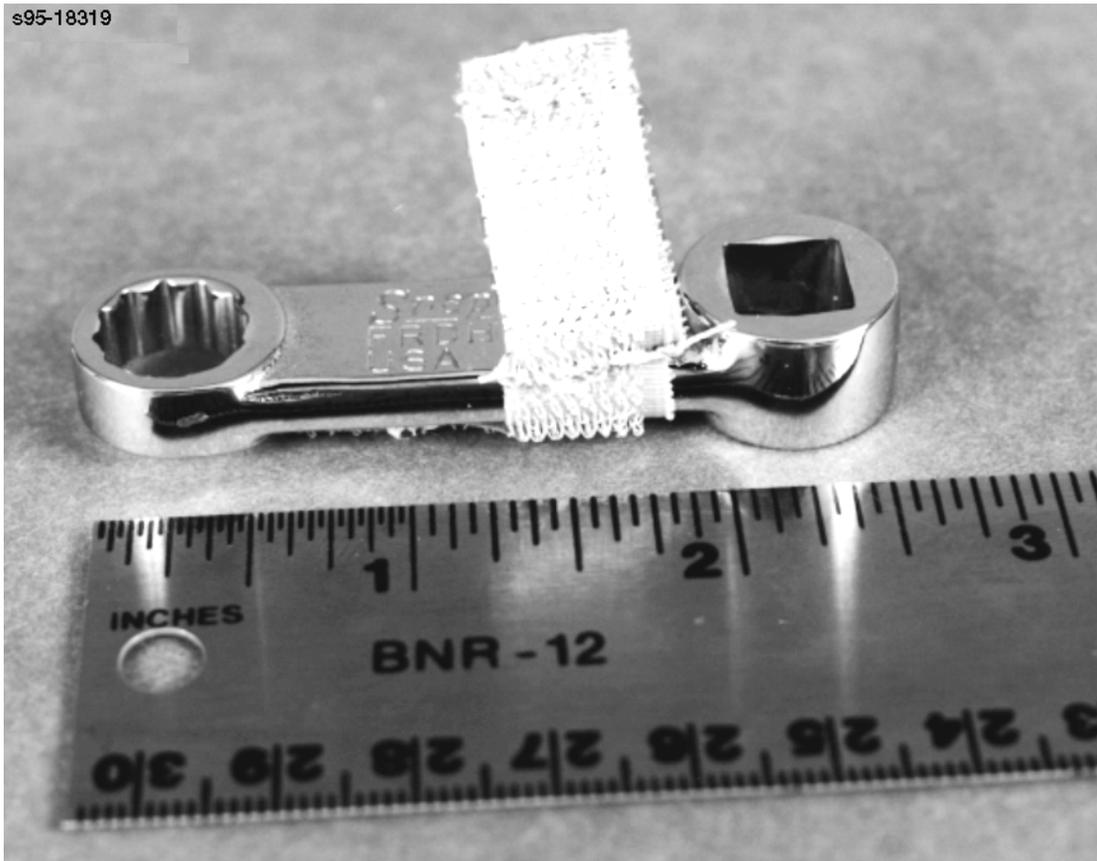
*The 3/8-inch (female) square drive to 1/4-inch (female) hexagonal bit holder is Apex part number SC308.

COMMENTS

Torque tip screwdriver #6, #8, and #10 are also in the IFM tool locker drawer 4 (see items 98A to 98C).

¹⁶ Apex Fastener Tools Catalog. Apex Machine and Tools, Dayton, Ohio, 1987.

TORQUE ADAPTER (7/16-INCH; 3/8-INCH DRIVE)

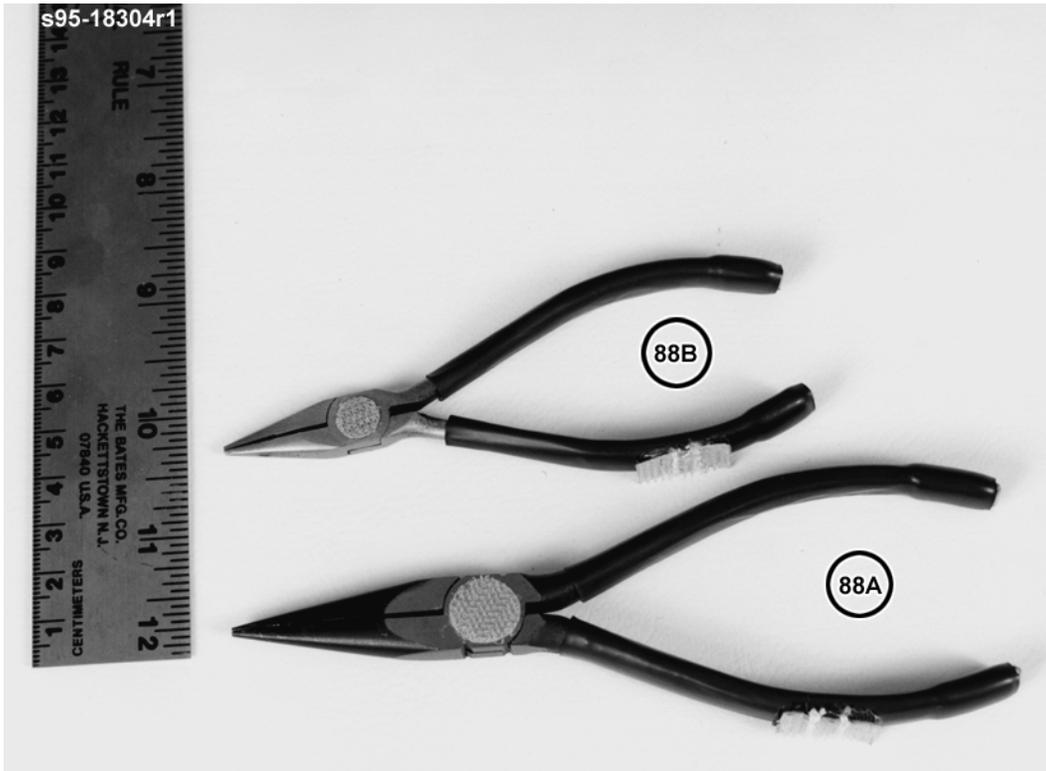


Item 82 Technical Information (A - B)	
Location	IFM tool locker drawer 3
CCCD part number	528-20146-12
CCCD drawing	SED32102161
Other drawings	Snap-On Tools/Boeing
Manufacturer	Nickel/chrome plated, high-quality steel
Quantity flown	One

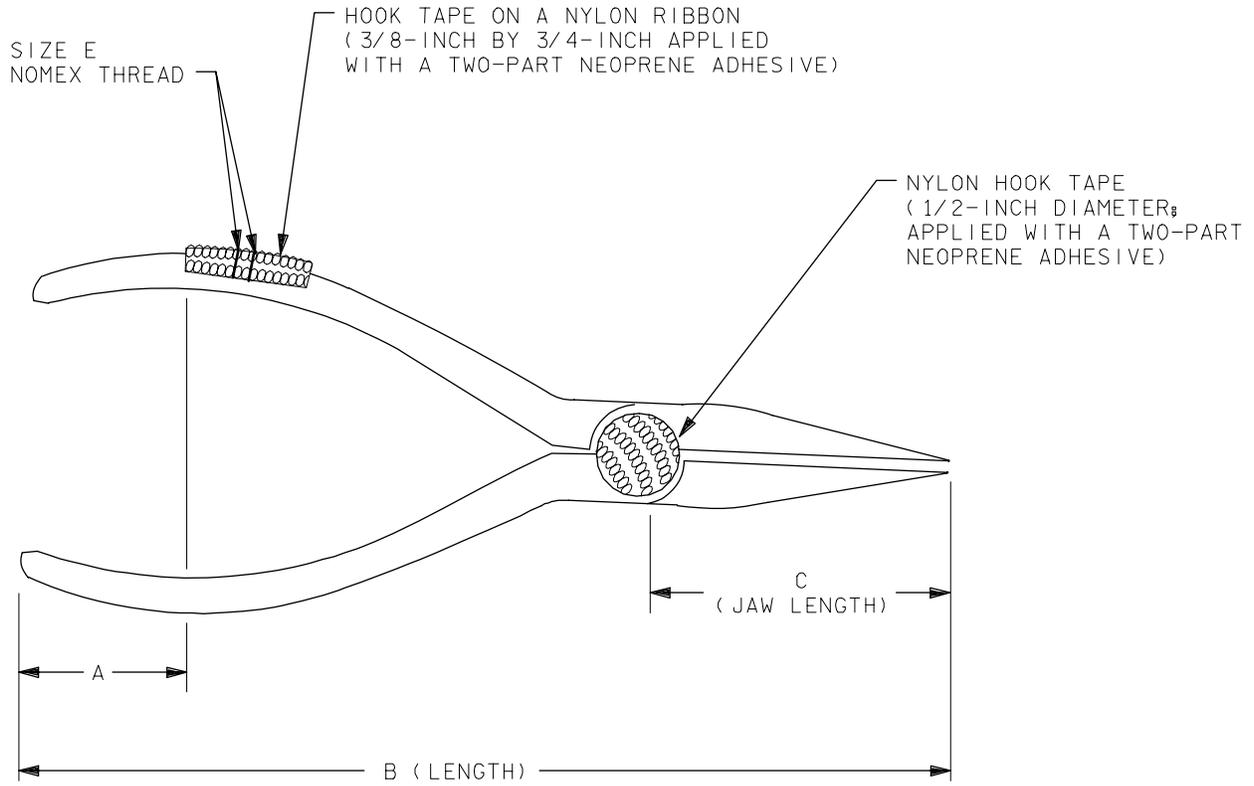
COMMENTS

Use the adapter to torque hard-to-reach 7/16-inch fasteners. The original application was for GPC changeout.

NEEDLENOSE PLIERS: LARGE (6 INCHES) AND SMALL (4-1/2 INCHES)



Item 83 Technical Information (A - B)	
Location	IFM tool locker drawer 3
CCCD part number	528-20145 (wrench assembly IFM tool kit/sheet 1 of 4)
CCCD drawing	SED32102161
Other drawings	Snap-On Tools/Boeing
Manufacturer	High-quality steel with a natural finish
Quantity flown	One of each (total two)



234460419, ART. 4

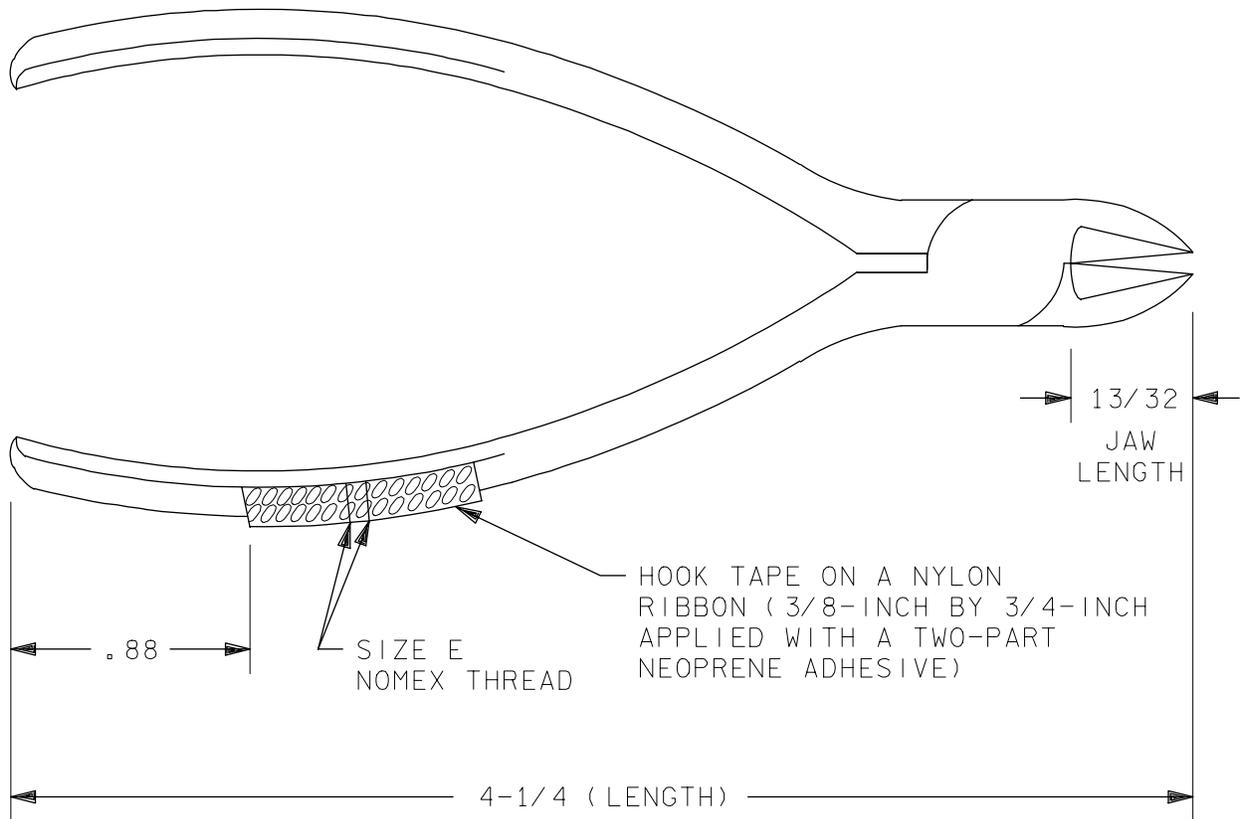
Needlenose pliers

Item number	Snap-On Tools part number	Needlenose pliers (size)	Dimensions (in.)			CCCD part number	Boeing spec number	Weight (lb)
			A	B	C			
88A	95ACP	Large	1.03	6.00	1-11/16	528-20145-12 (ST20T1013-1)	528-41013-1	0.205
88B	94ACP	Small	0.75	4.50	27/32	528-20145-22 (ST20T1013-91)	528-41013-91	0.105

4-1/2 INCH DIAGONAL CUTTERS



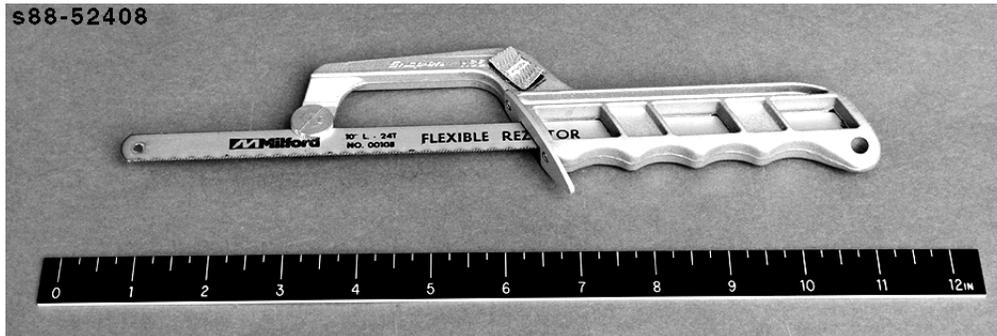
Item 84 Technical Information	
Location	IFM tool locker drawer 3
CCCD part number	528-20145-17 (ST20T1013-92)
CCCD drawing	SED32102161
Other drawings	528-20145 (wrench assembly IFM tool kit/sheet 3 of 4)
Manufacturer	Snap-On Tools
Manufacturer spec number	528-41013-92
Manufacturer part number	184ACP
Weight	1.5 oz
Material	High-quality steel with a natural finish
Quantity flown	One



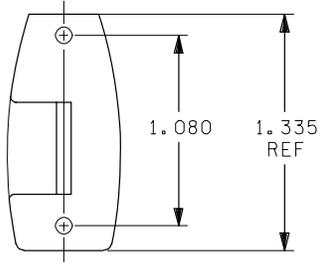
234460420. ART; 3

4-1/2 inch diagonal cutters

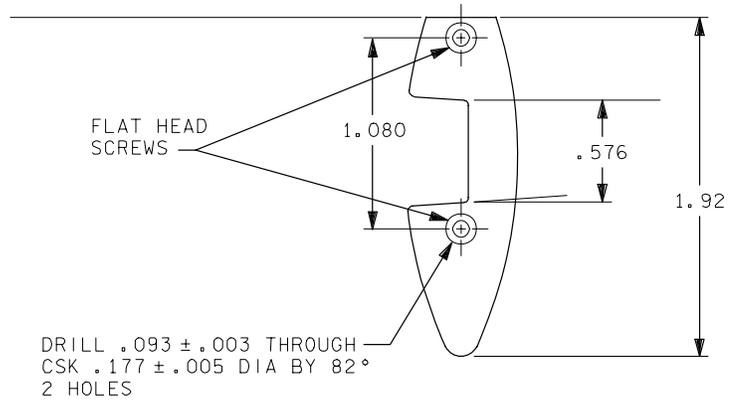
HACKSAW



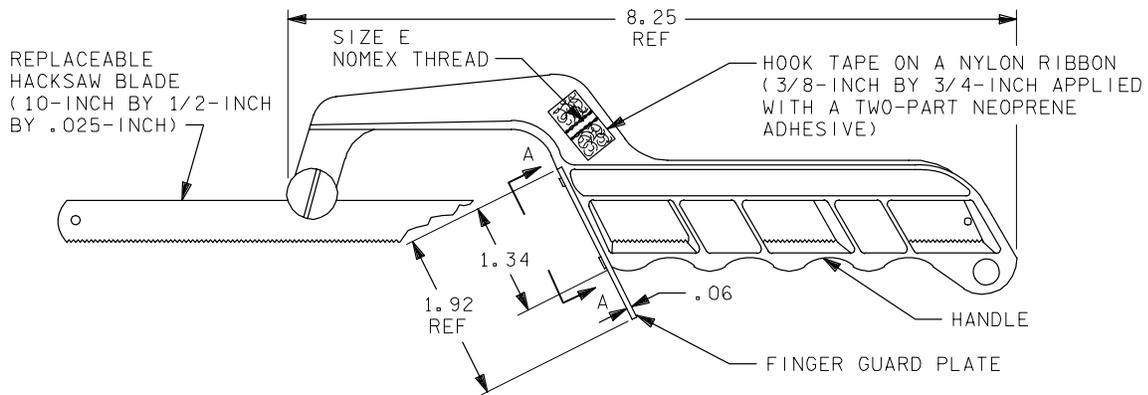
Item 85 Technical Information	
Location	IFM tool locker drawer 3
CCCD part number	528-20152-1
CCCD drawing	SED32102161
Other drawings	528-20152 (hacksaw assembly IFM tool kit/sheet 1 of 1)
Manufacturer	Snap-On Tools/Boeing
Snap-On part number	HS-5
Weight	3.56 oz
Material	Lightweight die cast aluminum (one piece)
Quantity flown	One



ORIGINAL PLATE
VIEW A-A



FINGER GUARD PLATE
VIEW A-A



234460421. ART; 3

Hacksaw

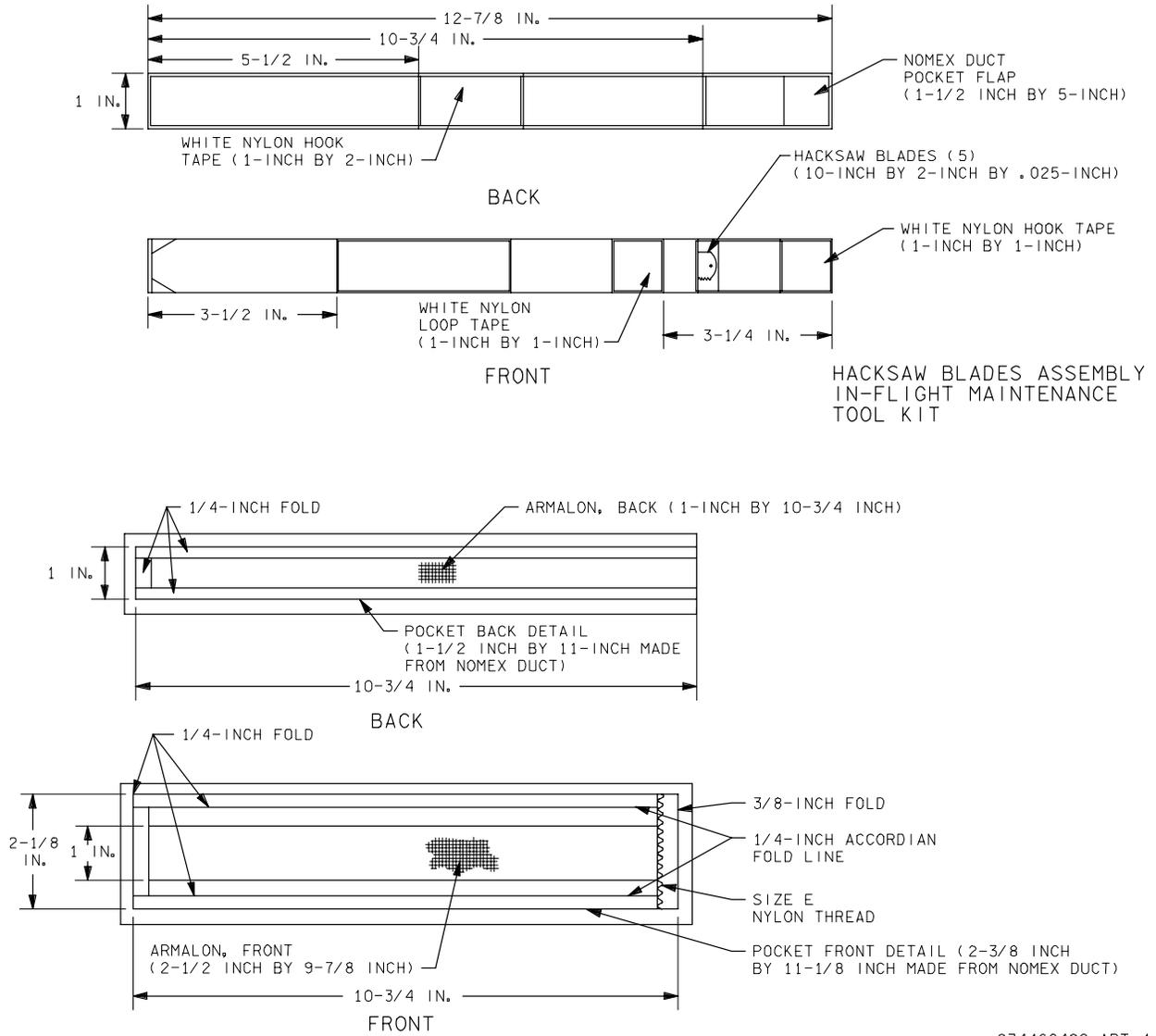
COMMENTS

The original Snap-On Tool hacksaw has been modified by Boeing with the addition of Velcro and a finger guard plate. The finger guard plate protrudes approximately 1/2 inch from the hacksaw handle to help prevent cutting the user's finger. The hacksaw is designed to use 10-inch or 12-inch blades, but only 10-inch blades are flown.

HACKSAW BLADE KIT



Item 86 Technical Information	
Location	IFM tool locker drawer 3
CCCD part number	528-20153-1
CCCD drawing	SED32102161
Other drawings	528-20153 (hacksaw blades assembly IFM tool kit/ sheet 1 of 1)
Manufacturer	McMaster Carr (blades)/Boeing (container)
Manufacturer part number	4061A12
Weight	3.61 oz
Material	High-speed steel
Quantity flown	One container with five blades

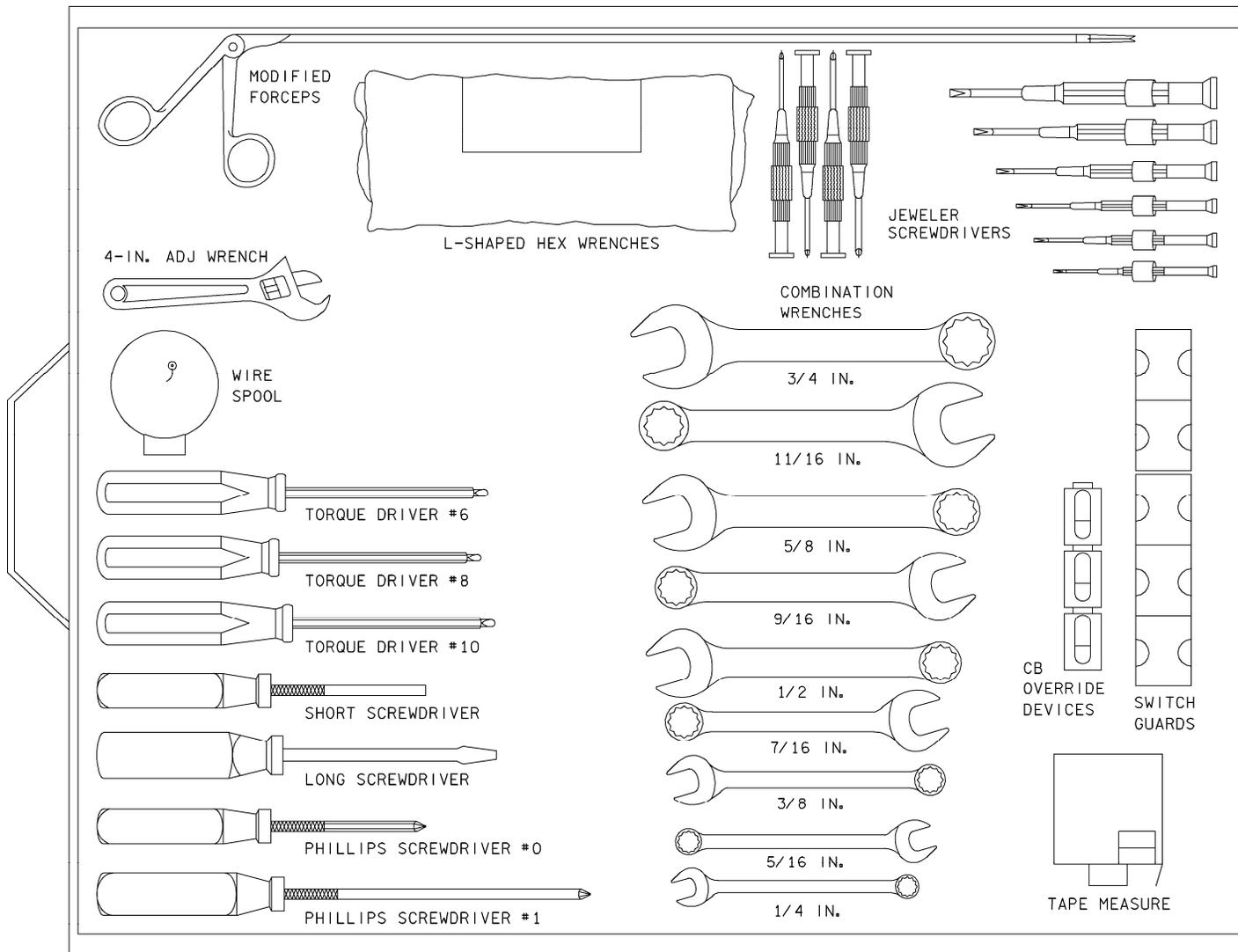


234460422, ART. 4

Hacksaw blade kit

IFM TOOL LOCKER DRAWER 4

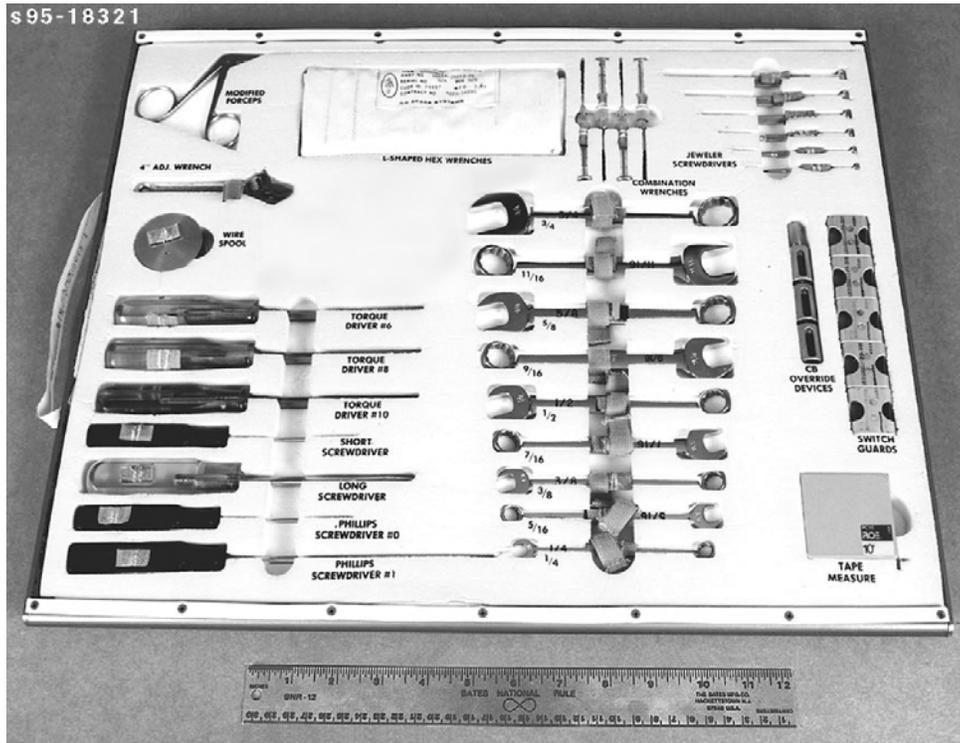
Item		Page
TRAY		
87	IFM TOOL LOCKER DRAWER 4 TRAY	5-2
WRENCHES		
88	COMBINATION WRENCH: 1/4, 5/16, 3/8, 7/16, 1/2, 9/16, 5/8, 11/16, 3/4-INCH	5-4
89	4-INCH ADJUSTABLE WRENCH	5-7
90	L-SHAPED HEX WRENCHES: .028, .035, 3/64, 1/16, 5/64, 3/32, 7/64, 1/8, 9/64, 5/32, 3/16, 7/32, 1/4-INCH.....	5-9
SCREWDRIVERS		
91	PHILLIPS HEAD SCREWDRIVERS #0, #1.....	5-11
92	FLAT TIP SCREWDRIVERS: SHORT (0.018 BY 1/8 BY 3.0 INCH), LONG (0.037 BY 1/4 BY 4.0 INCH).....	5-13
93	TORQUE TIP SCREWDRIVERS: #6, #8, #10	5-15
94	JEWELERS SCREWDRIVER SET (SIX FLAT TIP SCREWDRIVERS: 1/32, 3/64, 5/64, 3/32, 1/8, 9/64-INCH)	5-17
95	JEWELERS SCREWDRIVER SET (FOUR PHILLIPS HEAD SCREWDRIVERS: SIZES 1, 0, 00, AND 000)	5-19
MISCELLANEOUS		
96	MODIFIED FORCEPS	5-21
97	CB OVERRIDE DEVICE	5-23
98	SWITCH GUARD	5-25
99	TAPE MEASURE (10 FEET).....	5-27
100	WIRE SPOOL (10 FEET)	5-28



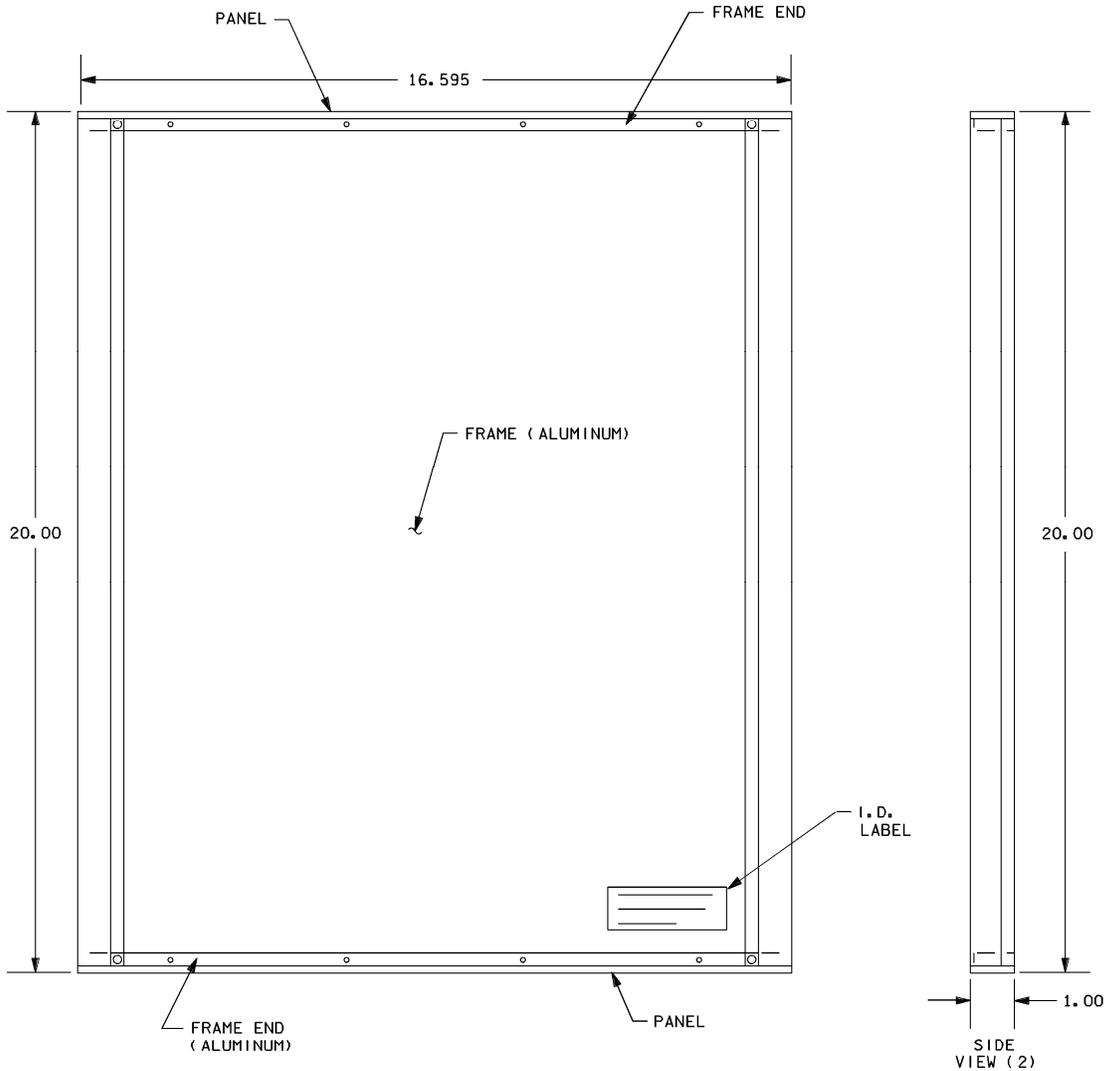
0033532. ART. 1

IFM tool locker drawer 4

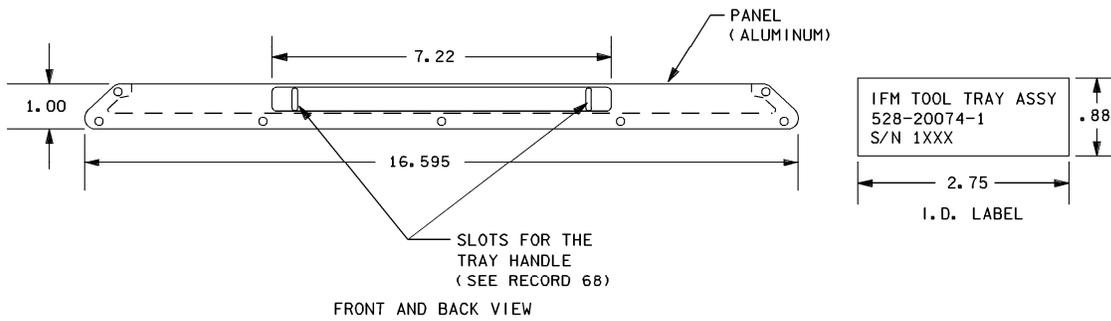
IFM TOOL LOCKER DRAWER 4 TRAY



Item 87 Technical Information	
Location	IFM tool locker drawer 4
CCCD part number	528-20074-2
CCCD drawing	SED32102162
Other drawings	528-20074 (IFM tool assembly/seven sheets)
Manufacturer	Boeing
Weight	2.11 lb
Quantity flown	One



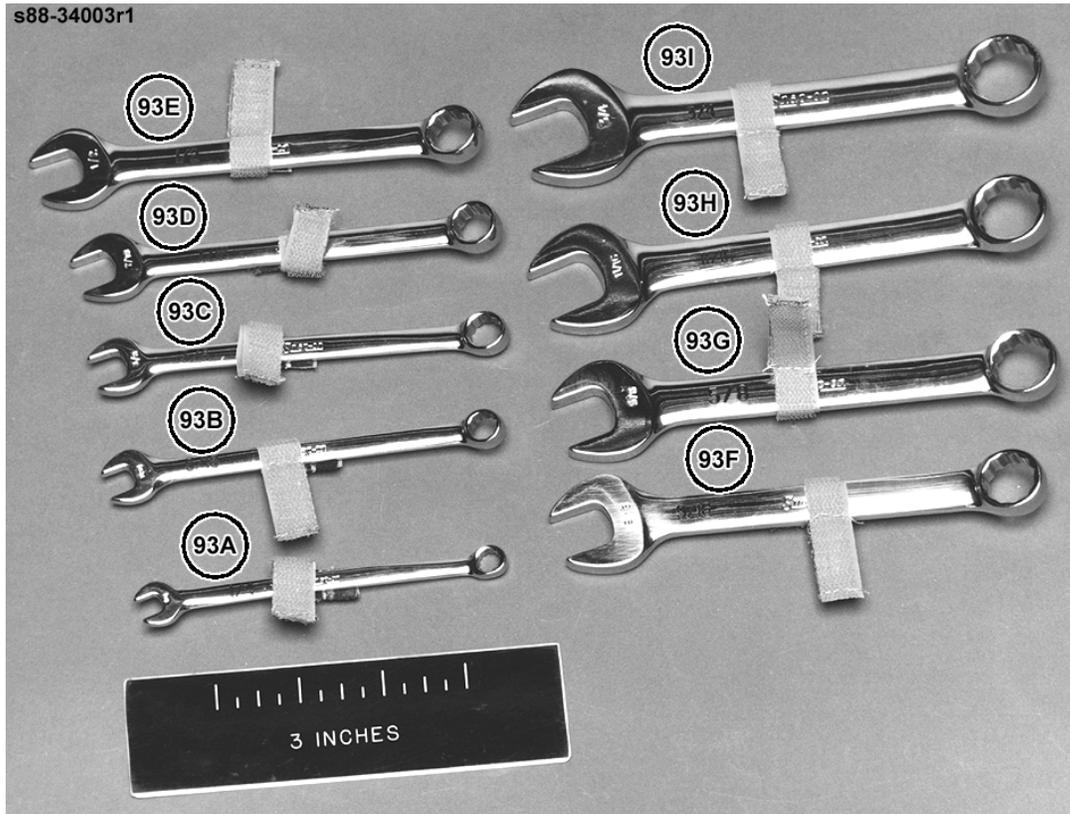
OVERHEAD VIEW



IFM tool locker drawer 4 special tray

0033511. ART. 1

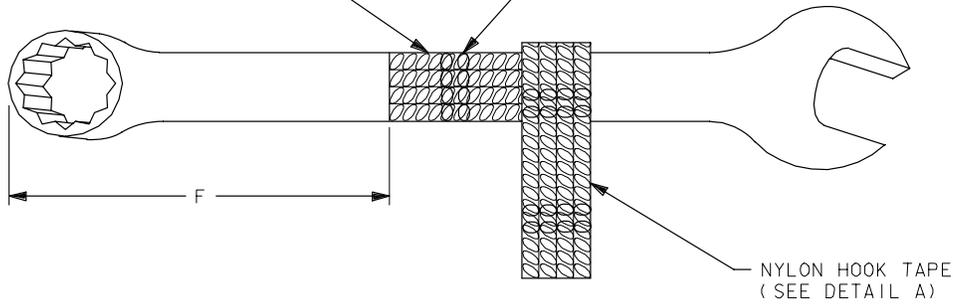
COMBINATION WRENCH: 1/4, 5/16, 3/8, 7/16, 1/2, 9/16, 5/8, 11/16, 3/4-INCH



Item 88 Technical Information (A - I)	
Location	IFM tool locker drawer 4
CCCD part number	528-20145-1 (ST20T1013-45)
CCCD drawing	SED32102162
Other drawings	528-20145 (kit/sheet 1 of 4)
Manufacturer	Snap-On Tools/Boeing
Weight	Nickel/chrome-plated, high-quality steel
Quantity flown	One of each (total nine)

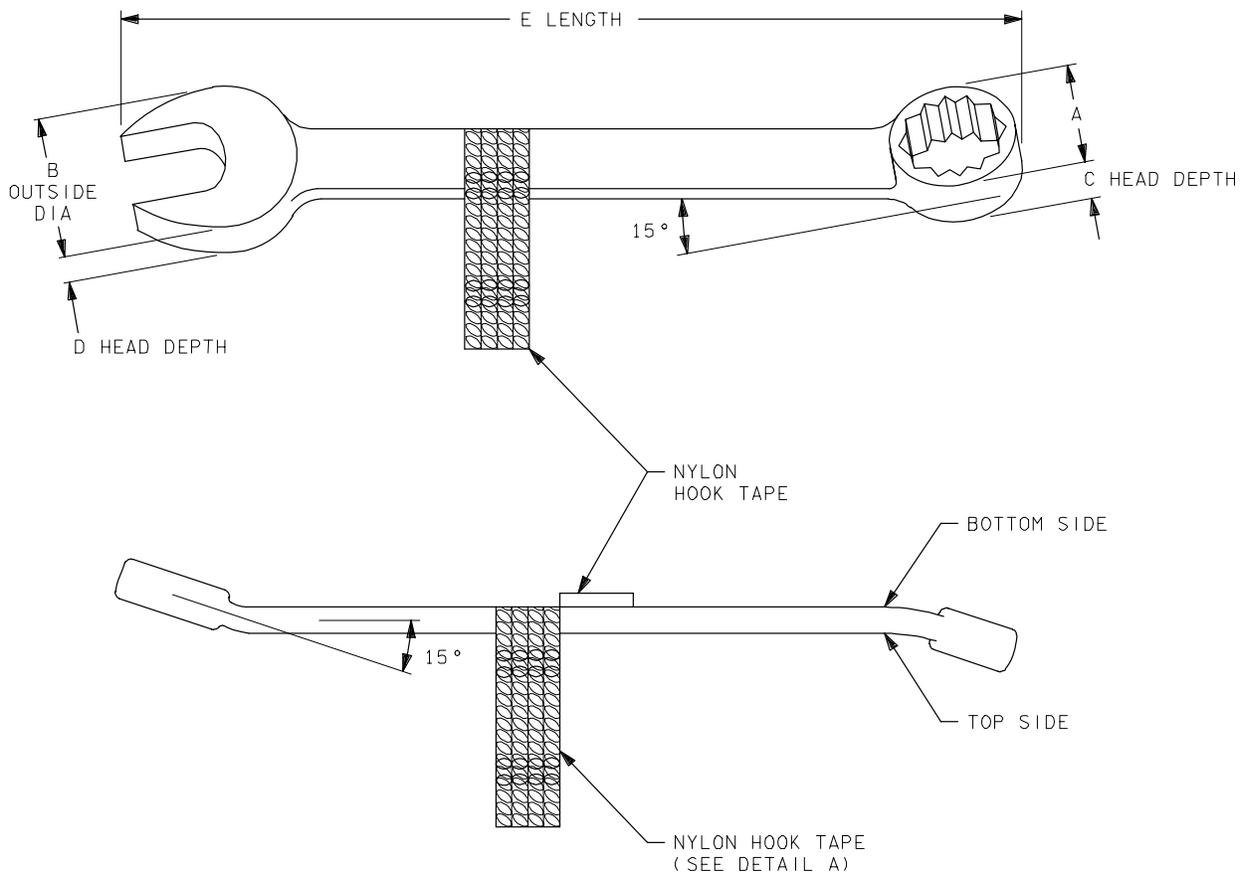
HOOK TAPE ON A NYLON
RIBBON (3/8-INCH BY 3/4-INCH
APPLIED WITH A TWO-PART
NEOPRENE ADHESIVE)

SIZE E
NOMEX THREAD



BOTTOM VIEW

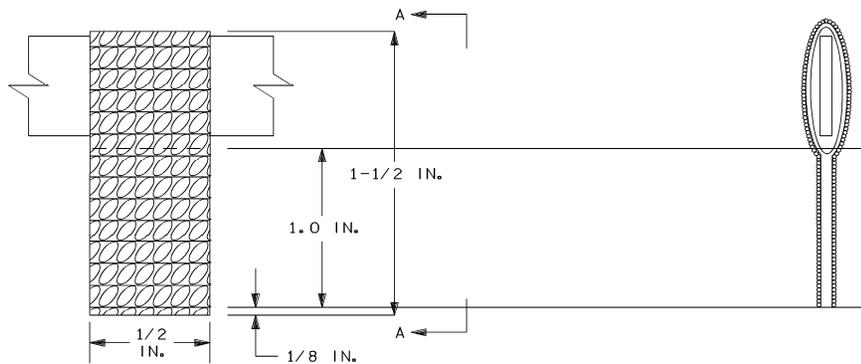
TOP VIEW



234460503. ART# 2

Combination wrench

Item number	Snap-On Tools part number	Wrench size (in.)	Dimensions (in.)						CCCD part number	Boeing spec number	Weight
			A	B	C	D	E	F			
93A	OEX 80	1/4	13/32	17/32	5/32	1/8	4-1/2	1.84	528-20145-1 (ST20T1013-45)	528-41013-45	0.035 lb
93B	OEX 100	5/16	15/32	21/32	7/32	7/32	4-7/8	1.84	528-20145-2 (ST20T1013-46)	528-41013-46	0.050 lb
93C	OEX 120	3/8	17/32	25/32	9/32	7/32	5-7/32	2.34	528-20145-3 (ST20T1013-47)	528-41013-47	0.075 lb
93D	OEX 140	7/16	5/8	29/32	5/16	7/32	5-7/16	2.41	528-20145-4 (ST20T1013-48)	528-41013-48	0.115 lb
93E	OEX 160	1/2	23/32	1-1/16	5/16	1/4	5-3/4	2.38	528-20145-5 (ST20T1013-49)	528-41013-49	2.47 oz
93F	OEX 180	9/16	13/16	1-3/16	11/32	9/32	6	2.72	528-20145-6 (ST20T1013-50)	528-41013-50	0.19 lb
93G	OEX 200	5/8	7/8	1-5/16	11/32	9/32	6-3/16	2.75	528-20145-7 (ST20T1013-51)	528-41013-51	0.22 lb
93H	OEX 220	11/16	31/32	1-7/16	11/32	9/32	6-19/32	2.81	528-20145-8 (ST20T1013-52)	528-41013-52	3.62 oz
93I	OEX 240	3/4	11/16	1-1/2	3/8	5/16	6-7/8	3.06	528-20145-9 (ST20T1013-53)	528-41013-53	0.28 lb



DETAIL A
NYLON HOOK TAPE

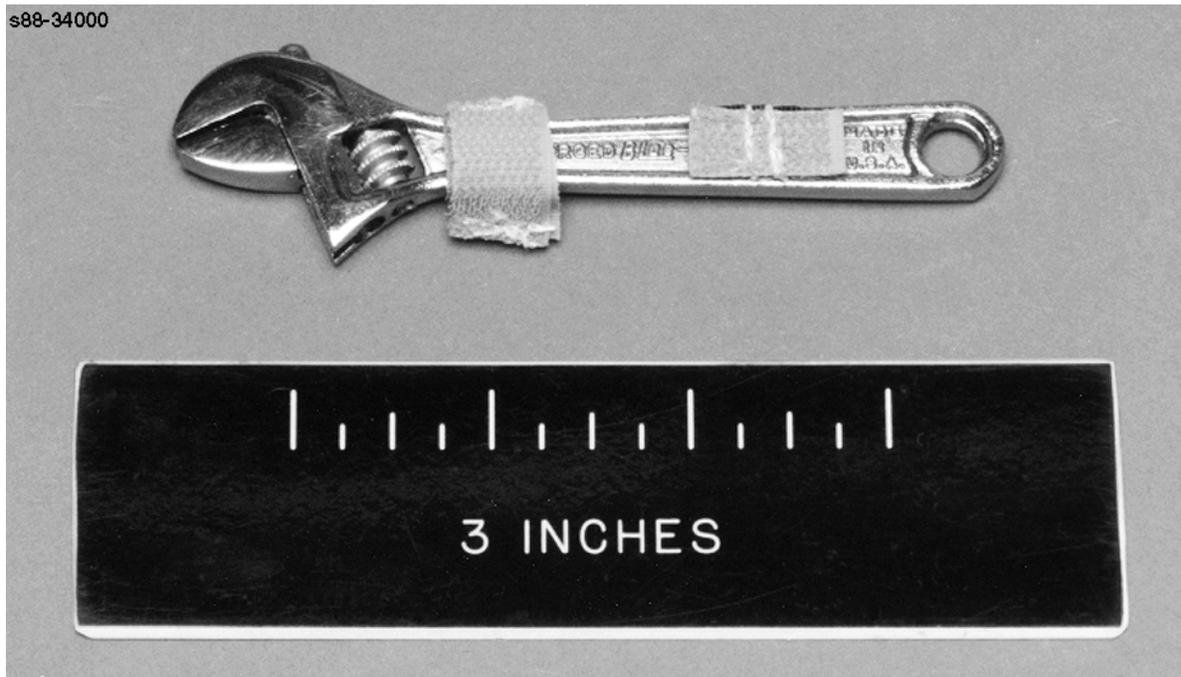
VIEW A-A

Combination wrench size (in.)	Dimensions B (in.)
1/4	1-3/8
5/16, 3/8, 7/16, 1/2	1-1/2
9/16, 5/8, 11/16	1-5/8
3/4	1-3/4

0033509. ART: 1

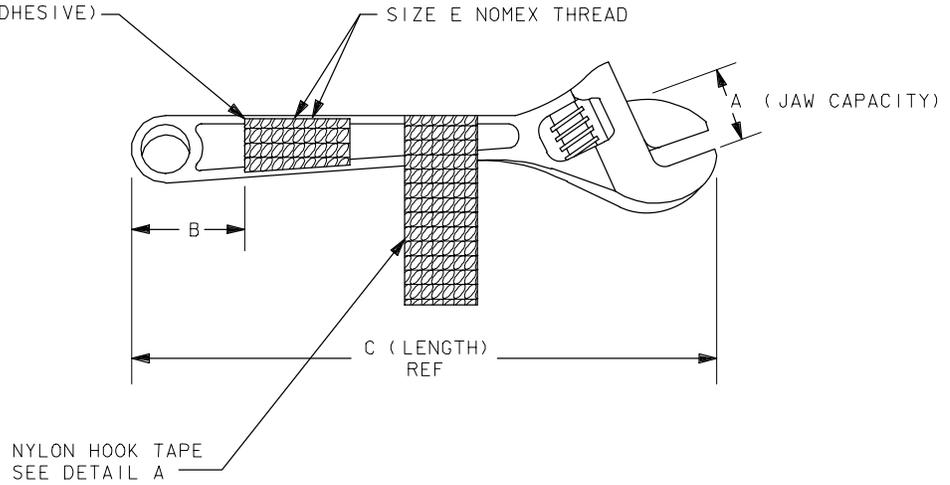
Nylon hook tape

4-INCH ADJUSTABLE WRENCH

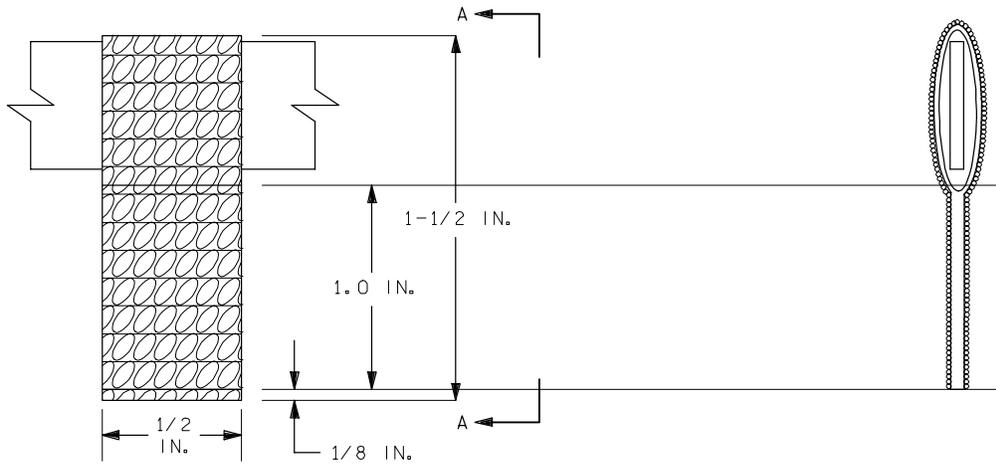


Item 89 Technical Information	
Location	IFM tool locker drawer 4
CCCD part number	528-20145-10 (ST20T1013-7)
CCCD drawing	SED32102162
Other drawings	528-20145 (wrench assembly IFM tool kit/sheet 1 of 4)
Manufacturer	Snap-On Tools/Boeing
Boeing spec no.	528-41013-7
Snap-On part no.	D74
Weight	1.4 oz
Material	Nickel/chrome-plated, high-quality steel
Quantity flown	One

HOOK TAPE ON A NYLON RIBBON
(3/8-INCH BY 3/4-INCH
APPLIED WITH A TWO-PART
NEOPRENE ADHESIVE)



DIMENSIONS (INCHES)		
A	B	C
1/2	.75	4.25



DETAIL A
NYLON HOOK TAPE

VIEW A-A

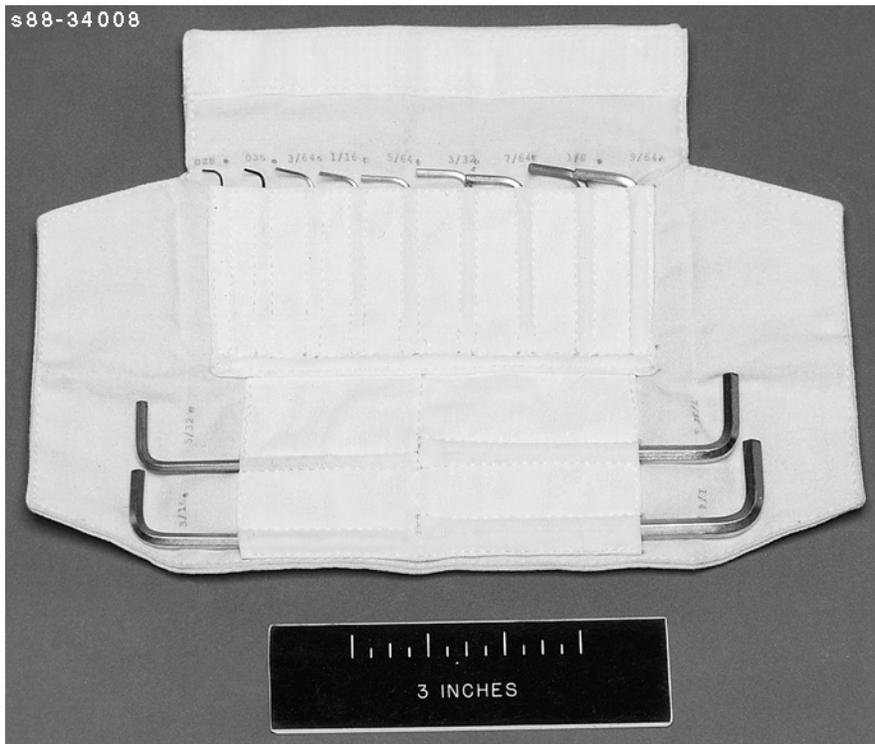
234460505, ART. 2

4-inch adjustable wrench

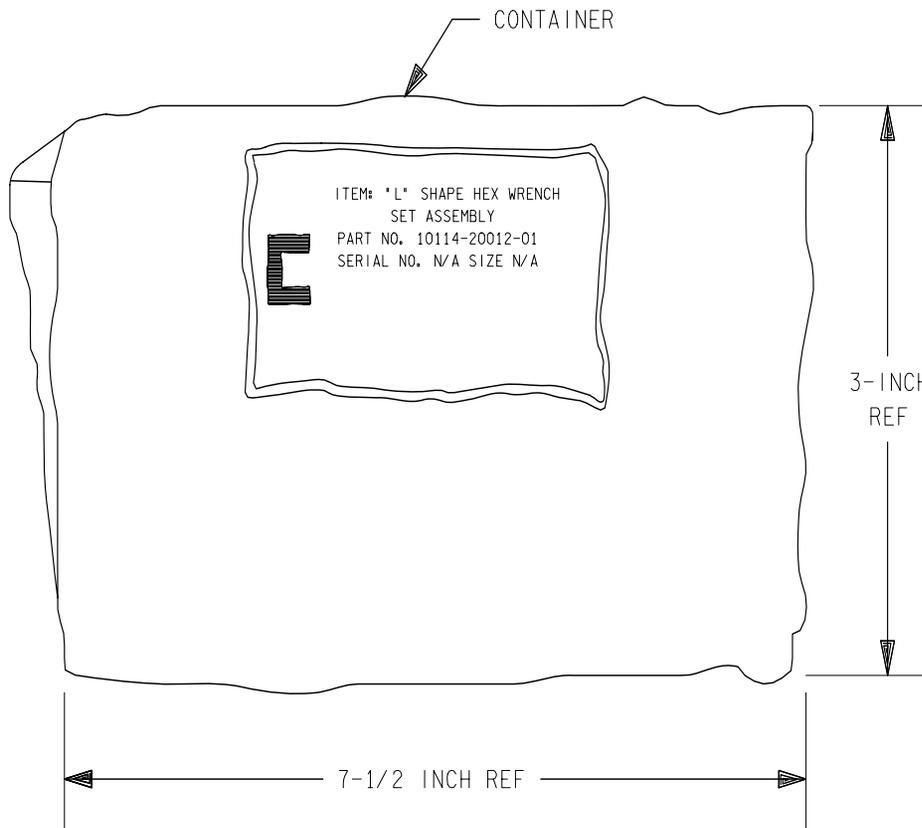
COMMENTS

A 10-inch adjustable wrench is also in IFM tool locker drawer 2 (see item 64).

L-SHAPED HEX WRENCHES: .028, .035, 3/64, 1/16, 5/64, 3/32, 7/64, 1/8, 9/64, 5/32, 3/16, 7/32, 1/4-INCH



Item 90 Technical Information	
Location	IFM tool locker drawer 4
CCCD part number	10114-20012-01 (ST20T1013-59)
CCCD drawing	SED32102162
Other drawings	10114-20012 (L-shaped hex wrench set assembly/one sheet)
Manufacturer	Snap-On Tools (wrenches)/Boeing (container)
Boeing spec no.	528-41013-59
Snap-On part no.	AW1013AK (for all 13 wrenches)
Weight	5.18 oz
Material	Zinc-plated steel
Quantity flown	One container with 13 wrenches



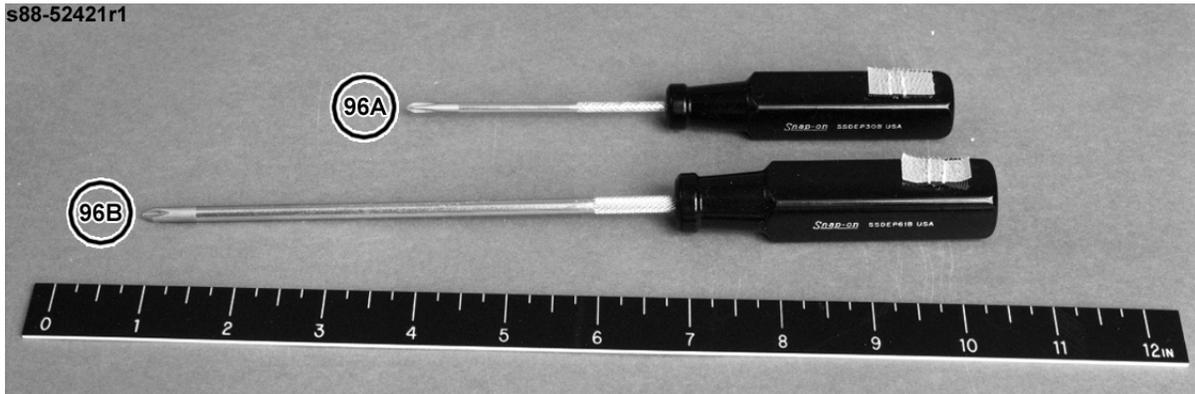
SNAP-ON TOOL PART NUMBER	WRENCH SIZE (IN.)	LENGTH (IN.)
AW028	.028	1-1/4
AW035	.035	1-5/16
AW050	.050	1-3/4
AW2	1/16	1-3/4
AW2 1/2	5/64	1-7/8
AW3	3/32	2
AW3 1/2	7/64	2-1/8
AW4	1/8	2-1/4
AW4 1/2	9/64	2-3/8
AW5	5/32	2-1/2
AW6	3/16	2-3/4
AW7	7/32	3
AW8	1/4	3-1/4

THE FOLLOWING "L" SHAPED HEX WRENCHES ARE IN THIS ASSEMBLY (13 TOTAL):
.028, .035, 3/64, 1/16, 5/64, 3/32, 7/64, 1/8, 9/64, 5/32, 3/16, 7/32,
AND 1/4 INCH

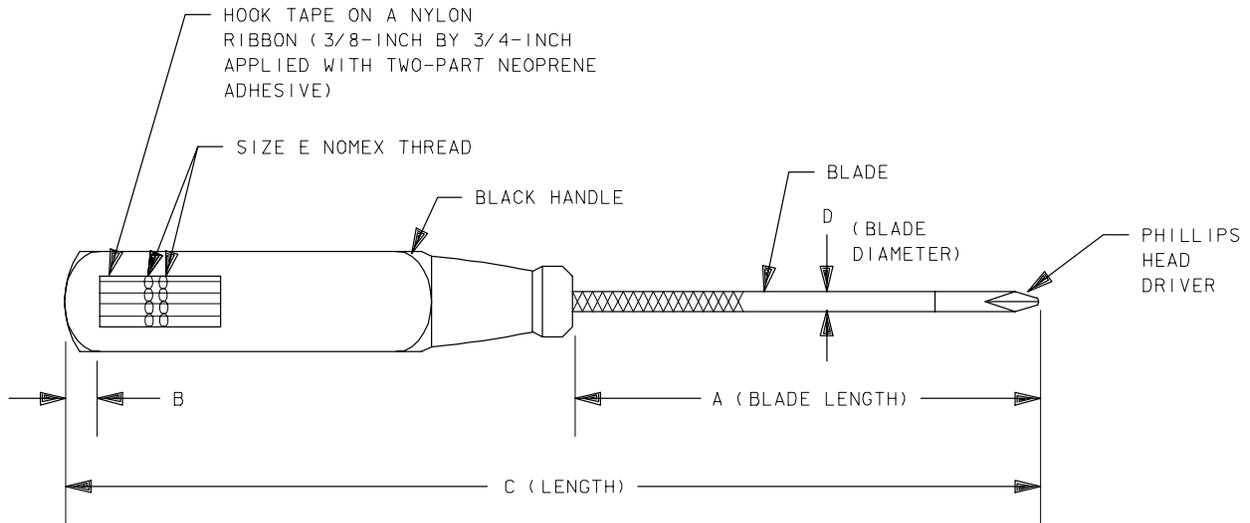
234460506.ORT; 7

L-shaped hex wrenches

PHILLIPS HEAD SCREWDRIVERS #0, #1



Item 91 Technical Information (A - B)	
Location	IFM tool locker drawer 4
CCCD drawing	SED32102162
Other drawings	528-20146 (screwdriver assembly IFM tool kit/sheet 1 of 1)
Manufacturer	Snap-On Tools/Boeing
Material	Nickel/chrome-plated, high-quality steel blade and a plastic handle. The blade tip is vapor blasted (to remove the chrome)
Quantity flown	One of each (total two)



234460507.ORT# 2

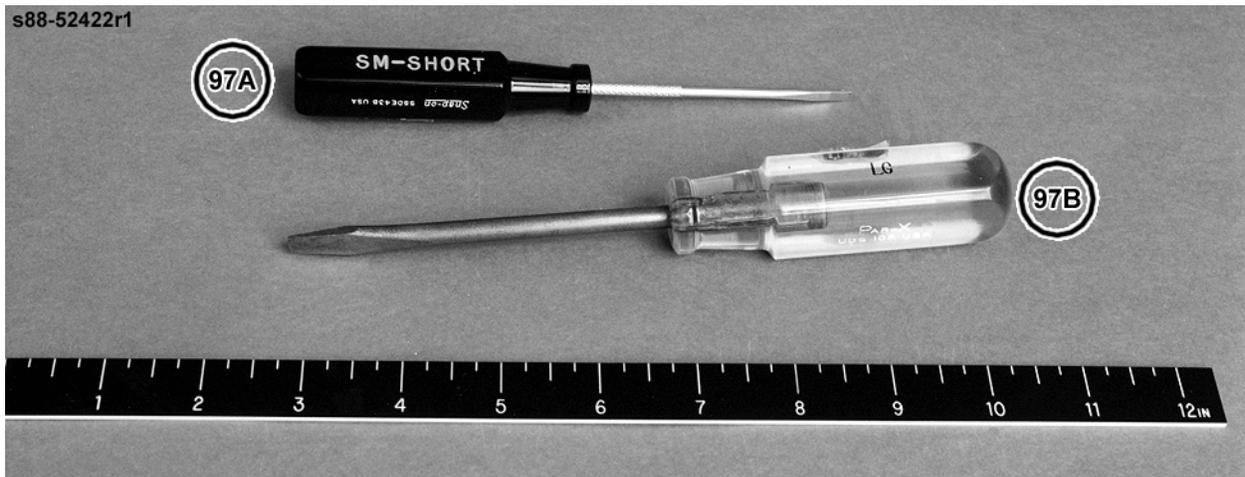
Phillips head screwdrivers

Item number	Snap-On Tools part number	Phillips head size	Dimensions (in.)				CCCD part number	Boeing spec number	Weight (oz)
			A	B	C	D			
96A	SSDEP30B	#0	3	0.25	6.44	1/8	528-20146-4 (ST20T1013-102)	528-41013-102	1.0
96B	SSDEP61B	#1	6	0.25	9.63	1/8	528-20146-5 (ST20T1013-103)	528-41013-103	2.03

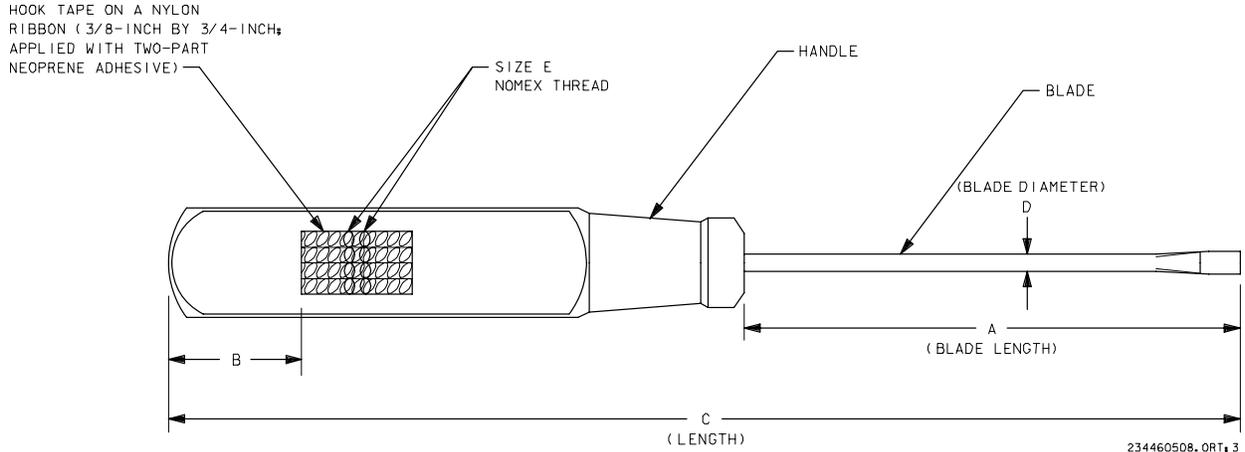
COMMENTS

Phillips head driver #2, #3, and #4 are also in the IFM tool locker drawer 3 (see item 85).

**FLAT TIP SCREWDRIVERS: SHORT (0.018 BY 1/8 BY 3.0 INCH),
LONG (0.037 BY 1/4 BY 4.0 INCH)**



Item 92 Technical Information (A - B)	
Location	IFM tool locker drawer 4
CCCD drawing	SED32102162
Other drawings	528-20146-9 (long screwdriver), 528-20146-8 (short screwdriver) (screwdriver assembly IFM tool kit/sheet 1 of 1)
Manufacturer	Snap-On Tools/Boeing
Material	Short screwdriver blade: nickel/chrome-plated, high-quality steel (with a vapor blasted tip, to remove the chrome) Long screwdriver blade: high-quality steel with a natural finish Both have plastic handles
Quantity flown	One of each (total two)



Flat tip screwdrivers

Item number	Tool	Snap-On Tools part number	Tip style	Tip size (in.)	Dimensions (in.)			
					A	B	C	D
97A	Short screwdriver	SSDE 43B	Flat tip	0.018 by 1/8	3.0	0.75	6.34	1/8
97B	Long screwdriver	UDS 104	Flat tip	0.037 by 1/4	4.0	1.13	7.75	1/4

Item number	CCCD part number	Boeing spec number	Weight (oz)	Shank material	Plastic handle color
97A	528-20146-8 (ST20T1013-67)	528-41013-67	1.03	Nickel/chrome	Black
97B	528-20146-9 (ST20T1013-61)	528-41013-61	3.05		Yellow

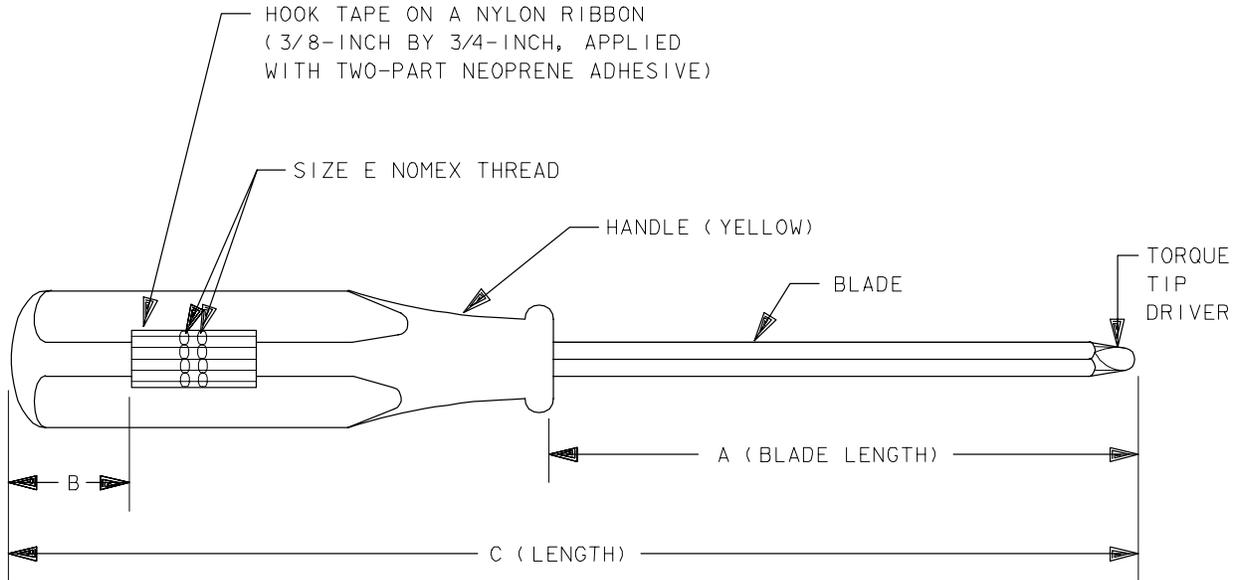
COMMENTS

The short screwdriver has a knurled blade.

TORQUE TIP SCREWDRIVERS: #6, #8, #10



Item 93 Technical Information (A - C)	
Location	IFM tool locker drawer 4
CCCD drawing	SED32102162
Other drawings	528-20146 (screwdriver assembly IFM tool kit/sheet 1 of 1)
Manufacturer	Apex (Dayton, Ohio)/Boeing
Material	High-quality steel with a natural finish blade and a plastic handle
Quantity flown	One of each (total three)



234460509.ORT; 2

Torque tip screwdrivers¹⁷

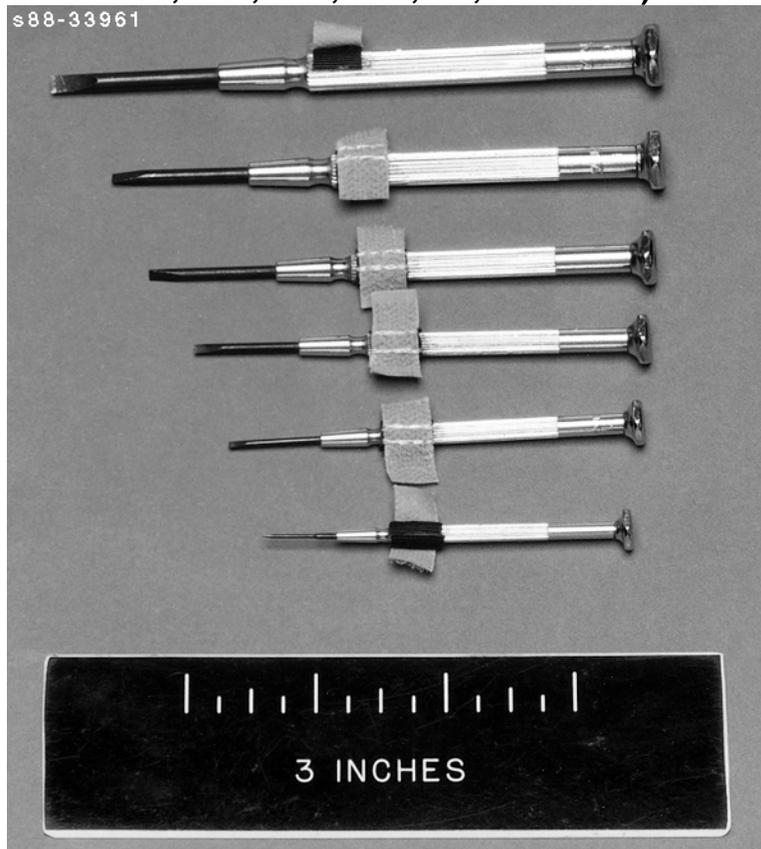
Item number	Apex ¹⁸ part number	Torque tip size	Dimensions (in.)			CCCD part number	Boeing spec number	Weight (lb)
			A	B	C			
98A	268P-6	#6	4.06	0.88	7.36	528-20146-1 (ST20T1015-9)	528-41015-9	0.18
98B	268P-8	#8	4.06	0.88	7.78	528-20146-2 (ST20T1015-10)	528-41015-10	0.18
98C	268P-10	#10	4.06	0.88	7.78	528-20146-3 (ST20T1015-11)	528-41015-11	0.17

COMMENTS

Torque tip drivers (3/8-inch drive) #2, #4, #6L, #8, and #10L are also in the IFM tool locker drawer 3 (see items 86A to 86E).

¹⁷ Apex Fastener Tools Catalog, Apex Machine and Tools, Dayton, Ohio, 1987.

**JEWELERS SCREWDRIVER SET
(SIX FLAT TIP SCREWDRIVERS:
1/32, 3/64, 5/64, 3/32, 1/8, 9/64-INCH)**



Item 94 Technical Information	
Location	IFM tool locker drawer 4
CCCD part number	528-20146-11 (ST2021305-01)
CCCD drawing	SED32102162
Other drawings	528-20146 (screwdriver assembly IFM tool kit/sheet 1)
Manufacturer	Radio Shack/Boeing
Boeing spec number	528-41305-1
Radio Shack part number	641948
Weight	3.52 oz
Material	Steel
Quantity flown	One set of six screwdrivers

HOOK TAPE ON A
NYLON RIBBON
(3/8-INCH BY
3/4-INCH, APPLIED
WITH A TWO-PART
NEOPRENE ADHESIVE)



SIZE E NOMEX THREAD

9/64 INCH

1/8 INCH

3/32 INCH

5/64 INCH

3/64 INCH

1/32 INCH



ATTACH TABS APPROXIMATELY WHERE SHOWN.

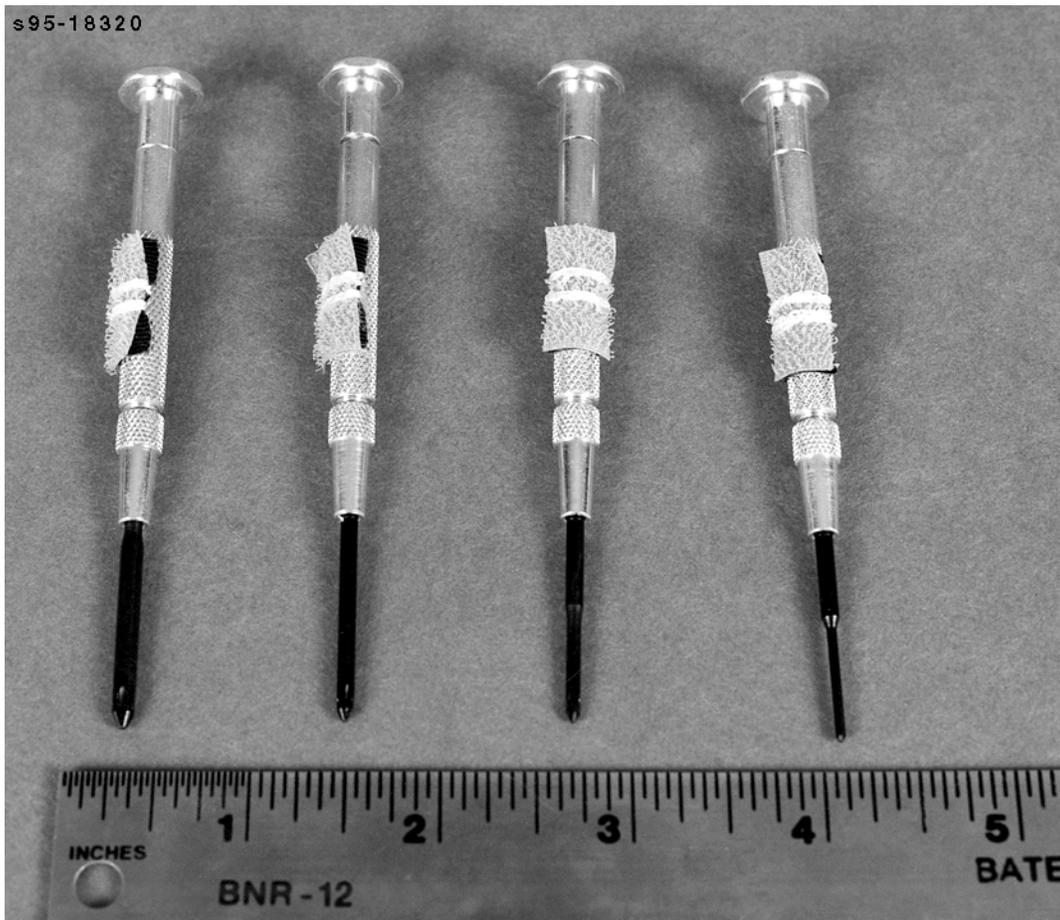
234460510. ART. 2

Jewelers screwdriver set (flat tip)

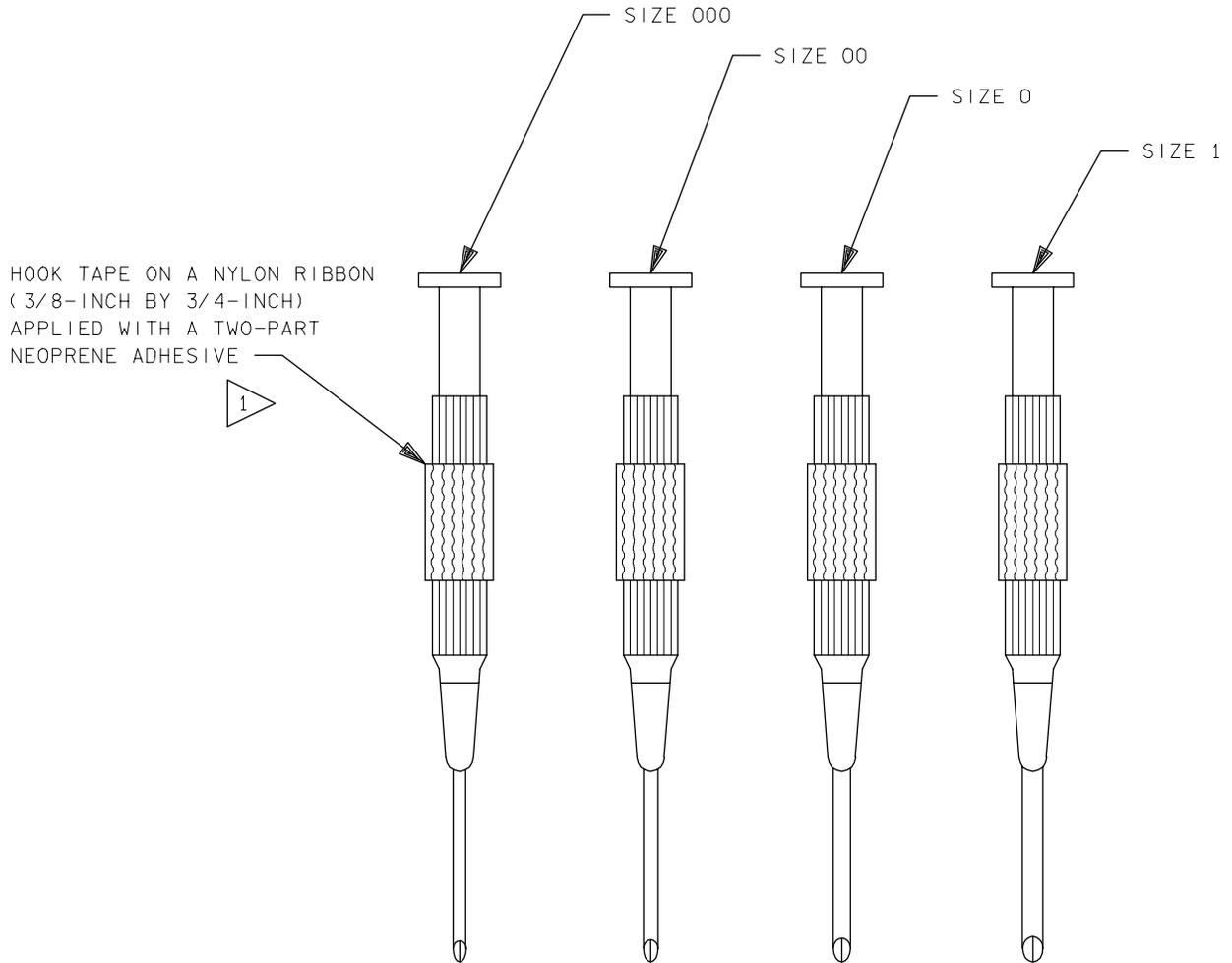
COMMENTS

These screwdrivers are used to change out keyboard keys, orbital digital autopilot-type pushbutton indicators, or light bulbs.

**JEWELERS SCREWDRIVER SET
(FOUR PHILLIPS HEAD SCREWDRIVERS: SIZES 1, 0, 00, AND 000)**



Item 95 Technical Information	
Location	IFM tool locker drawer 4
CCCD part number	528-20146-12/13/14/15
CCCD drawing	SED32102162
Other drawings	528-20146 (screwdriver assembly IFM tool kit/sheet 2 of 2)
Manufacturer	Boeing
Boeing spec number	528-43080-1/2/3/4
Material	Steel
Quantity flown	One set of four screwdrivers

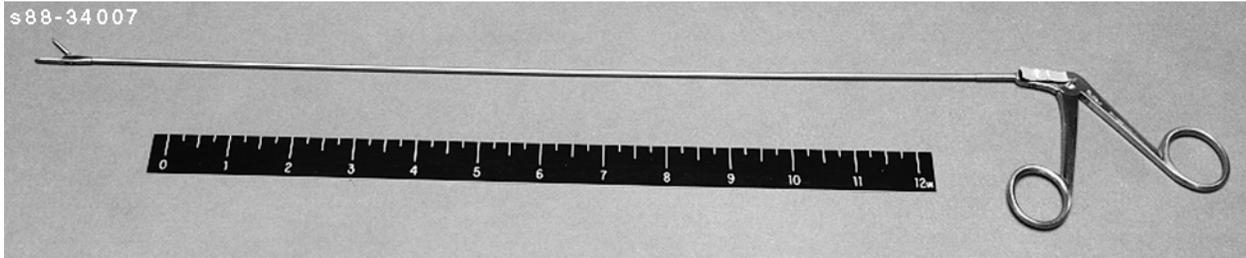


1 ATTACH TABS APPROXIMATELY WHERE SHOWN.

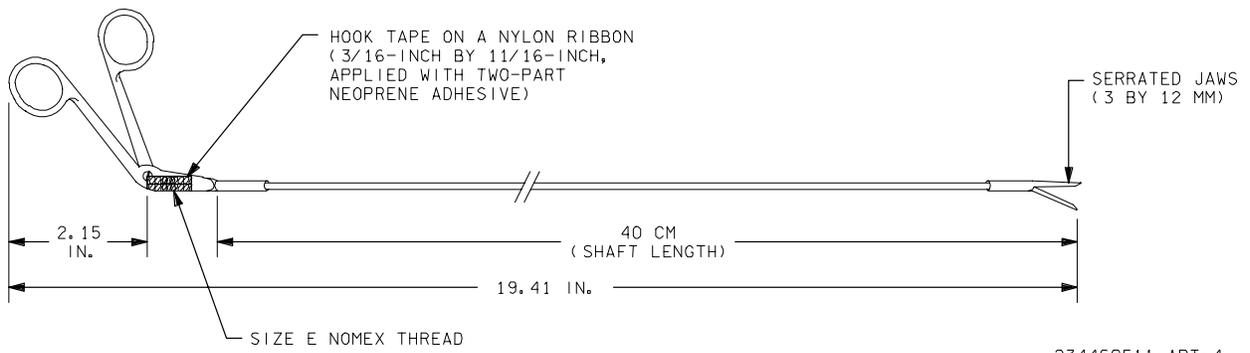
23446510A. ART. 3

Jewelers screwdriver set (Phillips head)

MODIFIED FORCEPS

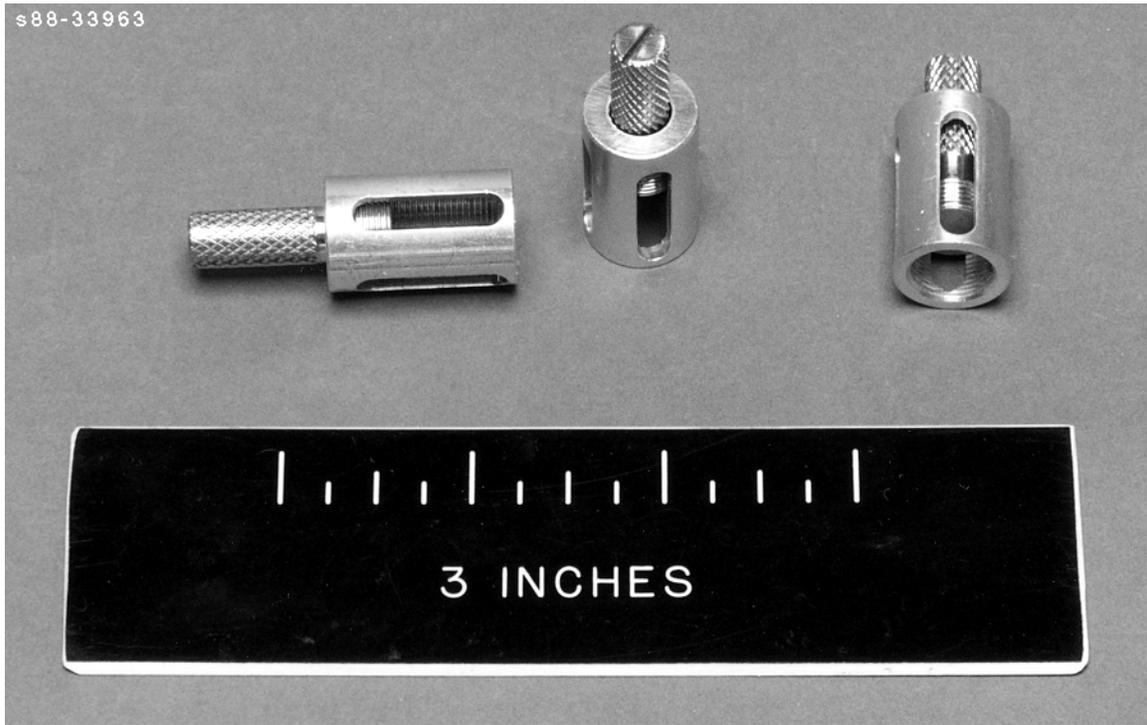


Item 96 Technical Information	
Location	IFM tool locker drawer 4
CCCD part number	SED33103805-301
CCCD drawing	SED32102162
Other drawings	SED33103805 (forcep assy, modified/one sheet)
Manufacturer	Miltex/Boeing
Miltex part number	Miltex 23-642
Weight	1.6 oz
Material	Stainless steel
Quantity flown	One

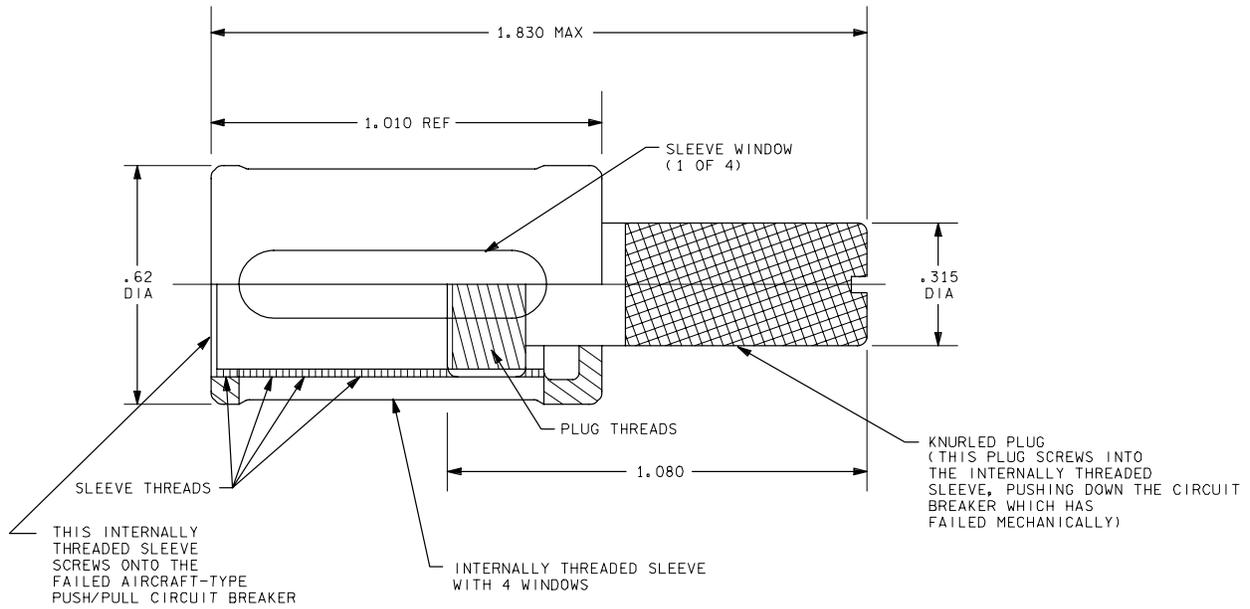


Modified forceps

CB OVERRIDE DEVICE



Item 97 Technical Information	
Location	IFM tool locker drawer 4
CCCD part number	10108-10042-02
CCCD drawing	SED32102162
Other drawings	10108-10042 (circuit breaker override device assembly/ one sheet)
Manufacturer	Boeing
Weight	0.57 oz
Material	Aluminum
Quantity flown	Three



THIS DEVICE HOLDS AN AIRCRAFT-TYPE PUSH/PULL CIRCUIT BREAKER (WHICH HAS FAILED MECHANICALLY) IN THE CLOSED POSITION. THE CIRCUIT BREAKER SHOULD STILL TRIP IF AN OVERCURRENT CONDITION OCCURS

234460512.ORT; 2

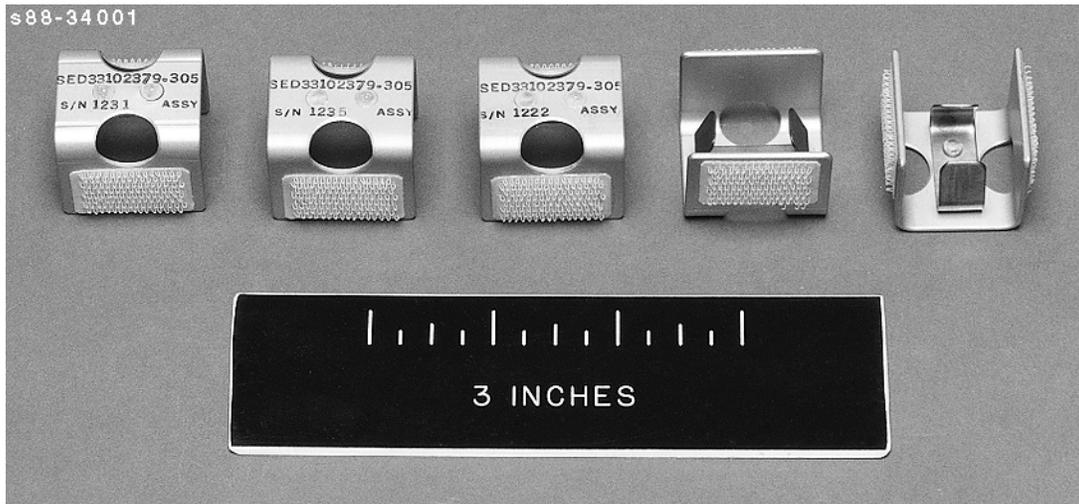
CB override device¹⁸

COMMENTS

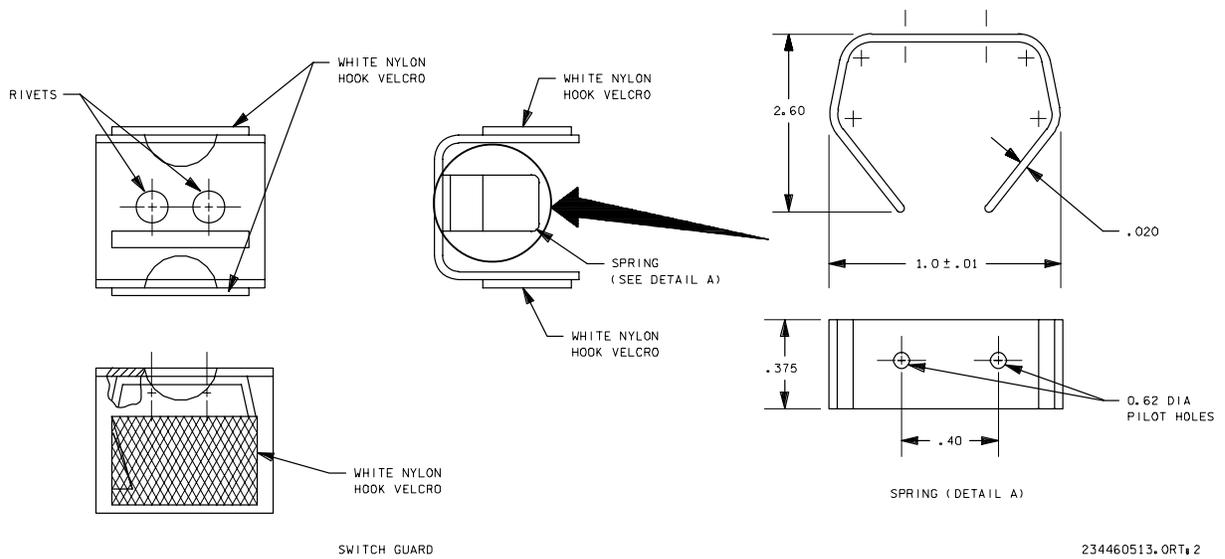
This device is installed only for emergency situations (refer to Flight Rules).

¹⁸ Robbins, Richard L., and Pierson, Thomas E. Overriding Faulty Circuit Breakers, NASA Tech Briefs, April 1987.

SWITCH GUARD



Item 98 Technical Information	
Location	IFM tool locker drawer 4
CCCD part number	SED33102379-305
CCCD drawing	SED32102162
Other drawings	SED33102379 (wicket safety cap assembly/two sheets)
Manufacturer	Boeing
Weight	0.025 lb
Material	Aluminum with a beryllium copper spring
Quantity flown	Five



Switch guard

COMMENTS

These spare switch guards can be placed on a switch to prevent inadvertent operation.

TAPE MEASURE (10 FEET)

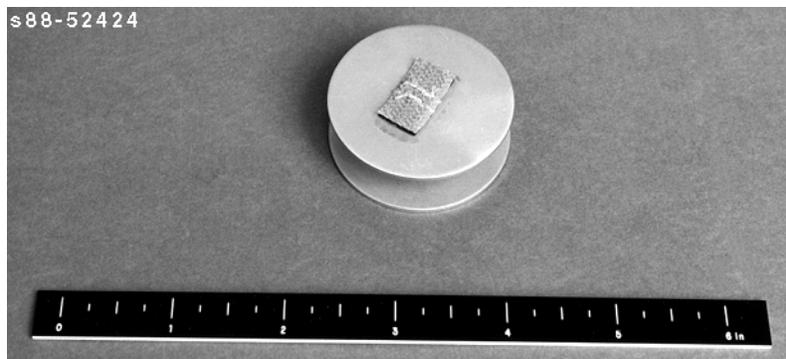
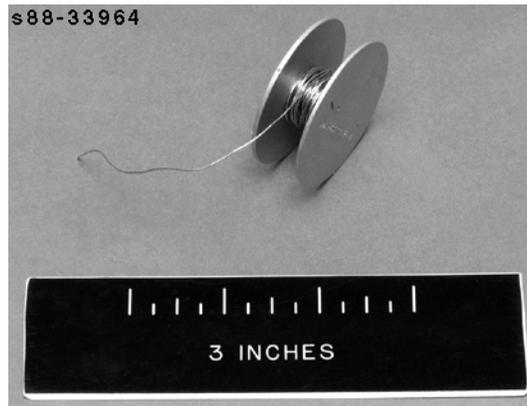


Item 99 Technical Information	
Location	IFM tool locker drawer 4
CCCD part number	528-43023-1
CCCD drawing	SED32102162
Manufacturer	Lufkin
Manufacturer part number	PC-10
Weight	3.03 oz
Quantity flown	One

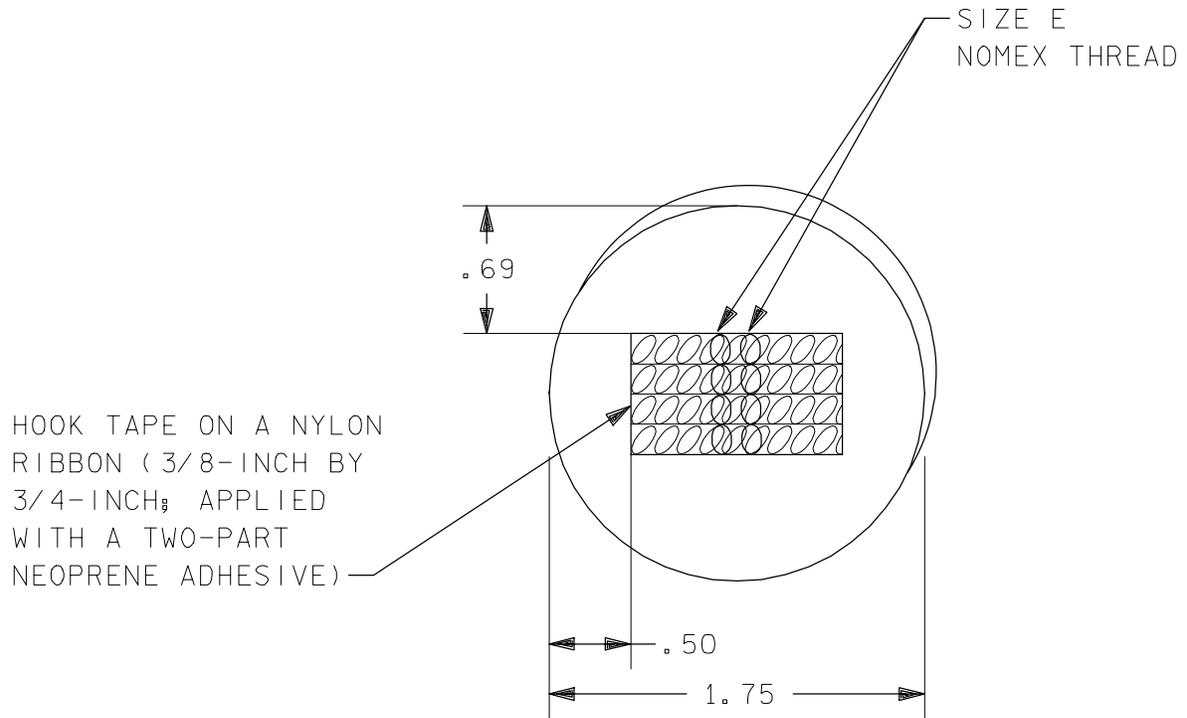
COMMENTS

The tape measure is 10 feet long, with increments only in inches: 1/4-, 1/8-, 1/16-, and 1/32-inch.

WIRE SPOOL (10 FEET)



Item 100 Technical Information	
Location	IFM tool locker drawer 4
CCCD part number	528-20148-2 (10114-20008-02)
CCCD drawing	SED32102162
Other drawings	528-20148 (misc. tool assembly IFM tool kit/sheet 1 of 2)
Manufacturer	Boeing
Weight	0.76 oz
Material	10 ft of 24-gauge, tin-coated copper wire on an aluminum wire spool (0.020-inch-diam)
Quantity flown	One

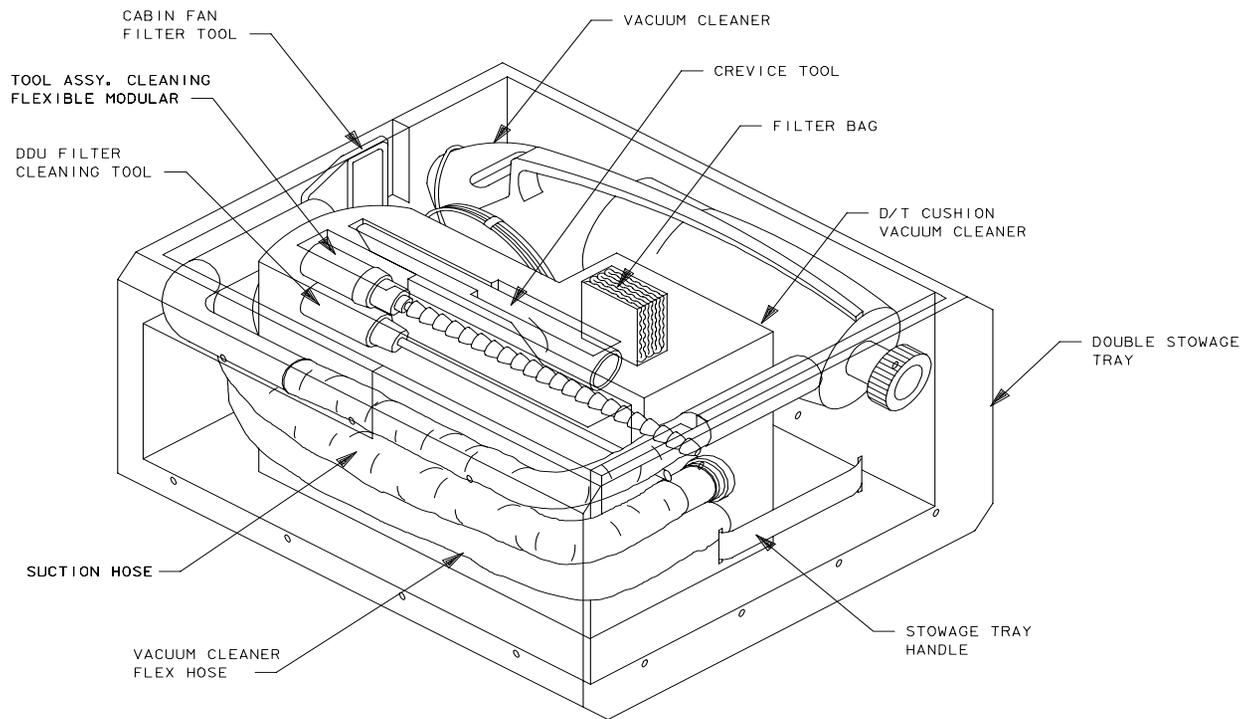


234460514. ART 3

Wire spool

IFM VACUUM CLEANER LOCKER

Item		Page
TRAY		
101	AC VACUUM CLEANER LOCKER DOUBLE TRAY	6-2
VACUUM CLEANER		
102	VACUUM CLEANERS (AC AND DC)	6-5
102B	AC VACUUM FILTER BAG	6-14
VACUUM CLEANER ATTACHMENTS		
103	CABIN FAN FILTER TOOL	6-15
104	CREVICE TOOL	6-16
105	VACUUM CLEANER FLEX HOSE	6-17
106	VACUUM CLEANER SUCTION HOSE	6-19
107	DDU FILTER CLEANING ATTACHMENT	6-20
108	FLEXIBLE MODULAR CLEANING TOOL	6-22



23446514A. ISO# 1

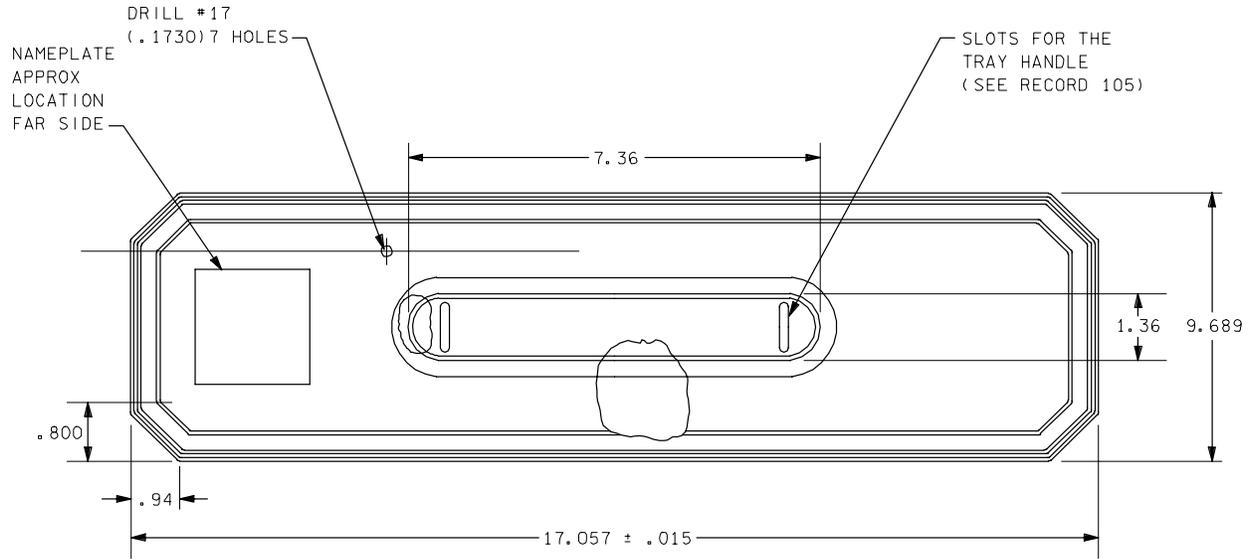
Vacuum cleaner locker (ac)

AC VACUUM CLEANER LOCKER DOUBLE TRAY

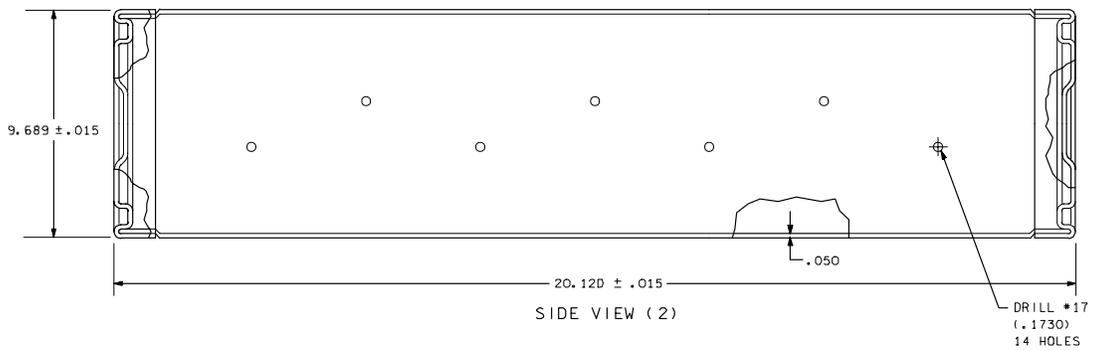
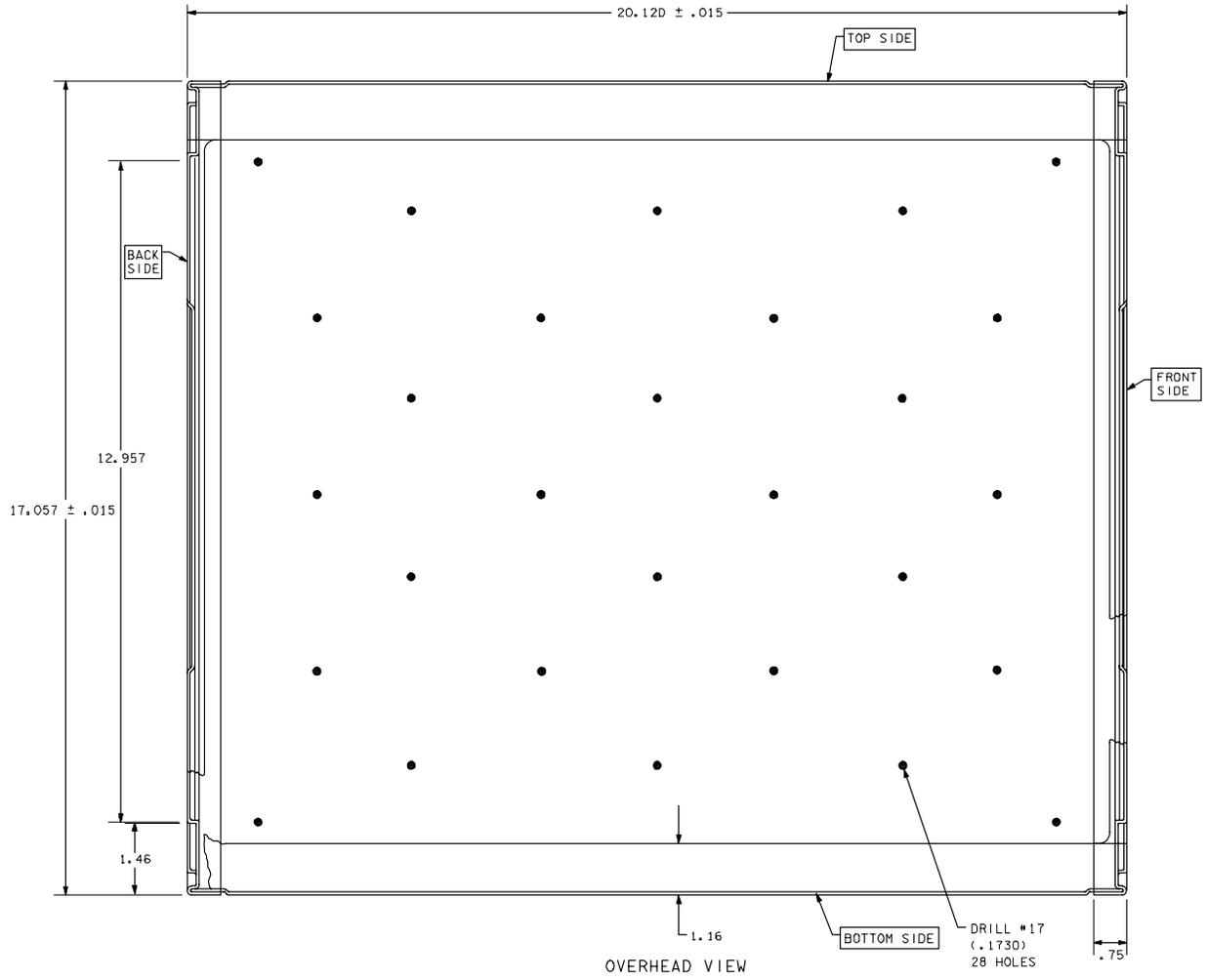
s95-18288



Item 101 Technical Information	
Location	Vacuum cleaner locker
CCCD part number	ME192-0070-0002
CCCD drawing	SED32100476
Other drawings	ME192-0070 (stowage tray, single)
Manufacturer	Rockwell
Weight	3.4 lb
Quantity flown	One



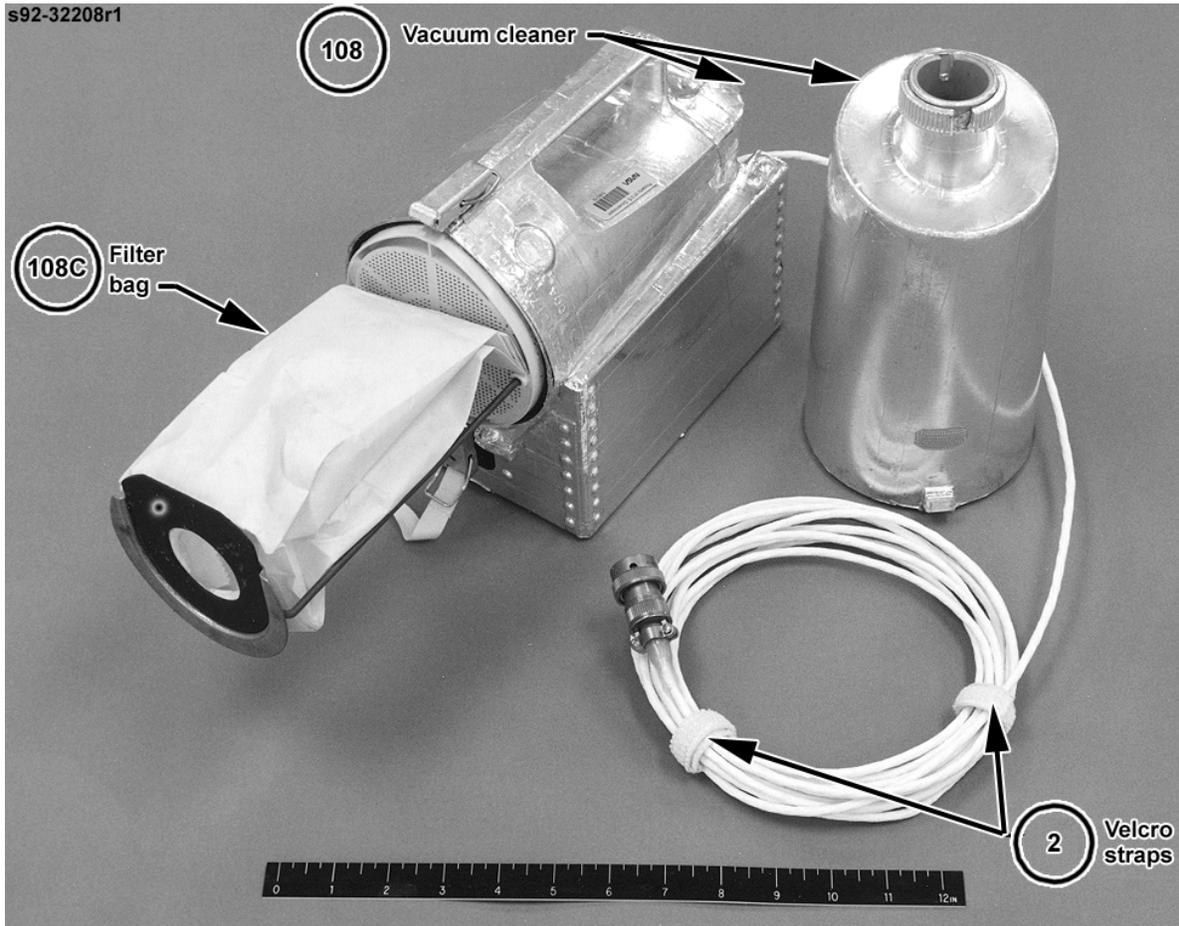
Vacuum cleaner locker double tray (front and back view)



234460617.ART, 1

Vacuum cleaner locker double tray (overhead and side views)

VACUUM CLEANERS (AC AND DC)



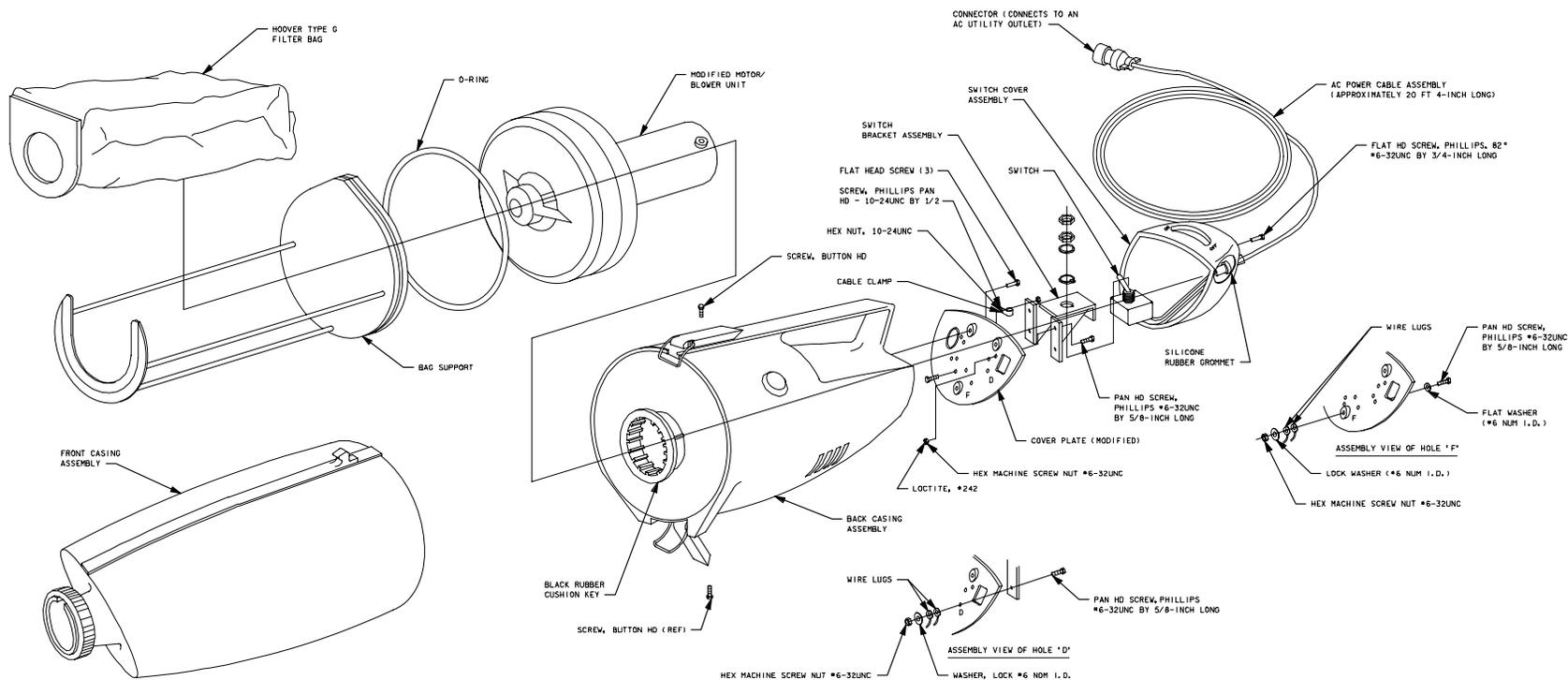
Vacuum cleaner (ac)

Item 102 Technical Information	
Location	Vacuum cleaner locker
CCCD part number	SED39121797-303 (ac vacuum cleaner) SED39125069-302 (dc vacuum cleaner) SED39123308-301 (bag for dc vacuum cleaner)
CCCD drawing	SED32100476
Other drawings	SED39121797 (vacuum cleaner assembly/five sheets)
Manufacturer	Boeing
Weight	7.60 lb (ac) 9 lb (dc)
Quantity flown	One

s88-33979r1



Vacuum cleaner (ac)



234460605, ART. 5

Vacuum cleaner (ac)

ORBITER AC VACUUM CLEANER DATA

1. Inrush current of 7.6 amps per each of three legs for a maximum of 1.3 seconds.

$$\text{RMS value} = 0.707 \times 7.6 = 5.37$$

2. ΔP across different size sharp edge holes

		ΔP (in. of H ₂ O)		Continuous current		
				A	B	C
a.	1.0	4.3	= 0.155 psi = 22 cfm	1.02	0.88	0.67
b.	0.71 diam	8.9	= .32 psi = 23 cfm	.92	.80	.63
c.	0.50 diam (\approx crevice tool 0.25 in ²)	13.3	= .48 psi = 17 cfm	.90	.78	.675

(steady state current)

3. Motor speed \approx 22,830 rpm

Vacuum cleaner rated \approx 30-40 cfm

COMMENTS

The vacuum cleaner is powered by orbiter ac power (its ac power cord connects to an ac utility outlet). It is normally used with the vacuum cleaner attachments to perform on-orbit filter cleaning (see the Scheduled Maintenance section, Filter Cleaning, in the IFM Checklist). It is also used in the IMU Contingency Cooling IFM procedure to cool the IMUs if all three IMU fans have failed.

The vacuum cleaner is an off-the-shelf Hoover with the following modifications:

1. Addition of 3 ϕ 400 Hz induction motor.
2. Thermal protection switch - Shuts down vacuum cleaner if thermal overload occurs (effective STS-40).
3. Plastic housing covered with aluminum tape (to prevent spreading of flames in the event of a fire).
4. Addition of a muffler (for noise reduction).

Caution should be exercised in the following situations to prevent overheating the vacuum cleaner.

1. Use of the DDU filter cleaning attachment (item 115; should not be run for more than 5 minutes continuously).
2. Use of vacuum cleaner in a 10.2-psi cabin.



Wet/dry dc vac disassembled

ORBITER DC VACUUM CLEANER

The values in the following table are based on high-speed operation of the redesigned vacuum cleaner, serial no. 1001. It is connected to the middeck multi-outlet adapter, also known as the Power Distribution Box (PDB).

Operation	Voltage (V dc)	Power (W)	Current (A)
Steady state	32.0	186	6.184
	28.0	148	5.64
	24.0	108	4.792
	Voltage (V dc)	Current (A_{pk})	Duration (ms)
Startup	32.0	10.05	2.1
	28.0	8.85	2.5
	24.0	7.75	1.9

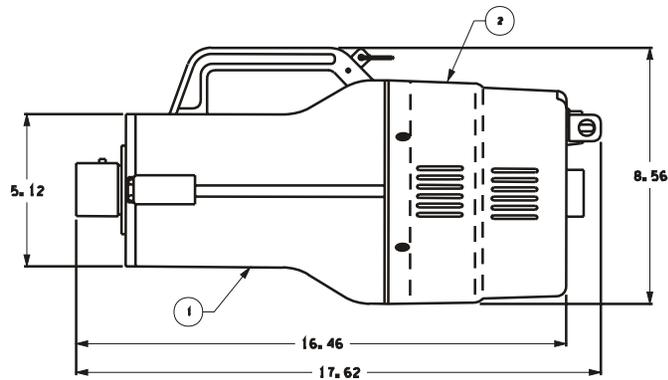
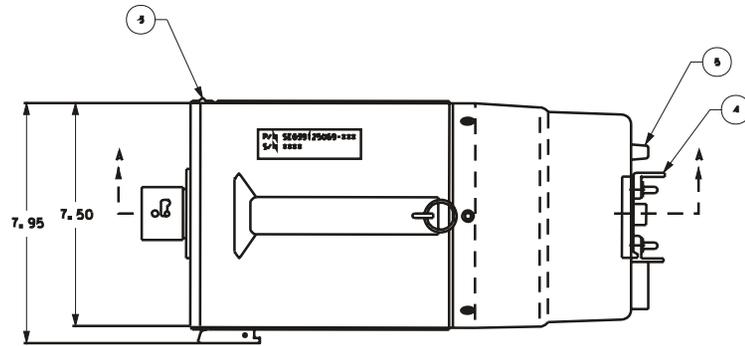
EMI/EMC tested: June 1995, TPS no. 6H9520048.

EMI/EMC susceptibility tested: None.

Power cable: Tested with 24-foot dc power cord (16 AWG).

COMMENTS

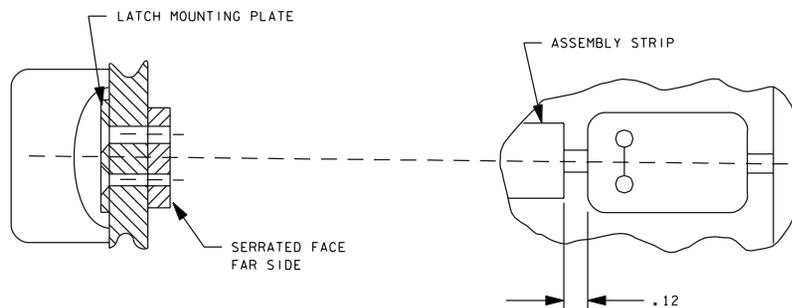
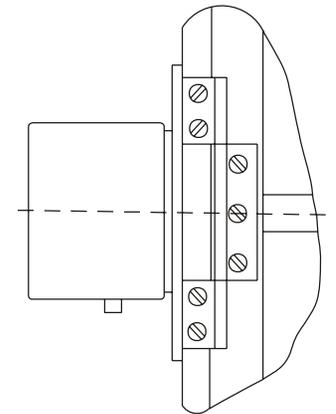
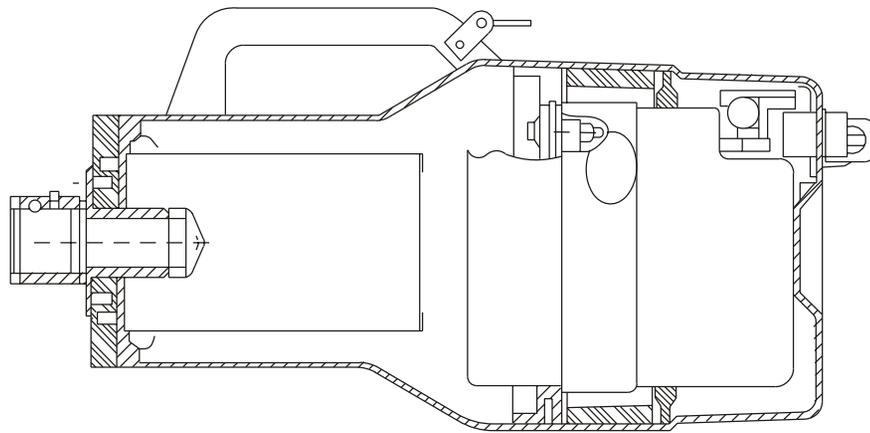
The wet/dry dc vacuum cleaner is powered by orbiter dc power and is capable of containing both wet spills (up to 48 oz) and dry debris. The IMU Contingency Cooling IFM procedure calls for this GFE hardware to be used to cool the IMUs if all three IMU fans have failed.



1	1	ME 451-0018-0750	SUBMINIATURE FUSE	CERAMIC, 7.5A	BUSSMAN, ST. LOUIS, MO.	5
2	2	SEG39123312-009	GUARD, SWITCH			4
1	1	SEG39123324-701	HOUSING HINGE ASSY			3
1	1	SEG39123303-701	EXHAUST HOUSING ASSY			2
1	1	SEG39123302-701	SUCTION HOUSING ASSY			1
-302	-301	PART NUMBER	DESCRIPTION	MATERIAL	SPECIFICATION	ITEM

0033551. ISO 1

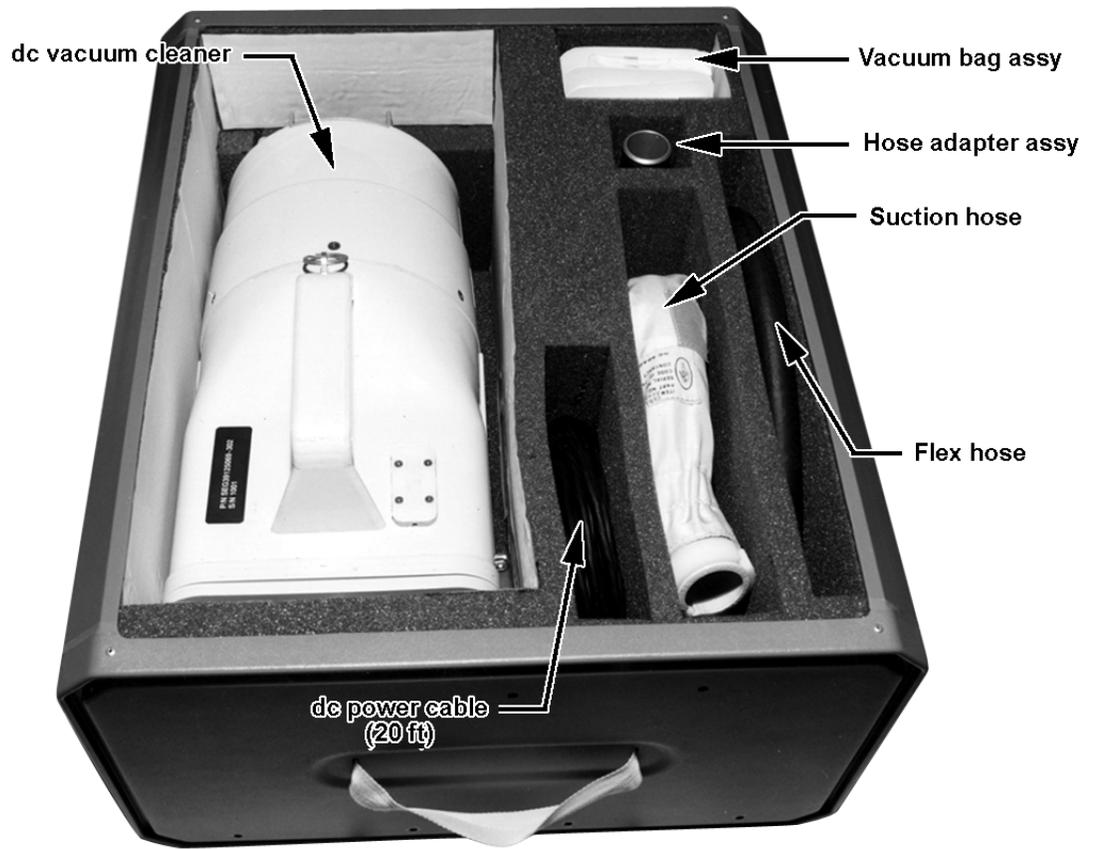
Cleaner assembly wet/dry vacuum, 28 volt



0033552. ISO# 1

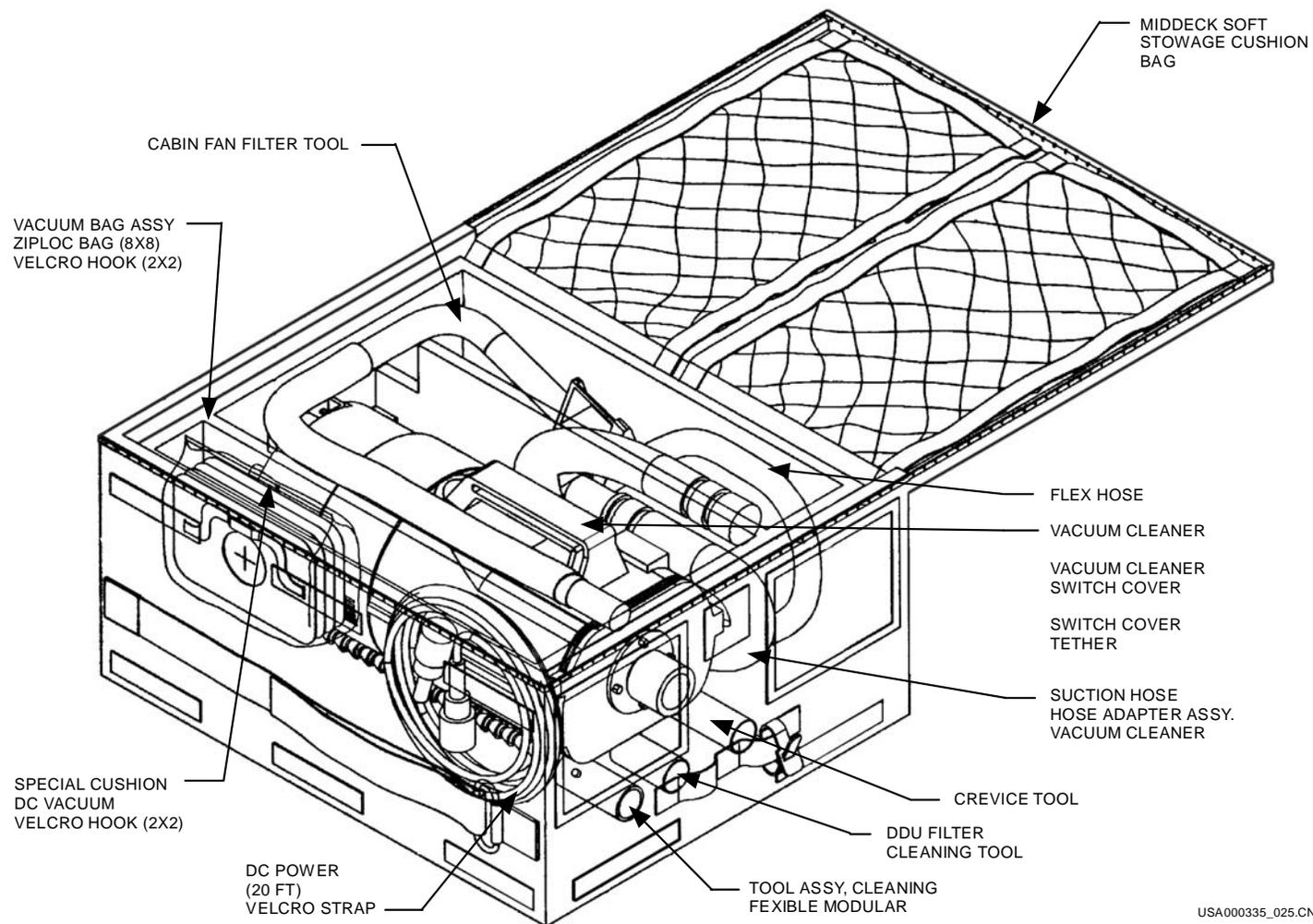
Cleaner assembly wet/dry vacuum, 28 volt (concluded)

S95-20904



Vacuum cleaner (dc) locker

CCCD drawing	SEG 39125069-302
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USA000335_025.CNV

Vacuum cleaner (dc) locker

AC VACUUM FILTER BAG

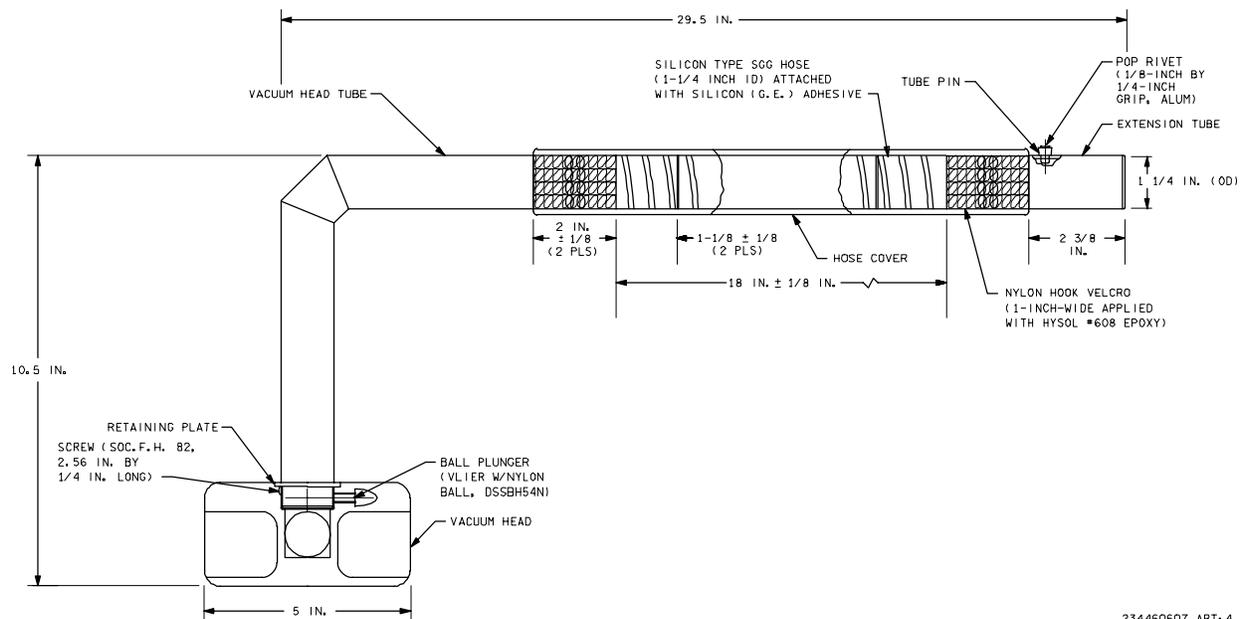
Item 102B Technical Information	
Location	Vacuum cleaner locker
CCCD part number	528-41115-1 (ST10B1115-01)
CCCD drawing	SED32100476
Other drawings	528-41115 (vacuum cleaner bag/three sheets)
Manufacturer	Hoover Company
Manufacturer part number	Hoover type G
Weight	0.04 lb
Quantity flown	Six

COMMENTS

Filter bags for the vacuum cleaner are not reusable.

CABIN FAN FILTER TOOL

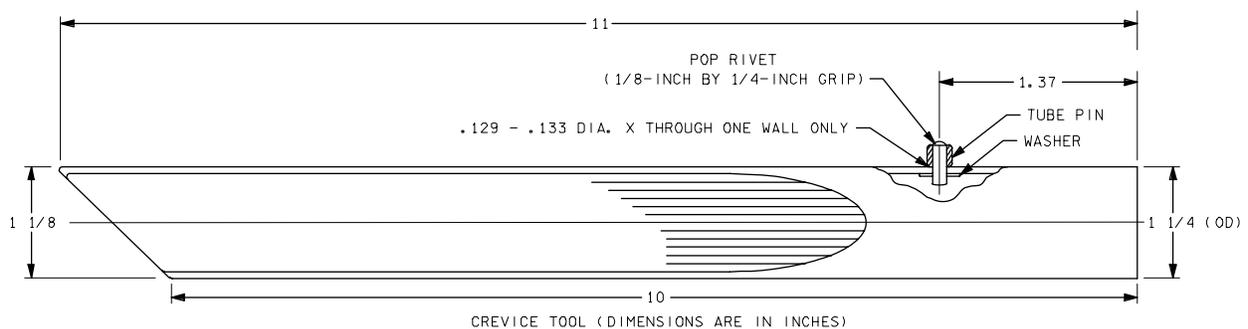
Item 103 Technical Information	
Location	Vacuum cleaner locker
CCCD part number	10113-20045-01
CCCD drawing	SED32100476
Other drawings	10113-20045 (cabin fan filter tool/orbiter vacuum cleaner/ one sheet)
Manufacturer	Boeing (responsibility transferred from ILC)
Weight	0.99 lb
Quantity flown	One

**Cabin fan filter tool****COMMENTS**

This tool attaches to the vacuum cleaner and is used to clean the cabin fan filters under MD79G.

CREVICE TOOL

Item 104 Technical Information	
Location	Vacuum cleaner locker
CCCD part number	10113-20008-01
CCCD drawing	SED32100476
Other drawings	10113-20008 (crevice tool assembly orbiter vacuum cleaner assembly/one sheet)
Manufacturer	Boeing (responsibility transferred from ILC)
Weight	0.12 lb
Material	Plastic
Quantity flown	One



NOTE: ALL EXTERIOR SURFACES OF THE CREVICE TOOL ARE COVERED WITH 2-INCH-WIDE ALUMINUM TAPE (3M #433) (TO PREVENT SPREAD OF FLAMES IN THE EVENT OF FIRE).

234460608, ART# 5

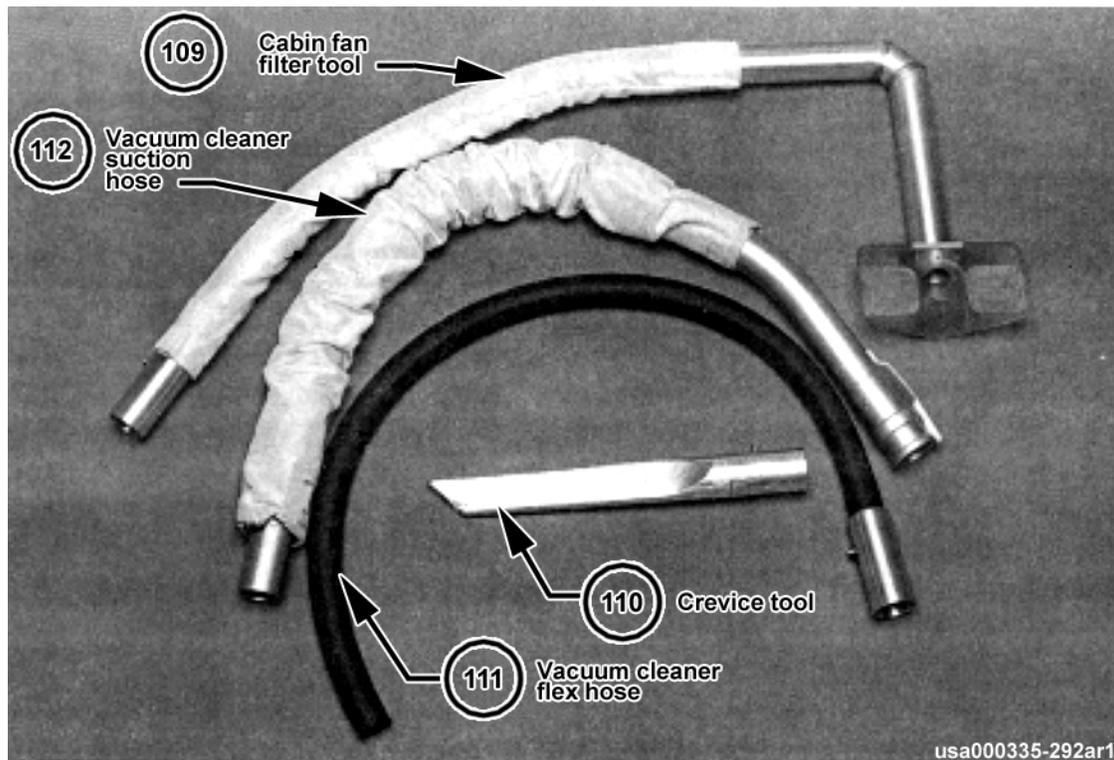
Crevice tool

COMMENTS

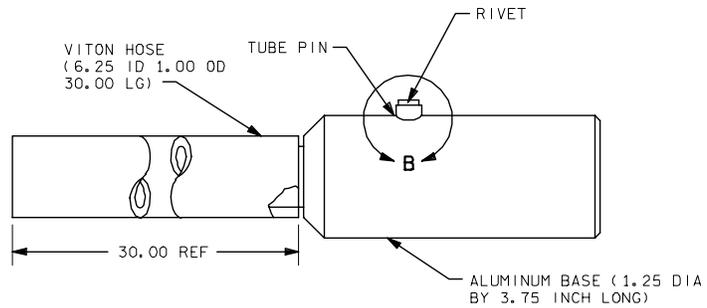
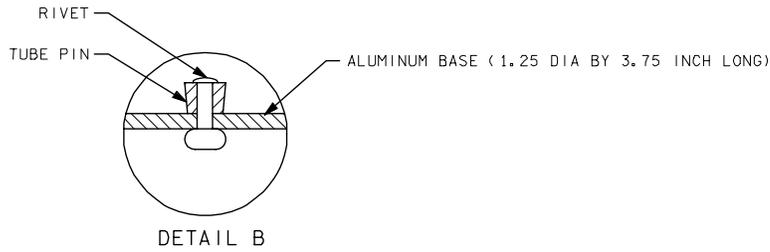
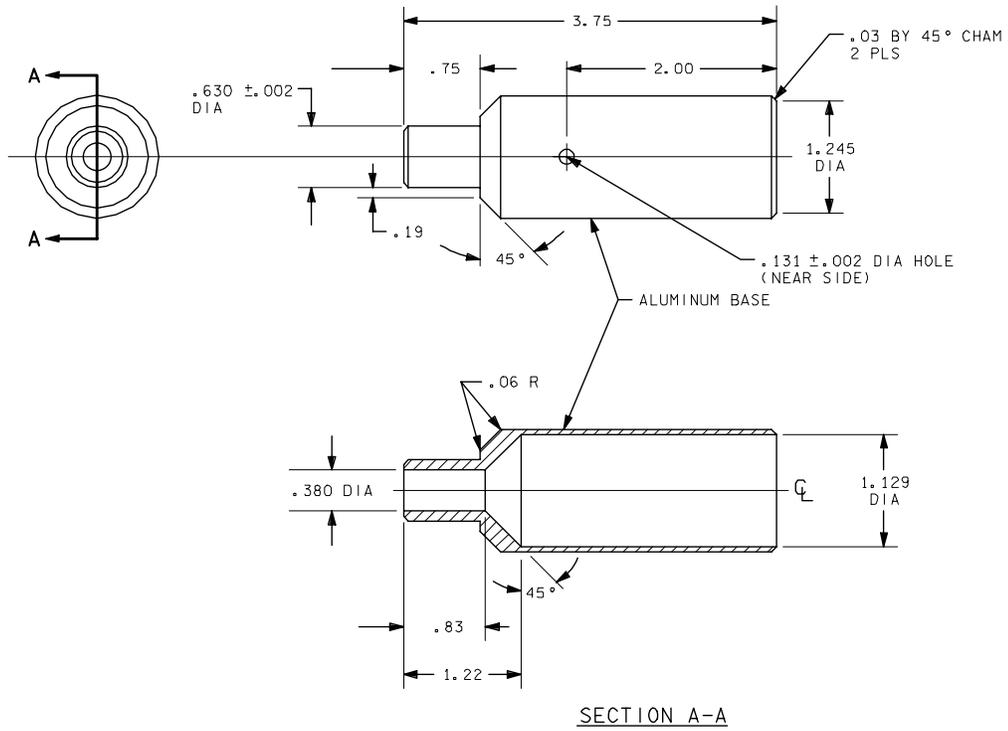
The crevice tool attaches to the vacuum cleaner suction hose (which attaches to the vacuum cleaner) and is used to perform cleaning on various filters/screens (see the scheduled maintenance section in the IFM checklist).

VACUUM CLEANER FLEX HOSE

Item 105 Technical Information	
Location	Vacuum cleaner locker
CCCD part number	528-20179-1
CCCD drawing	SED32100476
Other drawings	528-20179 (vacuum cleaner flex hose/one sheet)/ 10113-20001)
Manufacturer	Boeing
Weight	1.04 lb
Quantity flown	One



Vacuum cleaner attachments



234460610. ART# 4

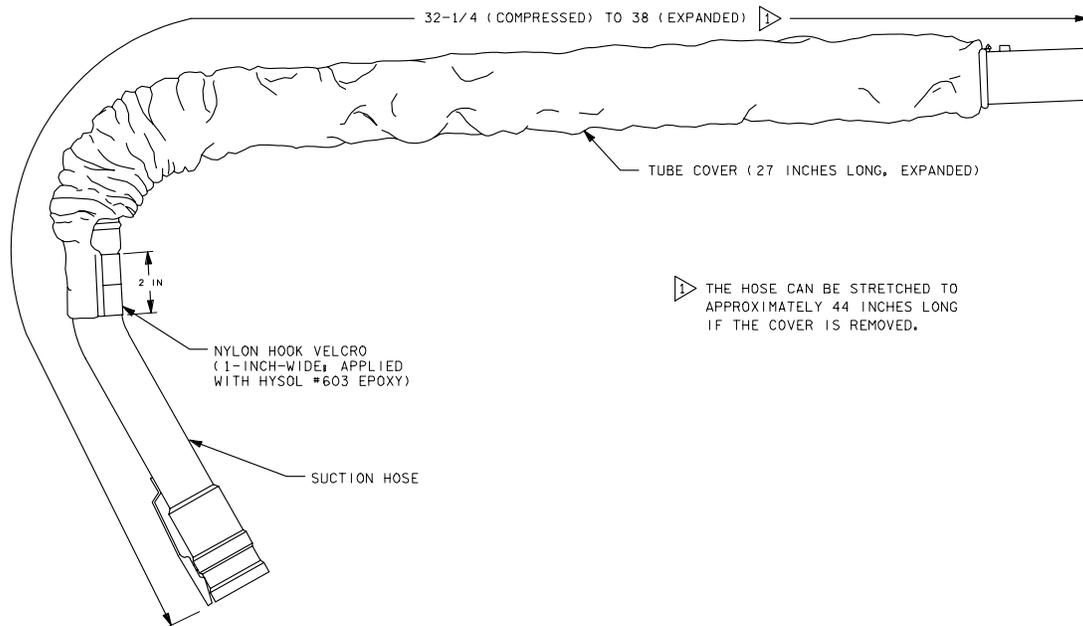
Vacuum cleaner flex hose

COMMENTS

The vacuum cleaner flex hose attaches to the vacuum cleaner.

VACUUM CLEANER SUCTION HOSE

Item 106 Technical Information	
Location	Vacuum cleaner locker
CCCD part number	10113-20001-01/02
CCCD drawing	SED32100476
Other drawings	10113-20001 (suction hose assembly orbiter vacuum cleaner/ one sheet)
Manufacturer	Boeing
Weight	1.13 lb
Quantity flown	One



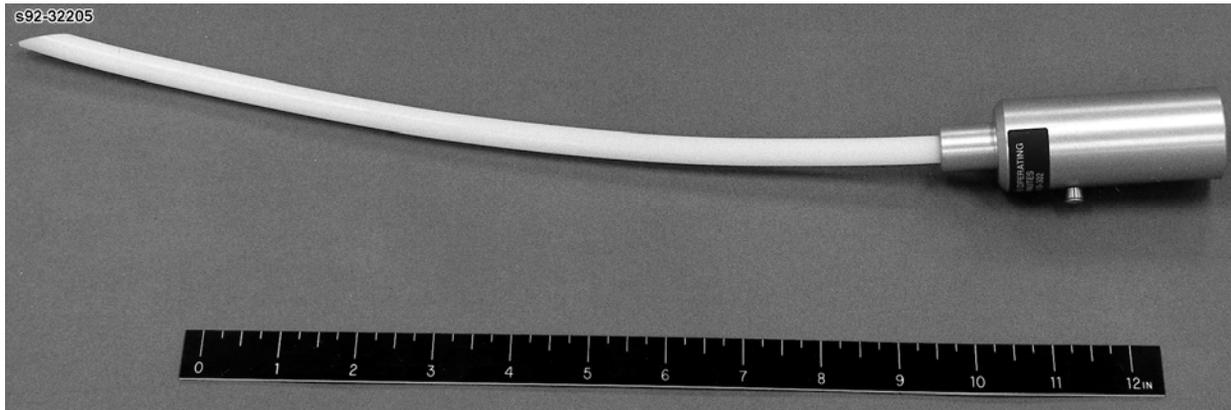
234460611. ART, 5

Vacuum cleaner suction hose

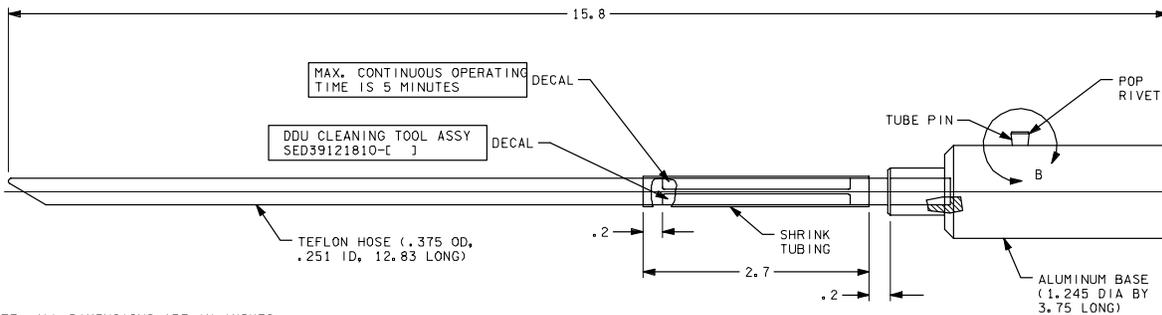
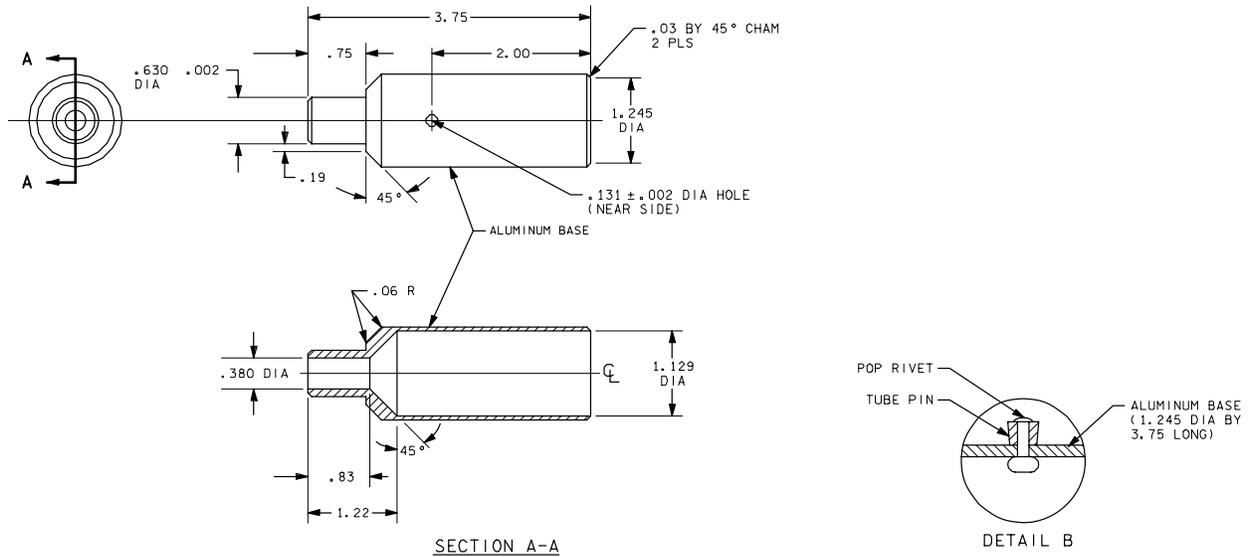
COMMENTS

The vacuum cleaner suction hose attaches to the vacuum cleaner and is used with attachment tools to clean various filters and screens (see the Scheduled Maintenance section in the IFM Checklist).

DDU FILTER CLEANING ATTACHMENT



Item 107 Technical Information	
Location	Vacuum cleaner locker
CCCD part number	SED39121810-302
CCCD drawing	SED32100476
Other drawings	SED39121810 (tool assy, cleaning, DDU flexible/three sheets)
Manufacturer	NASA JSC Technical Services
Weight	0.18 lb
Quantity flown	One



NOTE: ALL DIMENSIONS ARE IN INCHES.

23446611A. ART. 4

DDU filter cleaning attachment

COMMENTS

This attachment can be connected to the vacuum cleaner suction hose (which attaches to the vacuum cleaner) or directly to the vacuum cleaner. It is used to perform filter cleaning on the DDU 1 and 2 filters or other hard-to-access filters. If used for longer than 10 minutes, the attachment will cause the vacuum cleaner to overheat because decreased airflow through the vacuum cleaner is not sufficient to cool the motor.

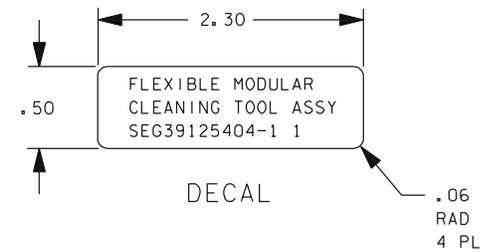
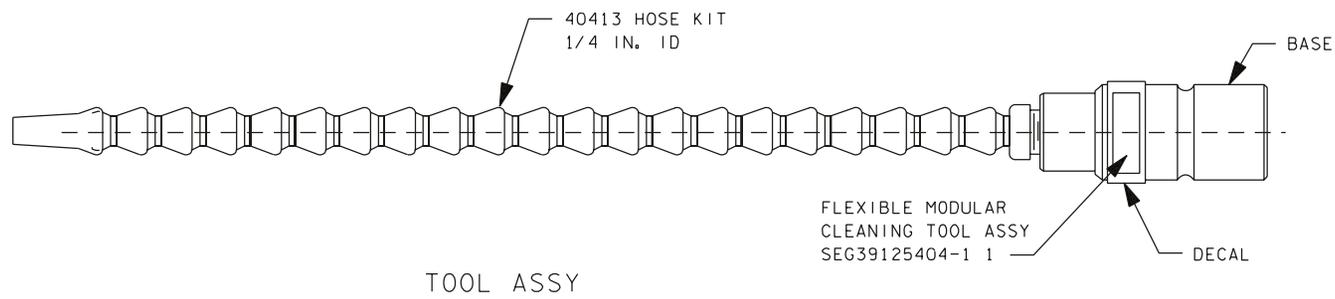
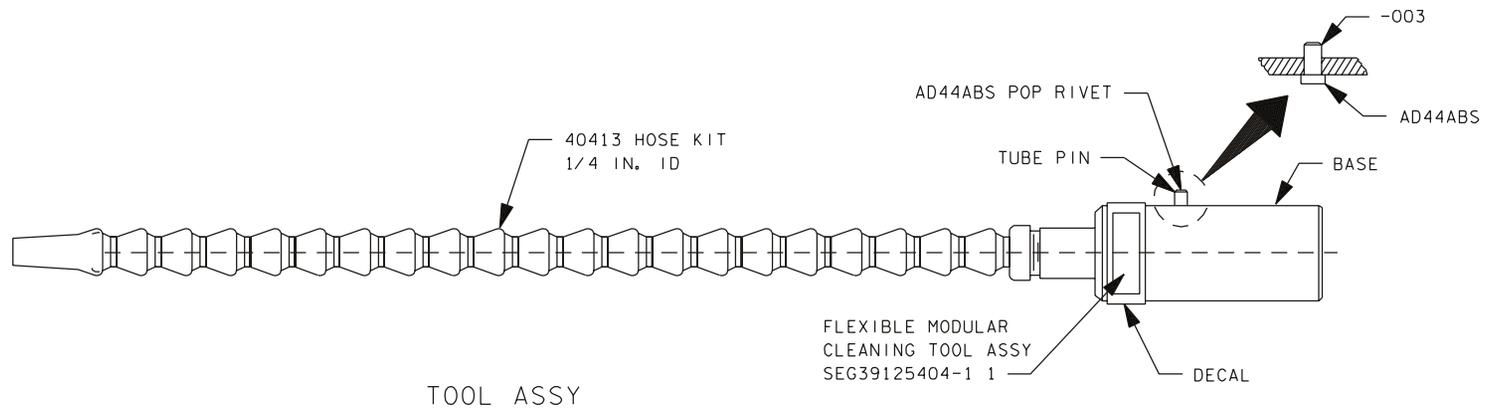
FLEXIBLE MODULAR CLEANING TOOL



Item 108 Technical Information	
Location	Vacuum cleaner locker
CCCD part number	SEG39125404-301
CCCD drawing	SED32104034
Manufacturer	Boeing (Loc-line, Lockwood Products, Inc.)
Quantity flown	One

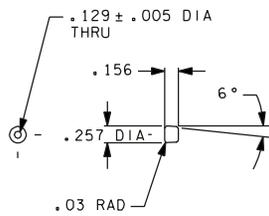
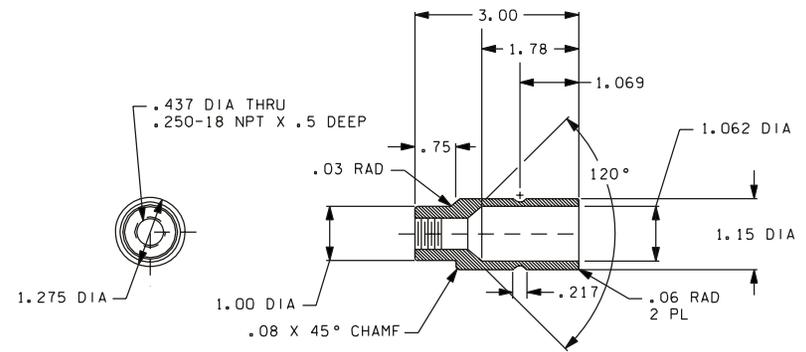
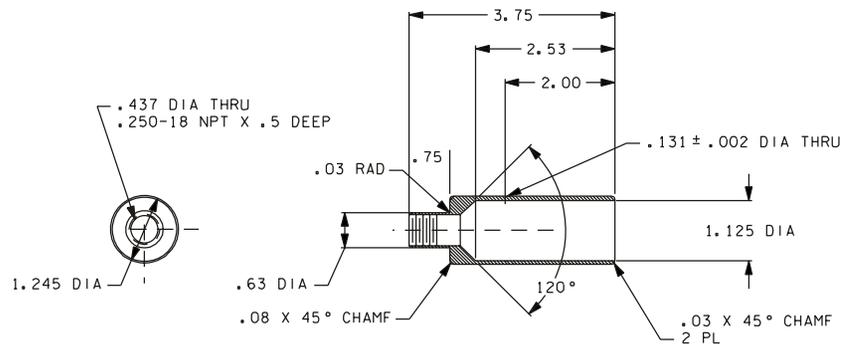
COMMENTS

This flexible modular cleaning tool can be connected to the vacuum cleaner suction hose or directly to the vacuum cleaner. It is used to perform filter cleaning on DDU 1 and 2 or other hard-to-access filters. If used for longer than 10 minutes on the ac vac cleaner, the attachment will cause the vacuum cleaner to overheat because of decreased airflow through the vacuum cleaner.



0033554. ART. 1

Flexible modular cleaning tool

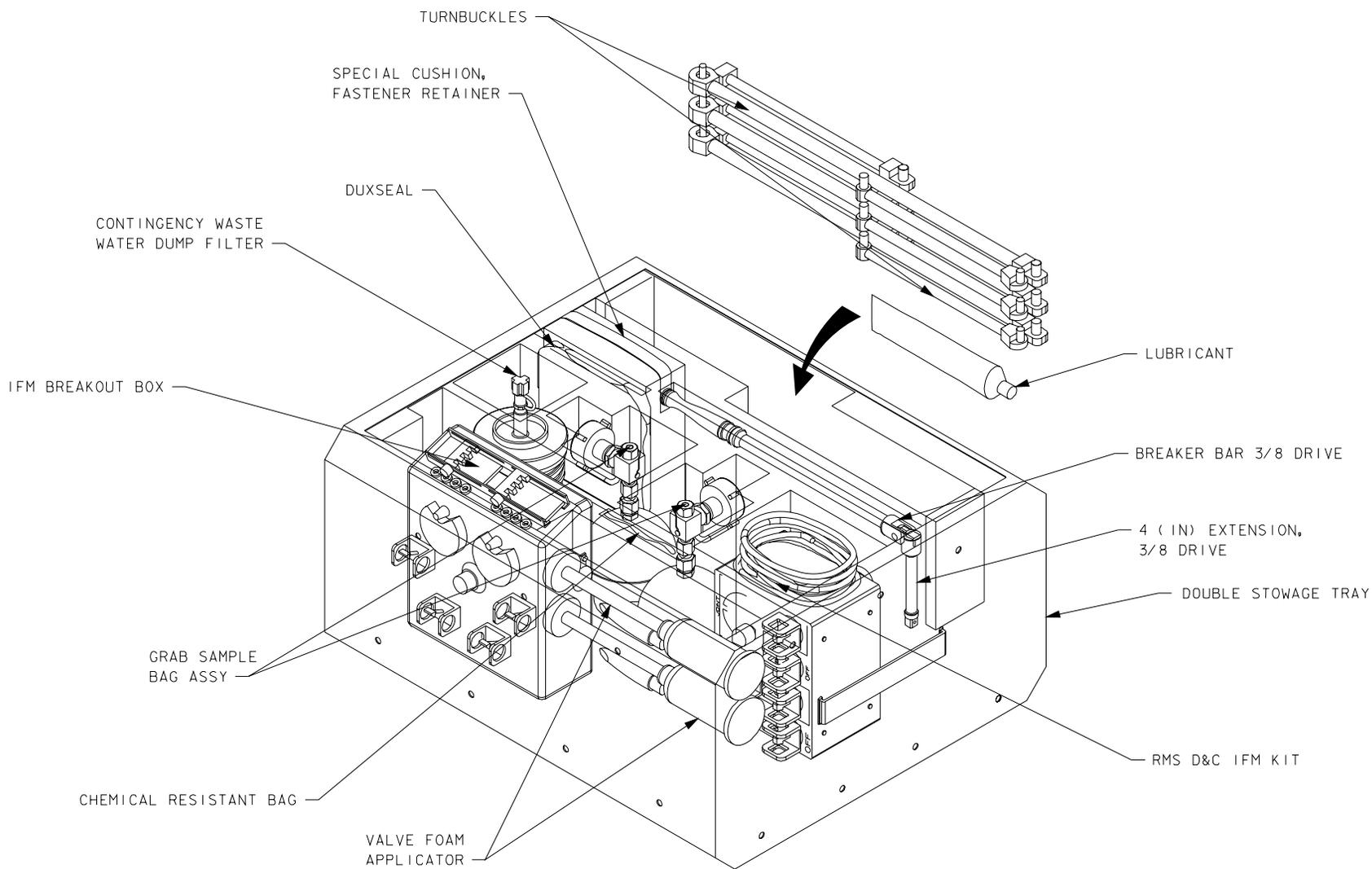


003355. ART. 1

Flexible modular cleaning tool (concluded)

BREAKOUT BOX LOCKER

Item		Page
TRAY		
109	BREAKOUT BOX LOCKER (DOUBLE TRAY)	7-2
110	BREAKER BAR (3/8-IN. DRIVE)	7-5
BREAKOUT BOX		
111	IFM BREAKOUT BOX	7-6
MISCELLANEOUS		
112	TURNBUCKLES	7-13
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114	AIR SAMPLE BOTTLES	7-16
115	FASTENER RETAINER CUSHION	7-18
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PATCH KIT ASSEMBLY		
117	LUBRICANT	7-22
118	DUXSEAL.....	7-23
119	FOAM APPLICATOR.....	7-24



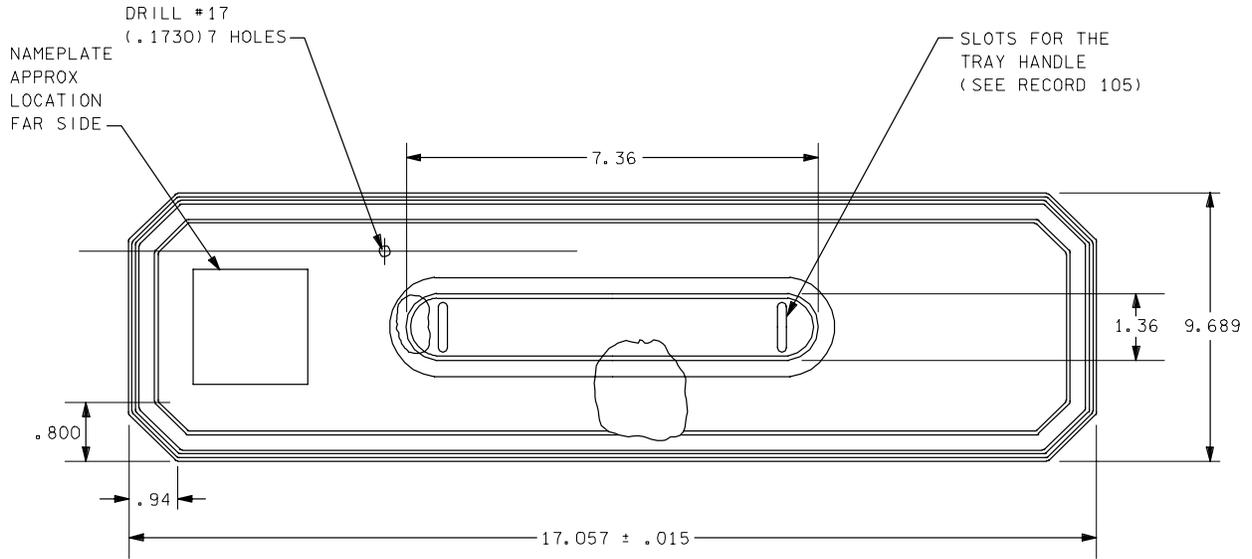
Breakout box locker

0033568. ISO 2

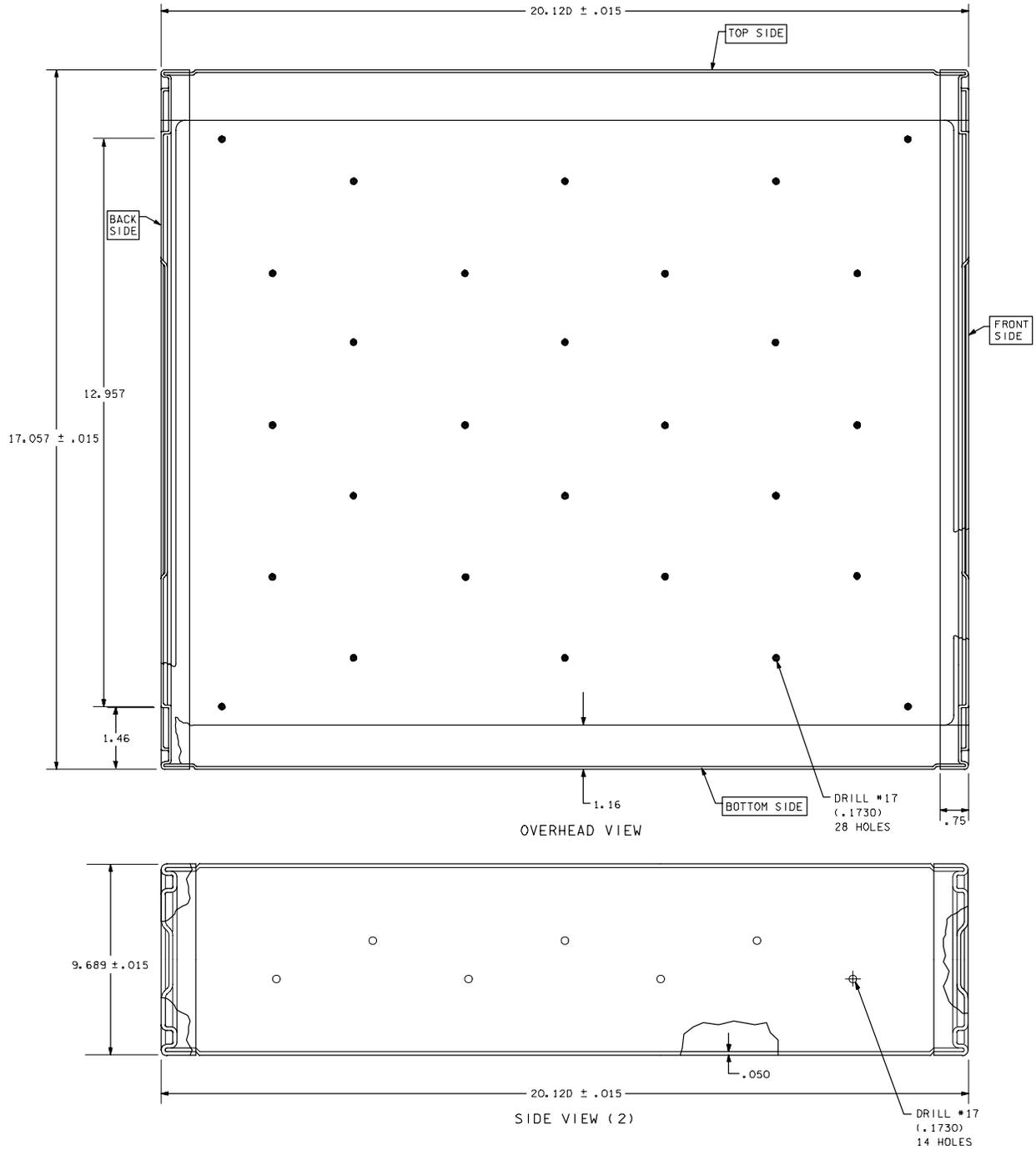
BREAKOUT BOX LOCKER (DOUBLE TRAY)



Item 109 Technical Information	
Location	Breakout box locker (double tray)
CCCD part number	SED32103995
CCCD drawing	SED32105452
Other drawings	ME192-0070 (stowage tray, single)
Manufacturer	Rockwell
Weight	3.4 lb
Quantity flown	One



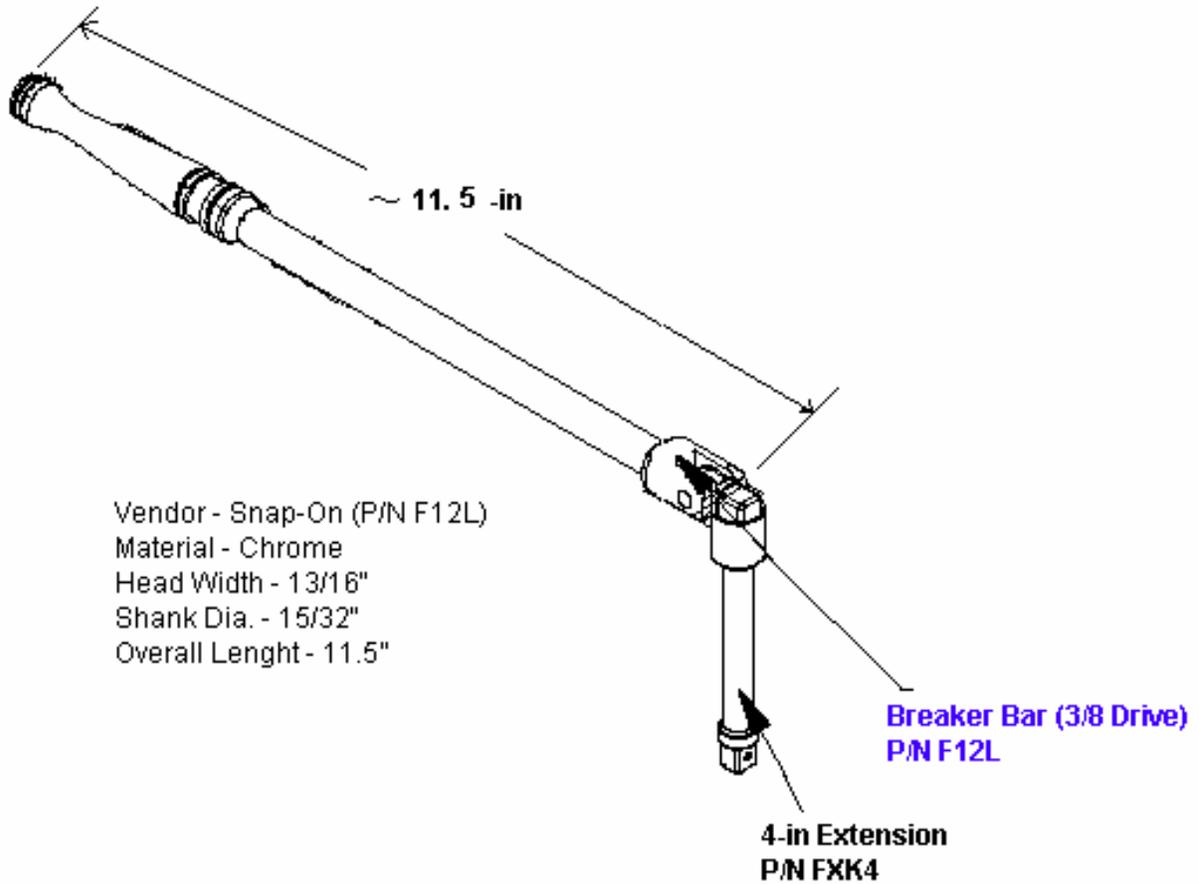
**Breakout box locker double tray
(front and back view)**



234460617. ART; 1

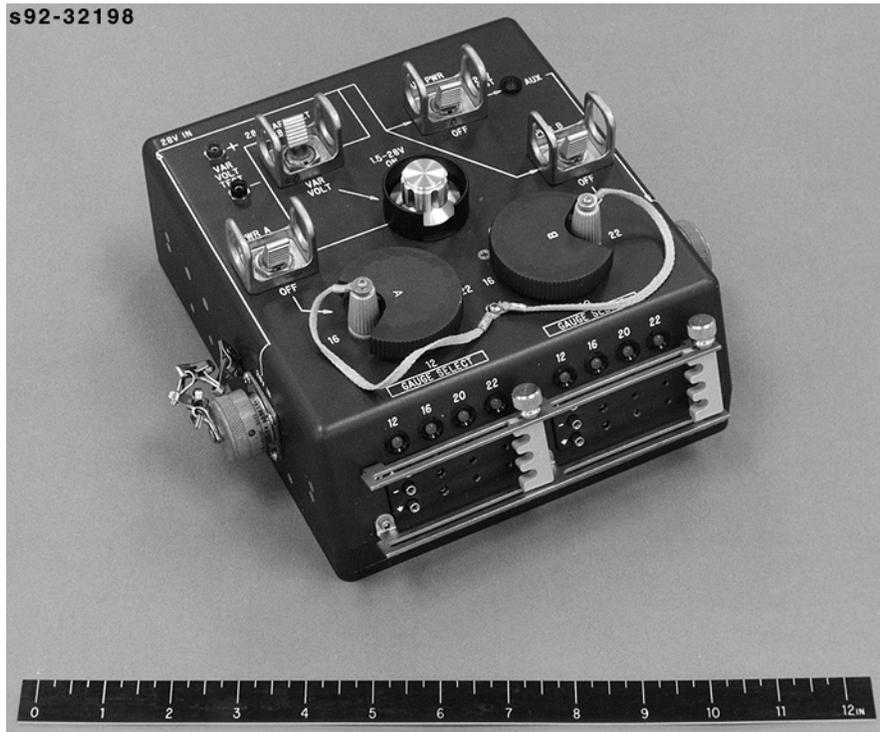
**Breakout box locker double tray
(overhead and side views)**

BREAKER BAR (3/8-IN. DRIVE)



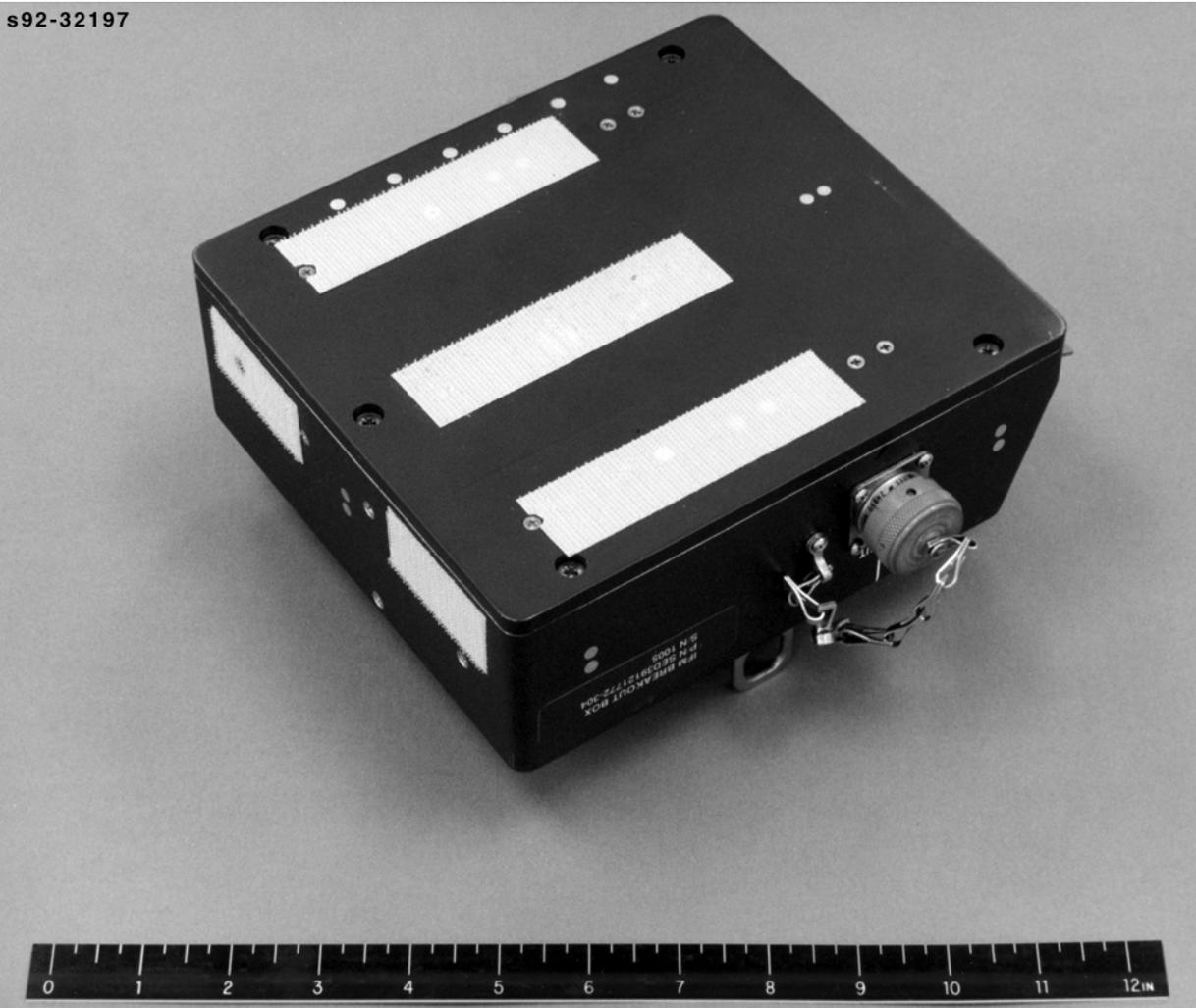
Item 110 Technical Information	
Location	Breakout box locker (3/4 in. drive)
CCCD part number	F12L
CCCD drawing	SED32105452
Manufacturer	
Weight	
Quantity flown	One
Head width	13/16 in.
Shank diameter	15/32 in.
Length	11 9/16 in.

IFM BREAKOUT BOX

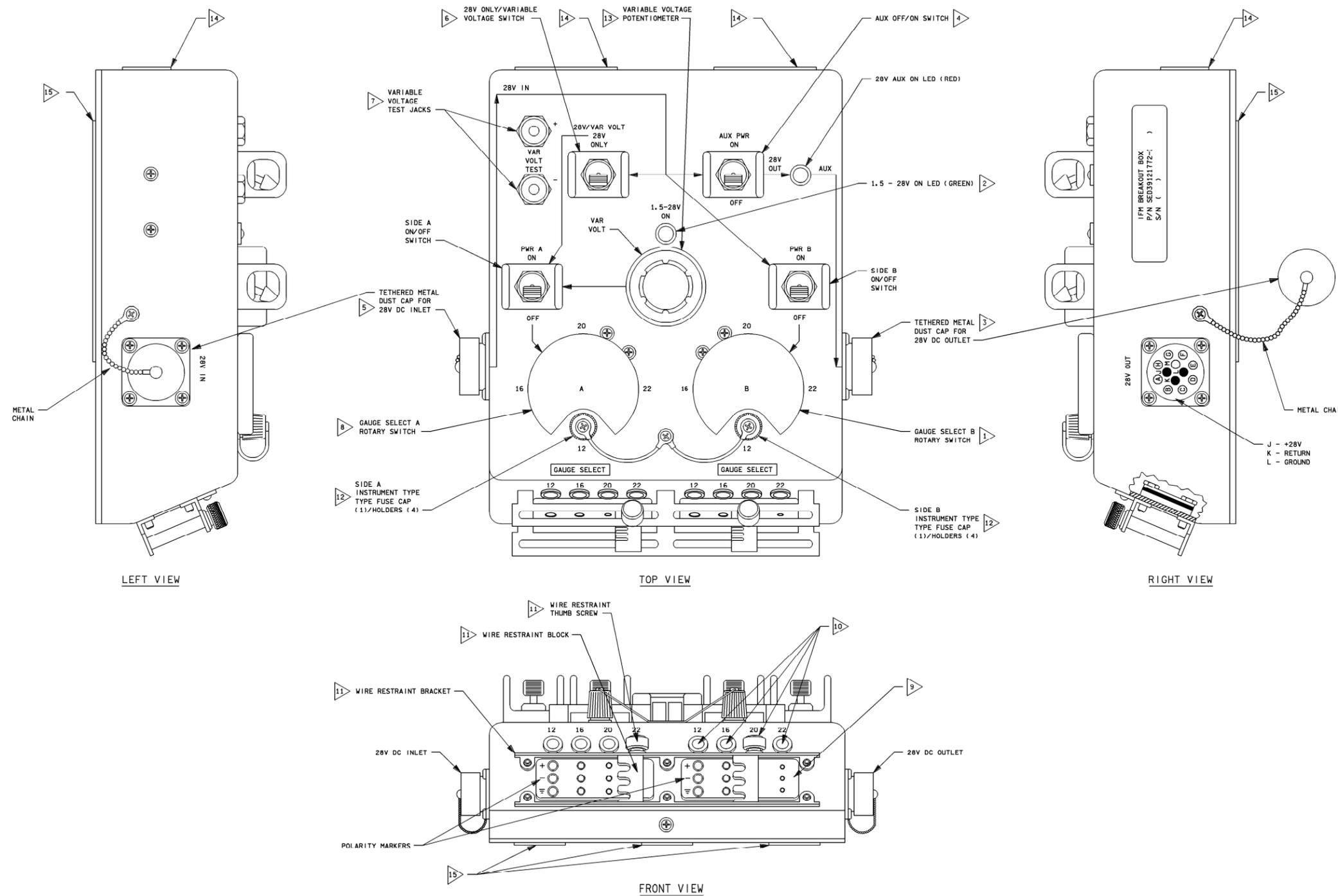


Item 111 Technical Information	
Location	Breakout Box Locker
CCCD part number	SED39121772-307
CCCD drawing	SED32102144
Other drawings	SED39121772 (IFM breakout box assembly kit/three sheets)
Manufacturer	NASA JSC Technical Services Division
Weight	6.1 lb
Quantity flown	One

s92-32197



IFM breakout box (back)

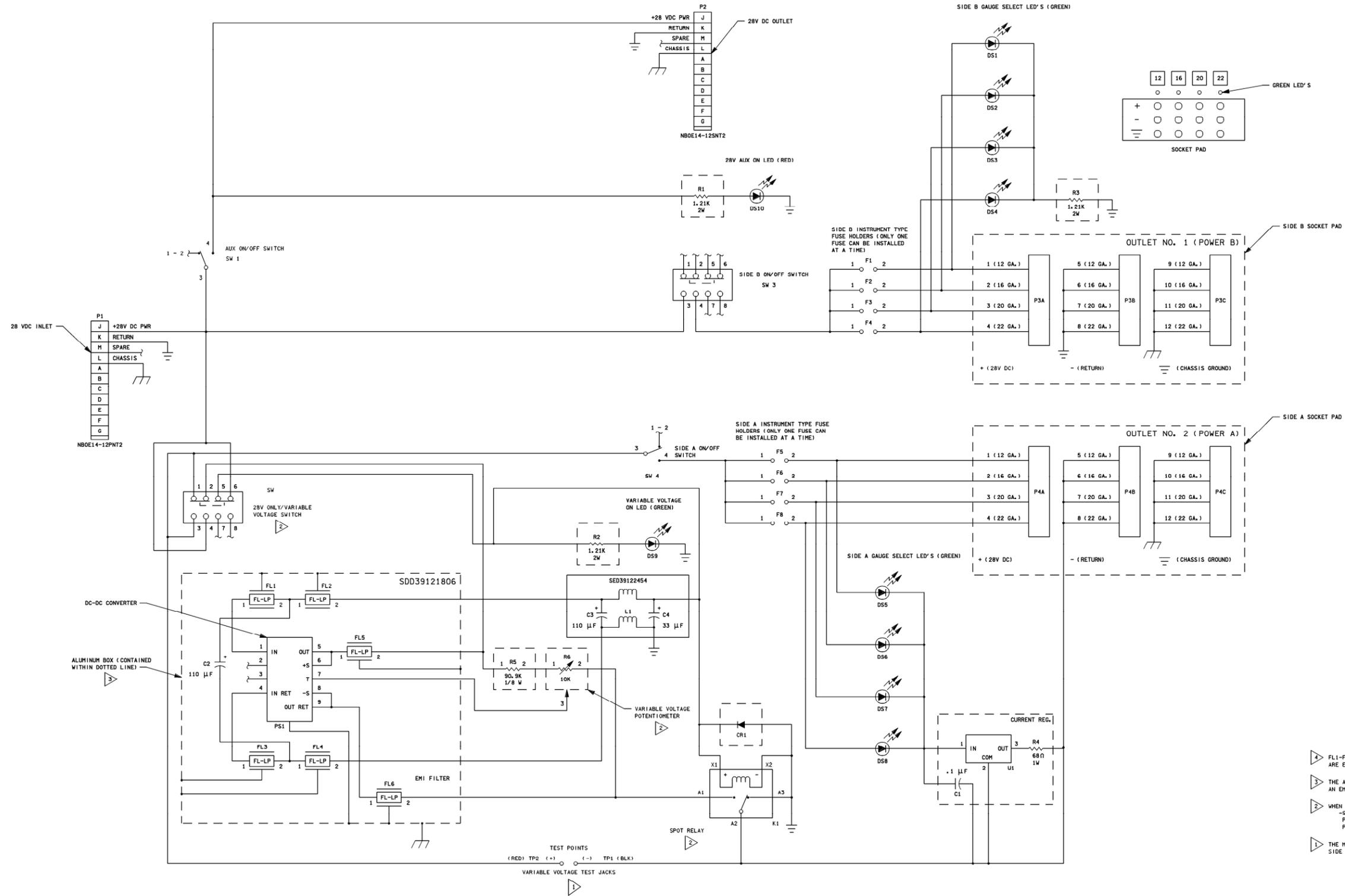


- 15 HOOK VELCRO ON BOTTOM SIDE (THREE 1- BY 4-INCH STRIPS)
- 14 HOOK VELCRO ON BACK SIDE (TWO 1- BY 2-INCH STRIPS)
- 13 SIDE A VOLTAGE CAN BE VARIED BY TURNING THE VARIABLE VOLTAGE POTENTIOMETER (TURNING CLOCKWISE INCREASES VOLTAGE) WITH THE 28V ONLY/VAR VOLT SWITCH IN VAR VOLT POSITION. THERE IS AN OVERVOLTAGE PROTECTION CIRCUIT INSIDE OF THE DC-DC CONVERTER (SEE SCHEMATIC). AT VOLTAGES GREATER THAN 30 VOLTS, THE DC-DC CONVERTER WILL TURN OFF. TO REGAIN POWER, THE 28V ONLY/VAR VOLT SWITCH MUST BE CYCLED, WITH THE VARIABLE VOLTAGE POTENTIOMETER TURNED TO A VOLTAGE OUTPUT OF LESS THAN 30 VOLTS
- 12 THE BREAKOUT BOX IS LAUNCHED WITH NO FUSES INSTALLED. INSTRUMENT FUSES BETWEEN 1/2 AMP AND 10 AMPS CAN BE OBTAINED FROM THE IFM PIN KIT. THERE IS ONLY ONE FUSE CAP PER SIDE (A OR B) WHICH CAN FIT ON ONE OF THE FOUR FUSE HOLDERS AT A TIME
- 11 A: WIRE RESTRAINT DEVICES: ONLY ONE GAUGE SIZE CAN BE SECURED AT ANY GIVEN TIME (SINCE THE +, -, AND GND SOCKETS FOR A PARTICULAR GAUGE SIZE ARE IN A VERTICAL COLUMN)
B: PREMANUFACTURED TEST JUMPER CABLES: SOME HAVE A FLANGE ON THE END THAT INSERTS INTO THE BREAKOUT BOX. THE RESTRAINT DEVICE CAN BE USED WITH THIS FLANGE TO HOLD THE JUMPER LEAD IN PLACE
C: JUMPER LOADS WITHOUT FLANGES: CAN BE KEPT IN PLACE BY PUSHING THE WIRE RESTRAINT BLOCK AGAINST THE LEAD AND BENDING THE PIN ON THE JUMPER LEAD
- 10 GAUGE SELECT GREEN LED'S: WHEN LIT, INDICATES POWER IS APPLIED TO ITS GAUGE SOCKETS
- 9 B SIDE PAD WITH + (+28V DC), - (RETURN), AND GND (CHASSIS GROUND) INSULATED SOCKETS FOR 22-, 20-, 16- AND 12-GAUGE PINS (ONLY ONE GAUGE SIZE CAN BE SELECTED AT A TIME); THERE ARE THREE SOCKETS PER GAUGE SIZE
- 8 SELECTS PROPER FUSE RECEPTACLE TO SIDE A 12-, 16-, 20- AND 22-GAUGE SELECT OUTPUT
- 7 RED (+) AND BLACK (-) TEST JACKS FOR INTERFACING THE DIGITAL MULTIMETER WITH THE BOX WHEN SETTING THE VARIABLE VOLTS VOLTAGE
- 6 PROVIDES 28V DC POWER TO GAUGE SELECT A ROTARY SWITCH IN THE 28V ONLY POSITION OR POWER TO THE VARIABLE VOLTS CIRCUIT IN THE VAR VOLTS POSITION
- 5 28V DC INLET (MATES WITH DC HARNESS CABLE) (NBDE14-12PNT2) ONE JACK WITH FOUR 16-GAUGE AND EIGHT 20-GAUGE PINS; ONLY THREE 16-GAUGE PINS ARE CONNECTED J - +28V DC, K - RETURN, L - CHASSIS GROUND
- 4 ISOLATES THE 28V OUT CONNECTOR WHEN IN THE OFF POSITION, PROVIDES POWER TO THE CONNECTOR IN THE ON POSITION (A RED LED TO THE RIGHT OF THE SWITCH IS LIT WHEN POWER IS APPLIED TO THE CONNECTOR)
- 3 28V DC OUTLET (IDENTICAL TO A DC UTILITY OUTLET) (NBDE14-12SNT2) ONE JACK WITH FOUR 16-GAUGE AND EIGHT 20-GAUGE SOCKETS; ONLY THREE 16-GAUGE SOCKETS ARE CONNECTED J - +28V DC, K - RETURN, L - CHASSIS GROUND
- 2 WHEN LIT, INDICATES VARIABLE VOLTS CIRCUIT IS POWERED

NOTES: 1 PROVIDES SAME FUNCTION FOR SIDE B AS GAUGE SELECT A ROTARY SWITCH DOES FOR SIDE A

0033541, ART, 1

IFM breakout box



0033540.SCH 1

IFM breakout box schematic

GENERAL INFORMATION

1. The IFM Breakout Box (BOB) is a tool designed to provide direct current (dc) to components that have experienced a failure of their dc power source.

The BOB can provide a fixed 28 V dc, at a maximum of 10 A, or a variable voltage from 1.5 to 28 V dc, at a maximum of 4 A. The power source is a 24-foot dc harness cable (see item 9) connected to a dc utility outlet.

2. Due to orbiter weight conservation effort, only one breakout box will be flown for STS-75 and subs.

Note: Two different maximum current limits are placed on the IFM BOB, depending on whether the box is set to fixed or variable voltage.

In the fixed voltage, the BOB basically acts as a distribution box, providing straight feed of 28 ± 3 V dc. In this case, the voltage is not conditioned, and the box can handle a maximum of 10 A.

For the variable voltage case, the voltage is conditioned, allowing the voltage to be varied from 1.5 to 28 V dc. This is accomplished using a dc/dc converter that has an internal current limiter of 4 A. If the voltage exceeds 4 A while the box is set to variable voltage, the converter will shut down, requiring the box power to be cycled.

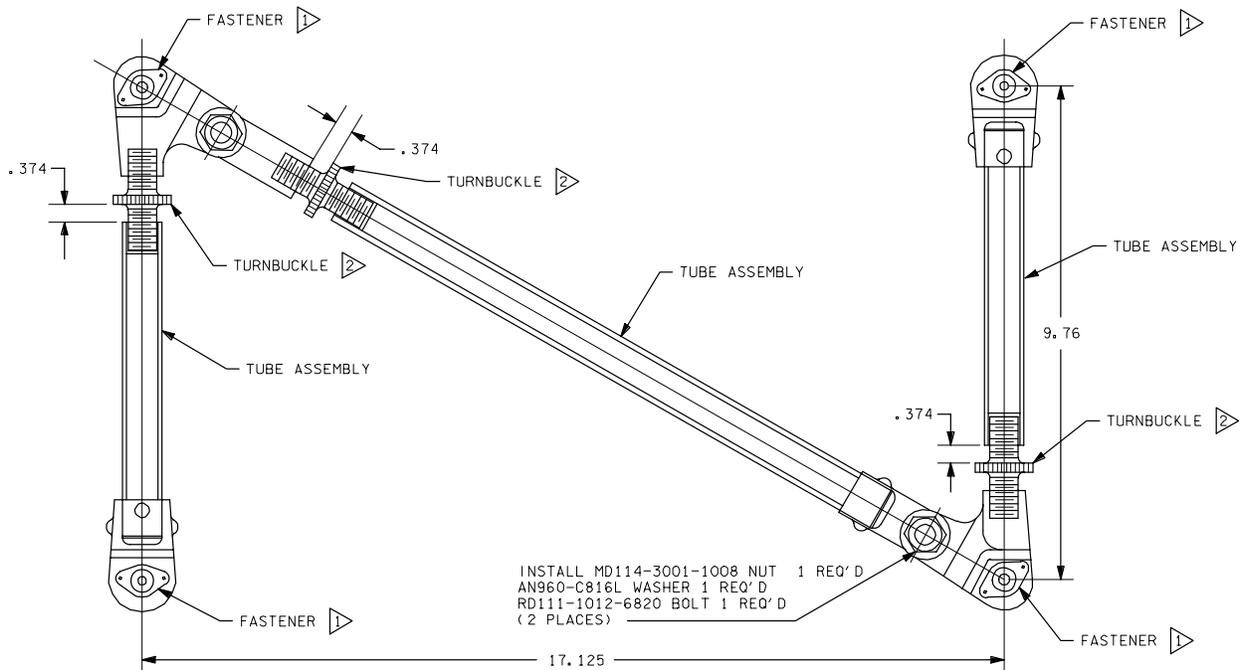
Reference documents (for BOB current limits):

1. SAR60 - IFM BOB Safety Analysis Report.
2. SMACAR - P/N SED39121772-307.

TURNUCKLES



Item 112 Technical Information	
Location	Breakout box locker
CCCD part number	V602-660302-002/-003
CCCD drawing	SED32100476
Other drawings	V602-660302 (turnbuckle - locker shear panel replacement assembly)
Manufacturer	Rockwell
Weight	5 lb
Quantity flown	Three



3. THE TURNBUCKLE SHOULD BE INSTALLED OVER THE THERMAL DEBRIS TRAP IN AN 'N' SHAPE (WHERE THE REMOVED LOCKER WAS PREVIOUSLY MOUNTED).

▶ THESE THREE TURNBUCKLES CAN BE ADJUSTED AS NECESSARY TO GET THE FOUR FASTENERS TO BE PROPERLY ALIGNED WITH THEIR ATTACH POINTS.

NOTES: ▶ THESE FOUR FASTENERS CONNECT TO THE AVIONICS BAY SHELF AT THE SAME ATTACH POINTS AS THE PREVIOUSLY MOUNTED MIDDECK LOCKER (USE THE LOCKER TOOL OR ANOTHER 3/16-INCH HEX DRIVER TO TIGHTEN).

234460616. ART 4

Turnbuckle

COMMENTS

These turnbuckles are used in place of a middeck locker that has been removed and cannot be reinstalled due to crew module distortion on orbit. This is necessary because a locker is a structural support for the orbiter avionics bay wire trays.

The crew recommends securing the bottom right, then top left, then the remaining corners (from K. Bowersox, STS-50 pilot).

WASTE WATER DUMP FILTER



Item 113 Technical Information	
Location	Breakout box locker
CCCD part number	SED39123946-301
CCCD drawing	SED32103894
Manufacturer	ILC
Quantity flown	One

COMMENTS

The waste water dump filter is required when performing the Free Fluid Disposal or Contingency Water Container (CWC) Dump procedure, which takes place at the contingency H₂O x-tie waste QD.

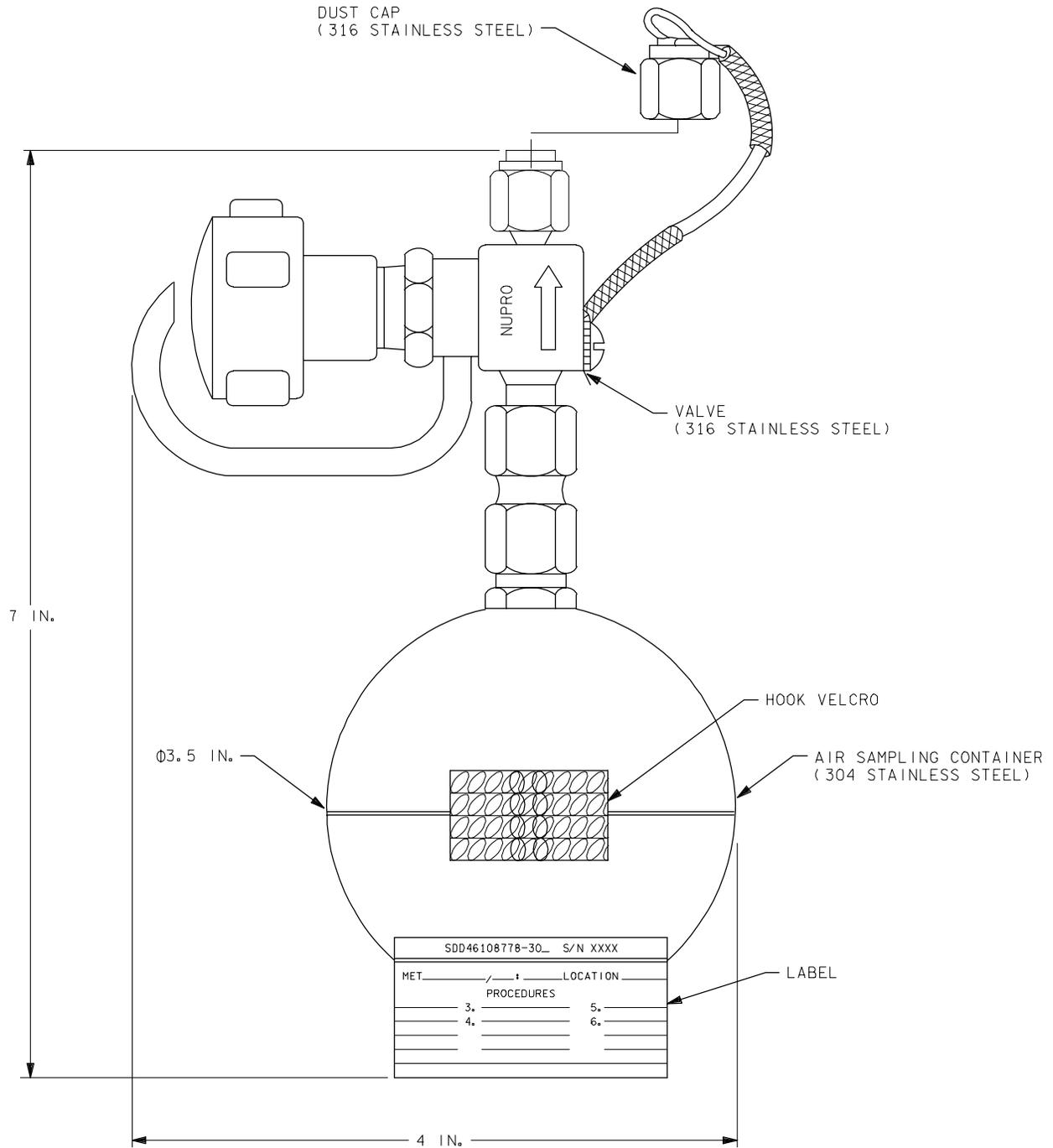
AIR SAMPLE BOTTLES



Item 114 Technical Information	
Location	Breakout box locker
CCCD part number	SDD46108778-301
CCCD drawing	SED32103894
Manufacturer	Scientific Instrumentation Specialist
Quantity flown	Two

COMMENTS

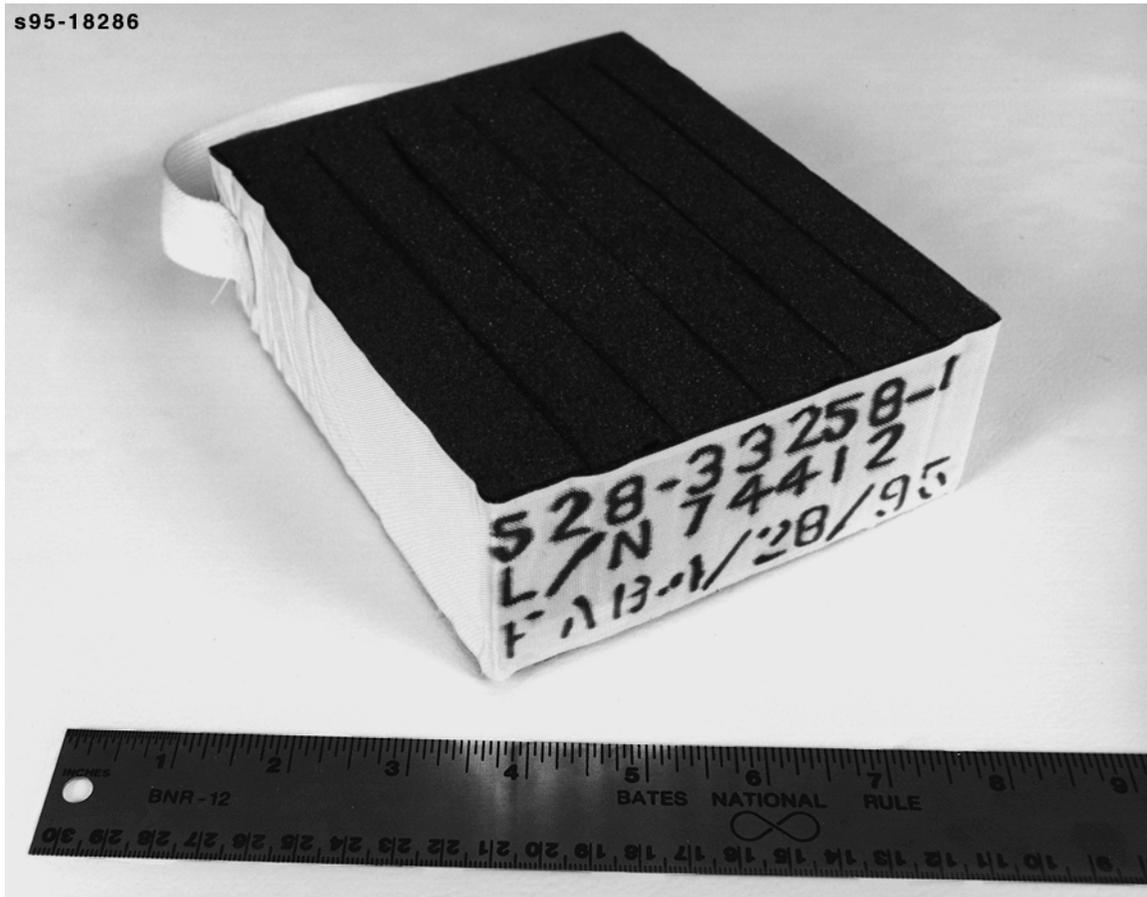
The air sample bottles are used to sample air quality during the deorbit prep phase of a space shuttle flight or when fire/smoke is detected in the cabin.



23446701A, A01

Air sample bottle

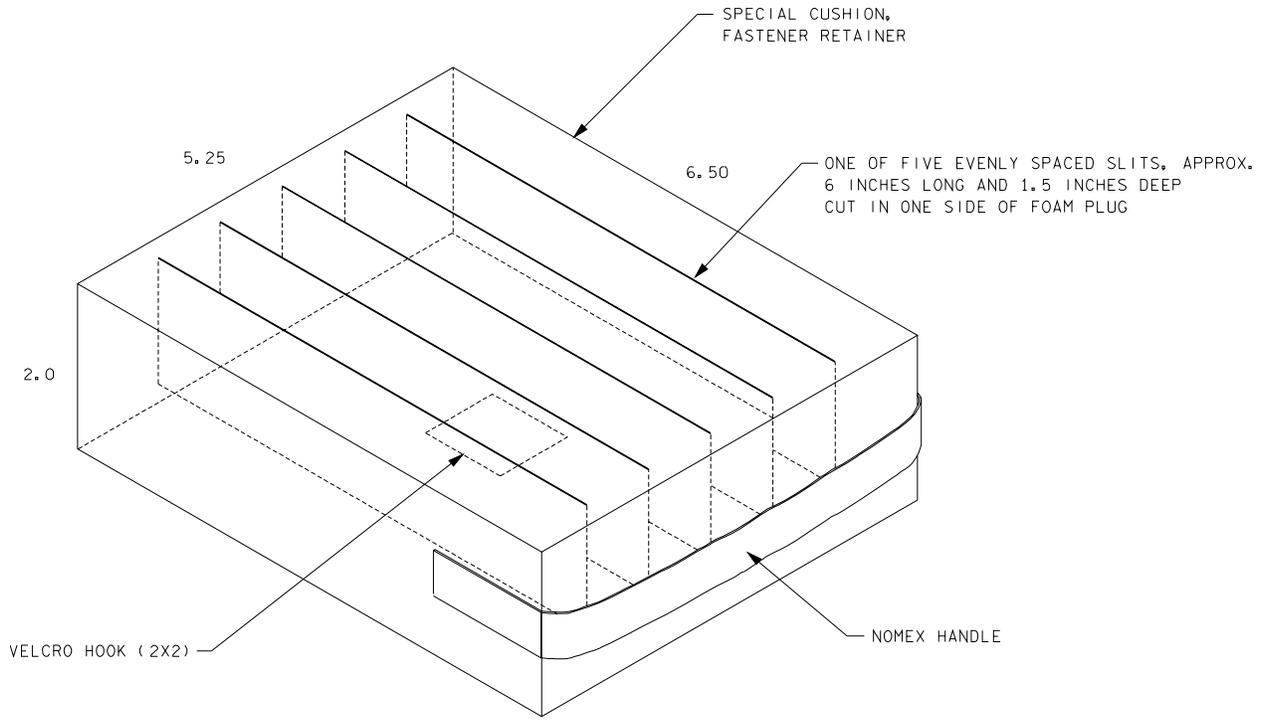
FASTENER RETAINER CUSHION



Item 115 Technical Information	
Location	Breakout box locker
CCCD part number	528-33258-1
CCCD drawing	SED32103894
Manufacturer	Boeing
Quantity flown	One

COMMENTS

The fastener retainer cushion is used to contain small loose fasteners.



0033569, ART. 1

Breakout Box Locker

RMS D&C IFM KIT

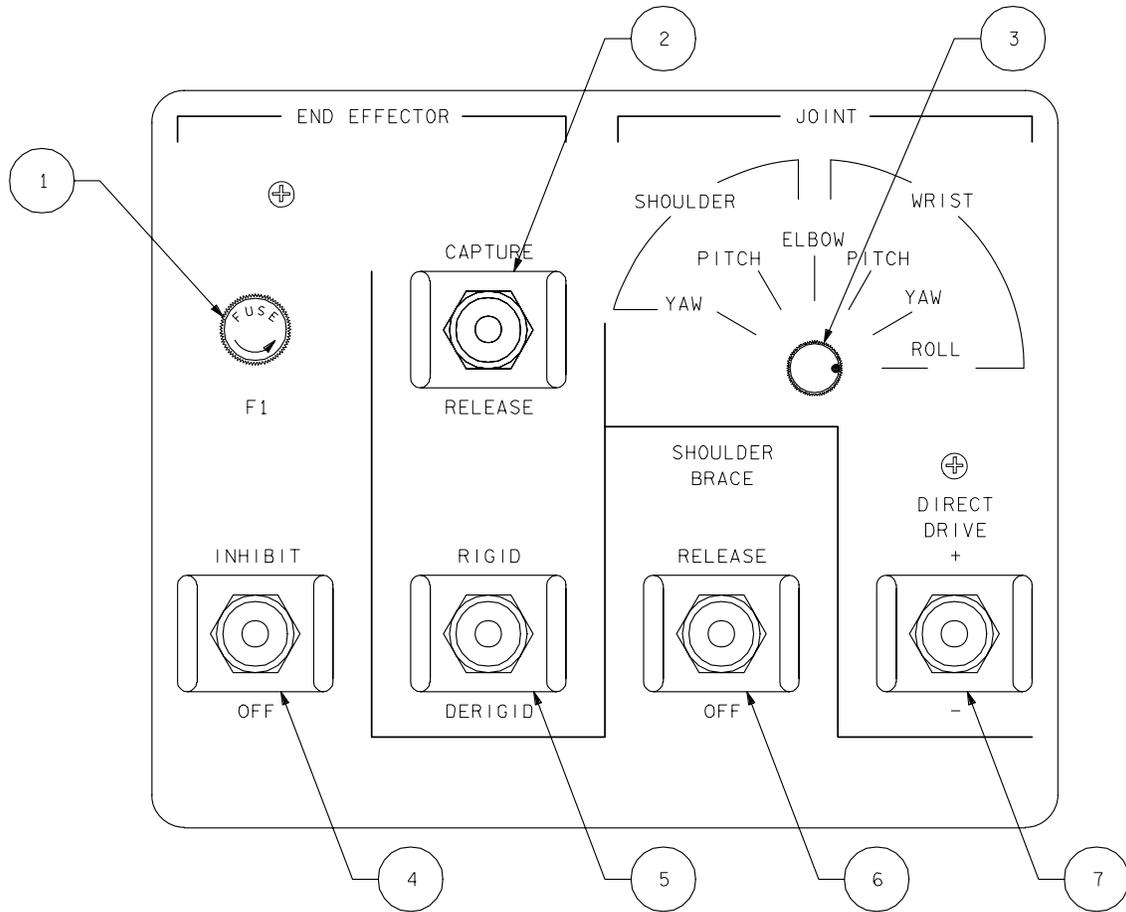


Item 116 Technical Information	
Location	Breakout box locker
CCCD part number	SED33103306-304
CCCD drawing	SED32103894
Manufacturer	Tech Services
Quantity flown	One

COMMENTS

The RMS D&C IFM kit provides contingency operations of RMS for the following failures:

Shoulder brace release switch	K1, K2, K6 relays	Single (direct) switch	28 V brake switch contact
End effector capture/release switch	Zener diodes	Joint select switch	EE man contr switch
End effector mode switch	Mode select switch	Safing switch	



23446702A. ART# 1

RMS IFM D&C IFM kit switch functions

FUSE - 1/4 AMP. All V dc protected by this fuse.

CAPTURE/RELEASE - Captures/releases PL when Box installed.
End Effector sw on D&C Pnl and RHC disabled when Box installed.

JOINT SELECT - Selects joint which Direct Drive will drive. Joint Select on D&C Pnl will still work single mode and joint angle readout.

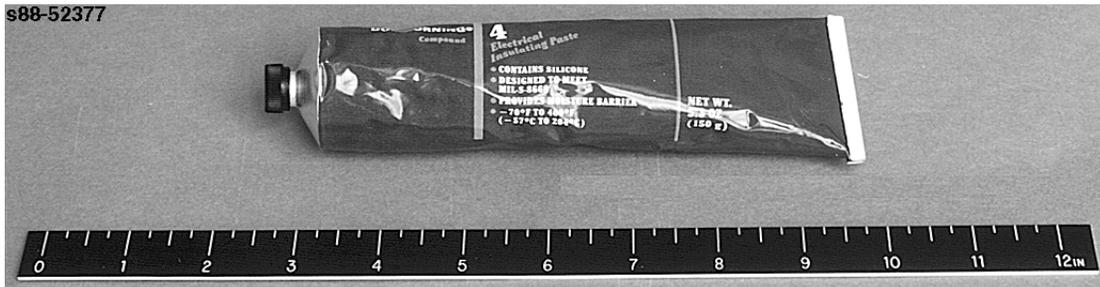
INHIBIT/OFF - Inhibit posn puts 28 V dc on safing line so H/W safing circuit bypassed. Center, down posn - OFF posn.

RIGID/DERIGID - Rigidizes/derigidizes end effector when attached to PL. End Effector sw on D&C Pnl and RHC disabled when Box installed.

SHOULDER BRACE - Release posn applies 115 VAC (ϕ A) directly to drive motor. Center, down posn - OFF posn.

DIRECT DRIVE - Drives select joint regardless of Brake sw posn.

LUBRICANT



Item 117 Technical Information	
Location	Breakout box locker
CCCD part number	528-41001-1
CCCD drawing	SED32103900
Other drawings	528-41001 (lubricant, silicone/three sheets)
Manufacturer	Dow Corning Corporation
Manufacturer part number	DC-4
Weight	5.8 oz
Quantity flown	One

COMMENTS

The tube contains 5.3 ounces of silicone grease MIL-S-8660 and has a shelf life of 18 months. It is an item in the patch kit.

DUXSEAL



Item 118 Technical Information	
Location	Breakout box locker
CCCD part number	528-20157-1
CCCD drawing	SED32103900
Other drawings	528-20157 (Duxseal assembly/one sheet), 8-in. by 8-in. Ziploc bag
Manufacturer	Johns Manville
Weight	1.1 lb
Quantity flown	One

COMMENTS

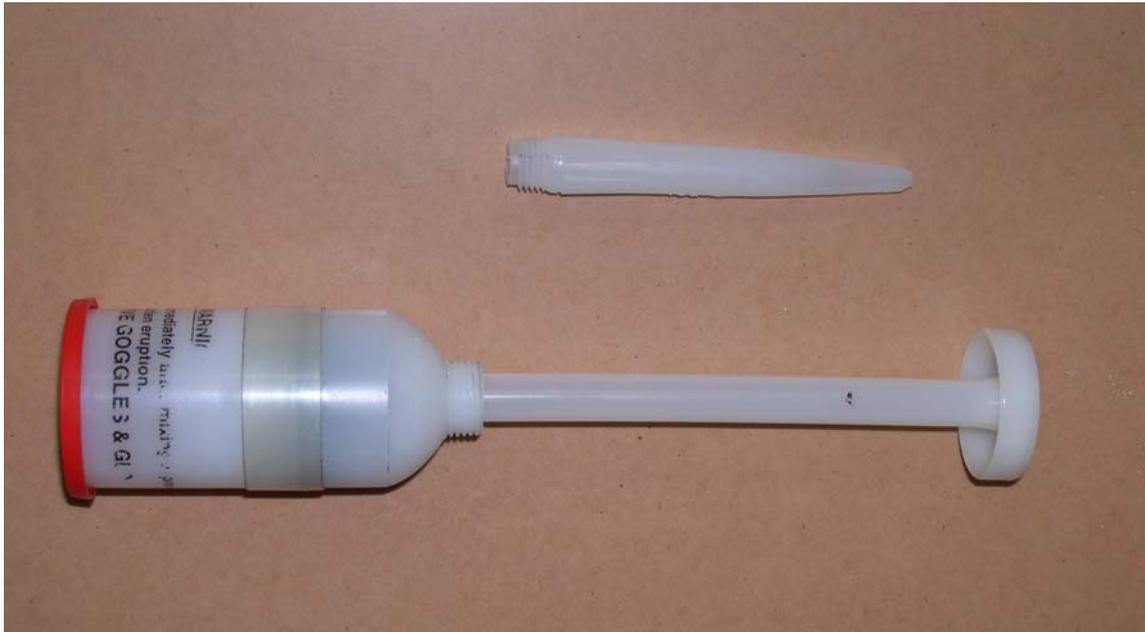
The Duxseal is used in the IFM procedure for cabin leak sealing.

Duxseal ingredients

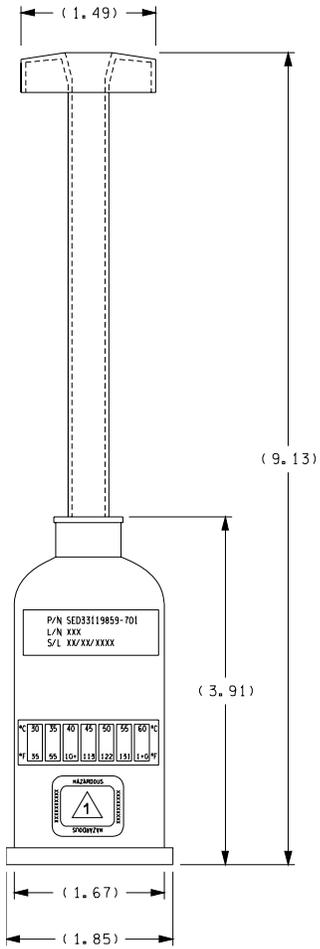
Material	Effects of overexposure	Inhalation	Ingestion	Control procedures	
Talc Chlorinated paraffin Mineral wool Diatomite	Eyes: Temporary irritation Skin: May cause slight temporary irritation to sensitive skin	Components are bound within the putty, and no respiratory hazards are expected	May cause cancer	Ventilation:	Not required when using product below 400° F
				Skin protection:	Not normally required
				Eye protection:	Not normally required

There are no known acute or chronic health hazards when this product is handled within the range of normal usage.

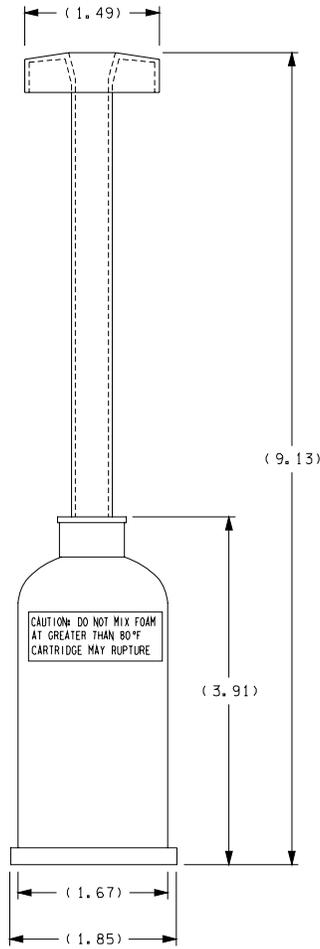
FOAM APPLICATOR



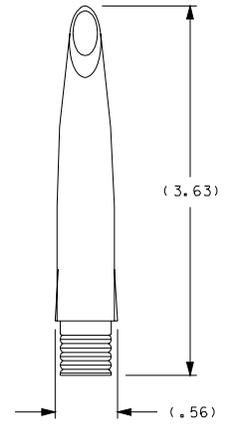
Item 119 Technical Information	
Location	Breakout Box Locker
CCCD part number	10127-20003-01
CCCD drawing	SED33119859
Other drawings	N/A
Manufacturer	PRC-Desoto International (Responsible Group, EC Williams, Nichole M.)
Weight	4.3 oz
Material	A black two-part Room Temperature Vulcanizing (RTV) fire resistant closed cell, silicone foam; (part A is black, part B is off-white)
Quantity flown	Two



FRONT VIEW



REAR VIEW



0033570. ART: 1

Foam Applicator

PART NUMBER	DESCRIPTION	MATERIAL	SPECIFICATION	FRAC CRIT
528-50000-4	ZIP LOCK BAG (2)	POLYETHYLENE	10 X 10 X .004	N
-001	LOT NUMBER LABEL			N
528-41706-2	TEMPERATURE STRIP, REVERSIBLE			N
-702	CARTRIDGE NOZZLE			N
SKD39123122-015	TOX LEVEL 1 DECAL			N
0855xxxxCA002KT	CARTRIDGE, FILLED		PR-855 FIRES TOP FOAM	N
-701	FOAM APPLICATOR CARTRIDGE			N
-301	FOAM APPLICATOR ASSY			N
-002	CAUTION LABEL			N

COMMENTS:

The silicone foam is mixed and applied, using the Decal for Leak Repair instructions in the IFM Checklist procedure for leak sealing - vacuum. The silicone foam expands to three times its liquid state (as it cures). This product has a very specific function and that is to seal a 1/64-in x 1-in crack with the equivalent area to a 1/8-in hole. It would most likely be used in areas such as wire connector penetrations or any other hard to reach places where the foam could be dispensed and drawn into the leak by a vacuum.

DECAL FOR LEAK REPAIR KIT	
1. Remove Tape	
	<u>NOTE</u>
	On following step, do not squeeze too hard because back of Cartridge may pop out
2. Pull handle to bring mixer towards top of cartridge, squeeze cartridge lightly along circumference of removed tape to deform foil barrier	
3. Begin rapidly mixing components ~25 cycles (30 to 60 sec), pushing handle all the way to top and bottom of each cycle, turning handle 1/4 turn on each downward stroke in a cw motion	
4. Pull handle out to hard stop, grasp cartridge firmly at location of mixer, unscrew handle and remove	
Immediately:	
5. Attach threaded nozzle to cartridge	
6. Insert handle in opposite end (to act as plunger, no threads on this end.) Wait 10 sec	
7. Position for use, push handle, quickly dispense mix onto desired area. As foam appears to set up, quickly dispense remainder onto desired area. (Tacky as soon as mixed, cured in 20 min)	
8. Place used Cartridge Assembly in Chemical Resistant Bag, stow	

Foam applicator ingredients

Ingredients	Effects of overexposure	Inhalation	Ingestion	Suggested control procedures
Silicone compound, part A (black portion) Crystalline silica Polydimethyl siloxane, hydroxy terminated Polydimethyl siloxane, dimethyl vinyl terminated	Eyes: May cause slight irritation Skin: None known	None known	None known	Ventilation: None required Skin protection: None required Eye protection: Safety glasses
Silicone compound, part B (off-white portion) Crystalline silica Polydimethyl siloxane, hydroxy terminated Methyl hydrogen polysiloxane Dimethyl, methyl hydrogen siloxane copolymer Polydimethyl siloxane, dimethyl vinyl terminated	Eyes: Temporary discomfort Skin: Temporary discomfort	None known	None known	Ventilation: General ventilation Skin protection: Rubber or plastic gloves Eye protection: Safety glasses

BACKGROUND:

The sealant was originally tested in May 1982; initial results from that test showed that it could adequately seal holes that are 1/8 inch or 1/4 inch in diameter. However, on an attempt to seal a second 1/4-inch-diameter hole, the sealant congealed too quickly and failed to seal because it could not be properly applied.

It was tested again in Feb/March, September, and October of 2006 by EC4 and they conclusively demonstrated the following:

- Air Temperature is the most important variable to determine whether or not the foam will seal a leak to vacuum.
- Surface temperature is a secondary affect to the curing of the foam material.
- Humidity does not affect the curing of the foam.

They found that the most suitable temperature for this product to work properly is between 70F and 80F. EC4 also found that Foam Applicator cartridges conditioned at 83-85F (and above) cure too quickly to eject the foam and it causes the cartridge to pop (using minimal force) and create a huge mess.

The foam applicator's previous configuration included a metal valve assembly and a metal "T" handle. The valve was proven to leak; therefore the foam applicator began being flown in its current state which is how it is shipped from the manufacturer. Its first flight in this "off the shelf" configuration was STS-115.

References:

CCCD drawing SED33119859.

STS-117 Modular Locker Layout.

In Flight Maintenance (IFM) Checklist, JSC-48025, Jan. 2007

PR-855, Fire Stop - Penetration Seals (pamphlet). Semco Division Products Research and Chemical Corporation May 1983.

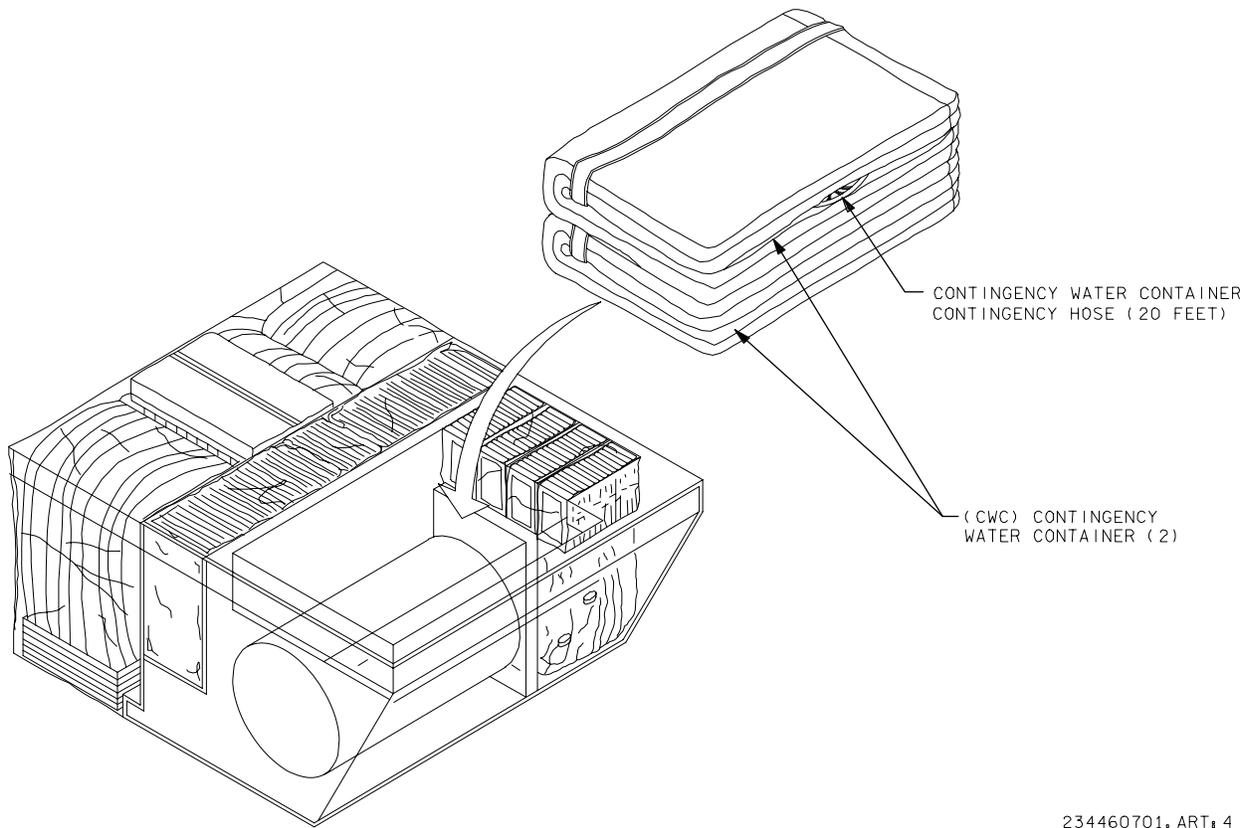
PR-855, Fire Stop Sealant Description and Installation (pamphlet), Semco Division Products Research and Chemical Corporation, April 1984.

MISCELLANEOUS

Item		Page
120	CONTINGENCY WATER CONTAINER (CWC)	8-2
121	ULTRASONIC LEAK DETECTOR (ULD)	8-4
122	NONMETALLIC EXTENSION PROBE (CLEAR)	8-8
123	RECEIVER	8-10
124	TRANSMITTER	8-12
125	ADAPTER	8-14
126	SMALL CONCENTRATOR	8-16
127	ACOUSTIC TIP	8-18
128	EXTENSION PROBE (ALUMINUM)	8-21
129	HEADPHONES	8-23
130	FEELER GAUGE	8-25

OBSOLETE

131	7/8-INCH TO 5/8-INCH QD ADAPTER	8-27
132	URINE QD ADAPTER	8-29



234460701. ART, 4

Volume G

Stowage container for CWC

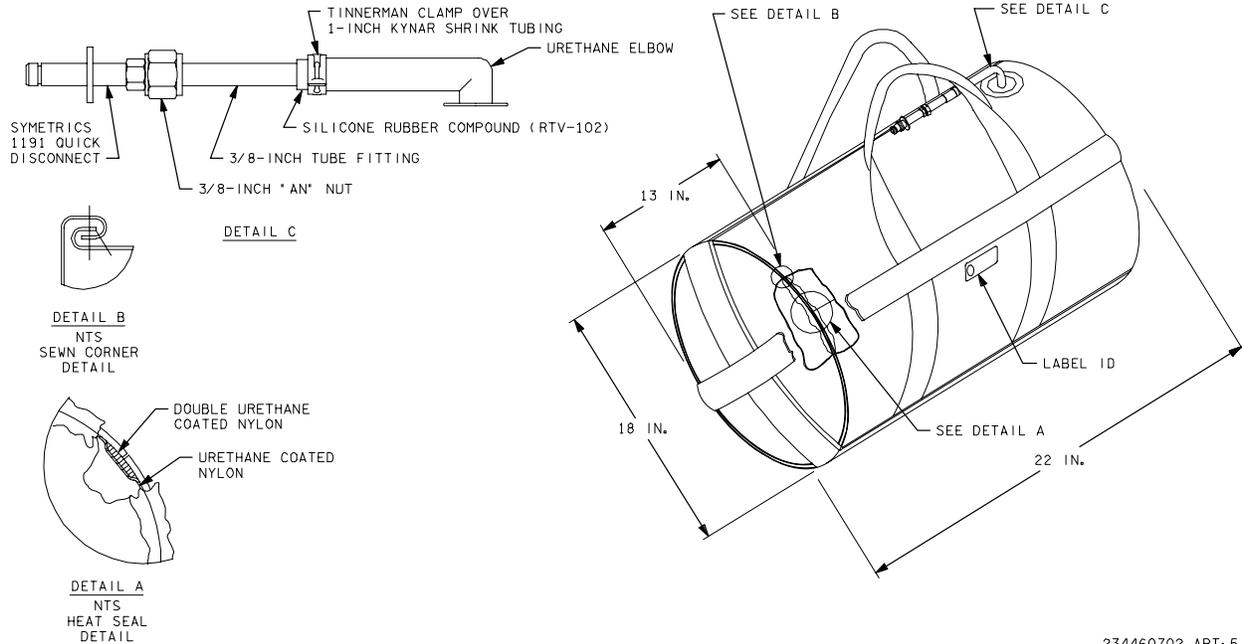
COMMENTS

The CWC is stowed in volume G, a middeck stowage container that extends into the lower equipment bay.

CONTINGENCY WATER CONTAINER (CWC)



Item 120 Technical Information	
Location	Volume G (MD80R)
CCCD part number	10132-10032-01
CCCD drawing	SED32101800
Other drawings	10132-10032 (contingency waste water collection bag assembly)
Manufacturer	Boeing (responsibility transferred from ILC)
Quantity flown	Two



234460702. ART; 5

Contingency water container

MATERIALS (AS REQUIRED):

1. Nylon hook Velcro/two-part Neoprene adhesive
2. Nomex Fabric HT9040/1-3/4-inch-wide Nomex webbing
3. Two-inch-wide nylon loop Velcro/Kevlar thread

COMMENTS

Specifications:

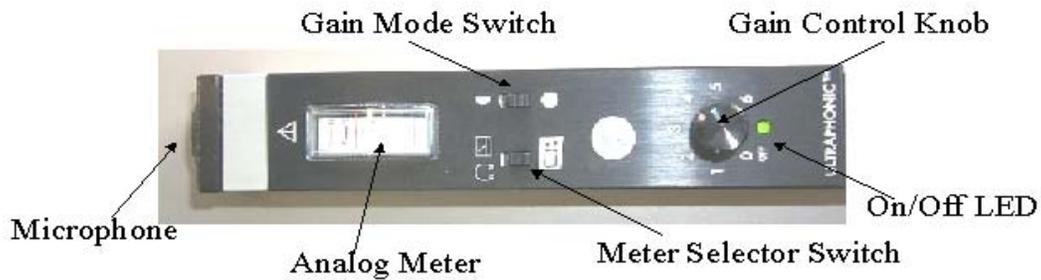
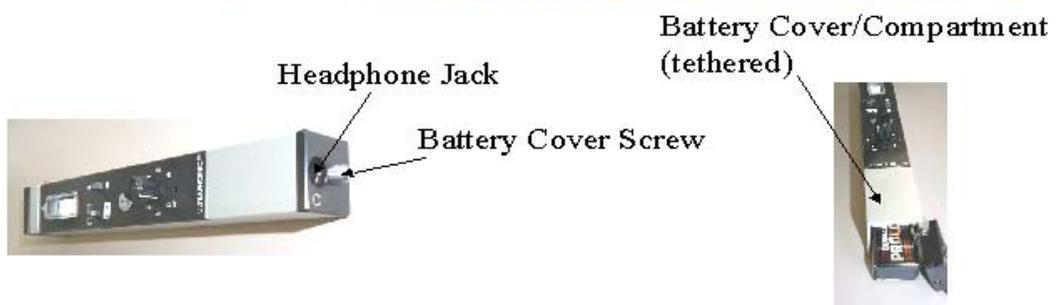
Size E Nomex thread/Resin, Kel-F-800/acrylic spray/typing cartridge. The capacity of the Contingency Water Container (CWC) is 120 lbm of water. The recommended maximum amount of liquid that can be placed in the CWC while in volume H is 90 lbm.

The CWC has a 3/8-inch male -1191 QD that mates with the CWC contingency hose, yellow/yellow contingency hose (with -3102 QDs, see item 5) or the yellow/yellow (-3102) hose (see item 4).

Waste water can be transferred from the waste tank to the contingency water container using the yellow/yellow contingency hose (with -3102 QDs) and contingency water x-tie waste QD if the waste tank cannot be dumped overboard (see the Contingency Water Container (CWC) Operation IFM procedure in the IFM Checklist).

ULTRASONIC LEAK DETECTOR (ULD)

Item 121 Technical Information	
Location	
CCCD part number	CS 412231.002
CCCD drawing	
Manufacturer	CTRL Systems, Inc.
Weight	
Quantity flown	One



Ultrasonic leak detector

COMMENTS

Ultrasound is sound with a frequency above the human hearing range. Humans can hear sound with frequencies between 20 Hertz (Hz) and 20,000 Hz. Ultrasound is all sound above 20,000 Hz and cannot be heard by humans.

All sound is the movement of pressure variations through a medium (solid, liquid, or gas). Sound is created when there is

- Vibration
- Impact
- Turbulence
- Friction
- Electrical arcing or corona discharge

Operating equipment usually produces ultrasound all the time, but the intensity, frequency, and shape of the resulting ultrasonic waves are in correlation to equipment operating conditions.

The Ultrasonic Leak Detector (ULD) is an ultrasound diagnostic tool that detects ultrasound in a narrow frequency band centered at 40,000 Hz. The ULD kit consists of the following:

- Receiver with attachments
- Headphones
- Transmitter

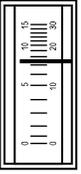
The receiver detects ultrasound and converts it so that humans can hear the corresponding sound through the headphones. The user is able to pinpoint the source of the ultrasound because the receiver has directional reception. The headset also serves to reduce or mask ambient sound. The user can then better concentrate on the converted ultrasound, which indicates the operating condition of working components, pressure or vacuum leaks, and electrical discharge.

There are two ways to use the ULD.

- In the scan mode, the ULD receives ultrasound through air without contacting the unit under test.
- In the contact mode, one of the solid probes is attached to the ULD receiver and is in contact with the unit under test.

Detecting ultrasound and pinpointing its source usually requires from a few seconds to a minute.

The ULD has several controls and indicators.

 <p>349.cvx</p>	<p><u>Analog Meter</u> – Indicates intensity of received ultrasound when the Meter Selector Switch is in the Meter and Headset position. When the Meter Selector Switch is in the Headset Only position, the meter acts as a battery tester. Replace the battery if the needle falls below the half of scale line, which is marked with both a 5 and a 10.</p>
 <p>350.cvx</p>	<p><u>Power supply On/Off Switch & Gain Control Knob (Potentiometer)</u> – Turns the unit on and off. The potentiometer adjusts the sensitivity of the receiver to the range of signals received. Turn up from 0 to turn the unit on (LED will glow when unit is on). Slowly increase the gain until desired component is just being heard through the headset (normally between 1 and 2). The user may need to increase sensitivity to detect faint ultrasounds.</p>
 <p>351.cvx</p>	<p><u>Gain Mode: Full/Half Gain Switch</u> – Normal operation is half gain, which reduces signal distortion when high intensity ultrasound is received. It allows the unit to focus on the ultrasound from the component under test. If the signal from the unit under test is very weak, the user may use full gain to intensify the signal. Always use the minimum necessary gain. The figure is shown in half gain position.</p>
 <p>352.cvx</p>	<p><u>Meter Selector Switch</u> – Signal registers in both the Meter and Headset or in the Headset only. When the switch is in the Headset Only position, the meter acts as a battery tester. The figure is shown when the meter is a battery tester.</p>

There are two operating techniques used to inspect, test, and diagnose with ultrasound.

Scan Mode – This mode is used to locate air or vacuum leaks or electrical arcing. The user aims the receiver, moving it side to side, up and down to locate the strongest (most intense) ultrasound, following the ultrasound to its source. To pinpoint the location of the leak, it is helpful to reduce the sensitivity while getting closer to the source of ultrasound.

Contact Mode – This mode is used to determine the operating condition of an internal component or to locate an internal leak. The operator places the tip of the solid probe

on a housing nearest the component under test. The user starts with the Gain Mode in Half Gain and slowly increases the Gain Control Knob from 0 until converted ultrasound of the component under test becomes audible. (This setting normally is somewhere between 0 and 1.)

Typical applications are listed below.

Contact mode

Bearings	Pumps
Gears	Compressors
Solenoid valves	Seals and gaskets
Valves	

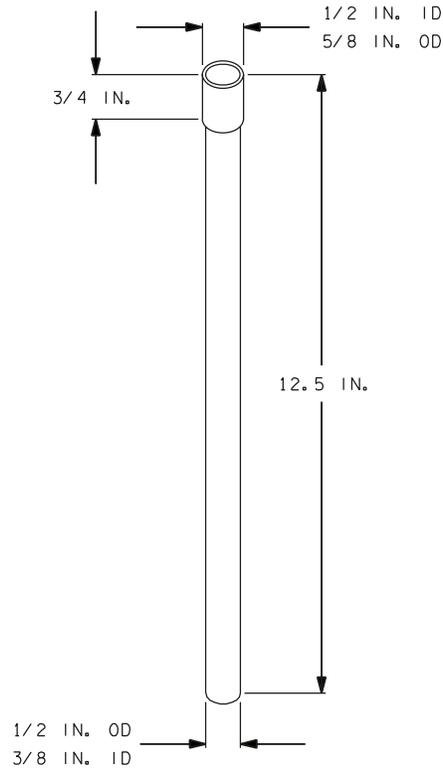
Scan Mode

Compressed air leaks	Heat exchangers
Compressed gas leaks	Electrical arcing
Vacuum leaks	Seals and gaskets

Scan mode with universal transmitter

Heat exchangers	Tanks
Seals and gaskets	Hatches
Hoses	

NONMETALLIC EXTENSION PROBE (CLEAR)



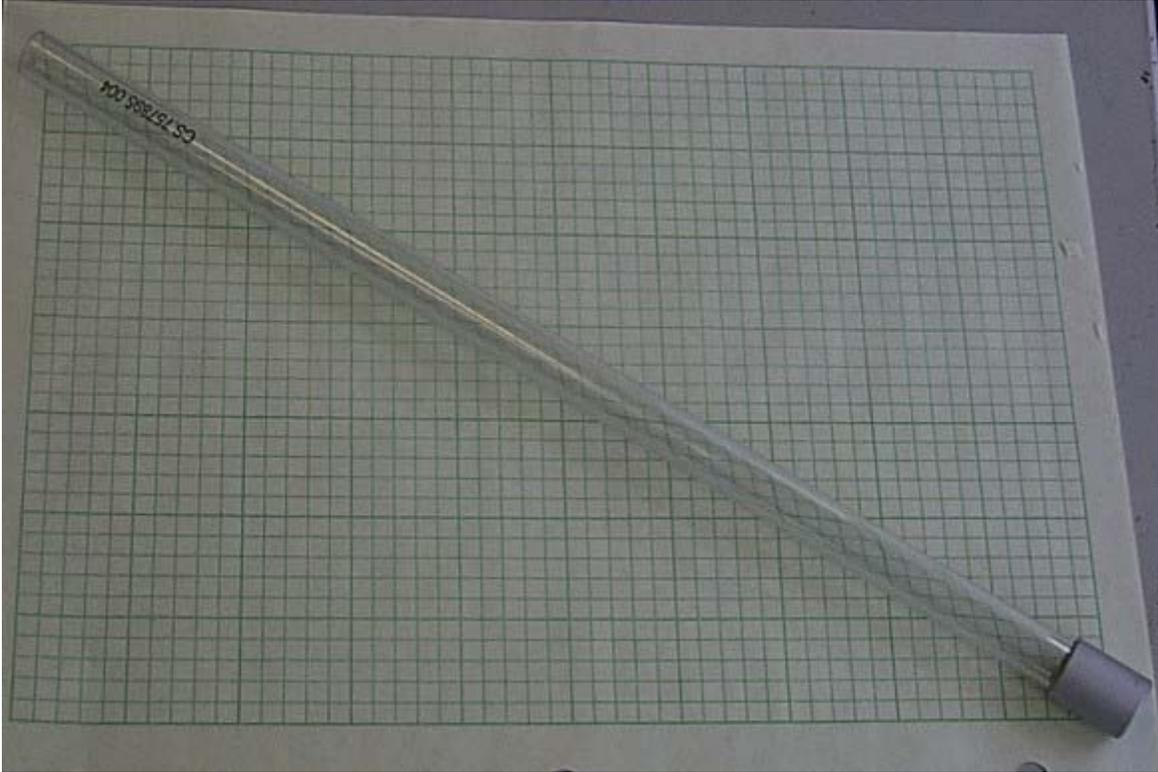
NON-METALLIC EXTENSION

0033563. ISO# 1

Item 122 Technical Information	
Location	
CCCD part number	CS 757895.004
CCCD drawing	
Weight	24.4 grams
Manufacturer	CTRL Systems, Inc.
Quantity flown	One

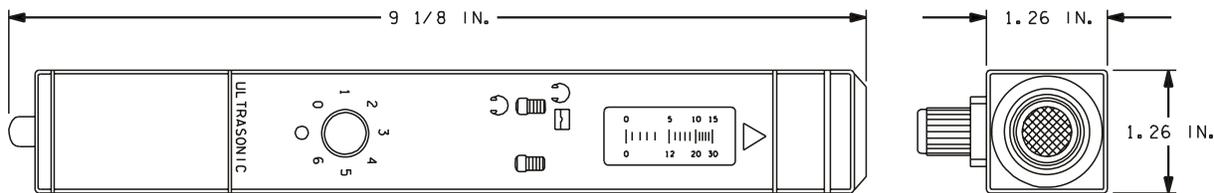
COMMENTS

This nonmetallic (polycarbonate) is used to get to hard-to-reach areas such as behind panels. This probe, made of high voltage tolerant polycarbonate, can be used safely around electrical equipment.



Nonmetallic extension probe (clear)

RECEIVER

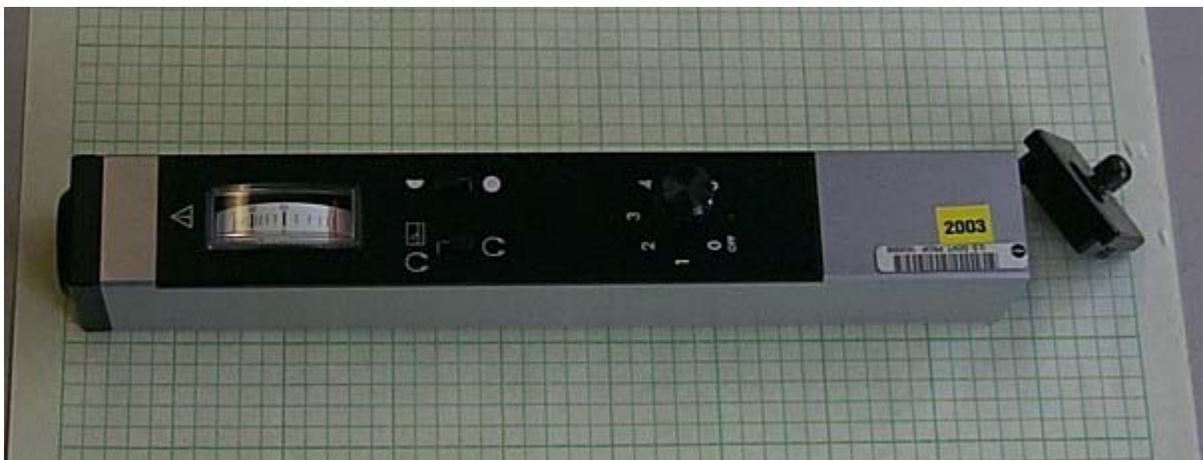
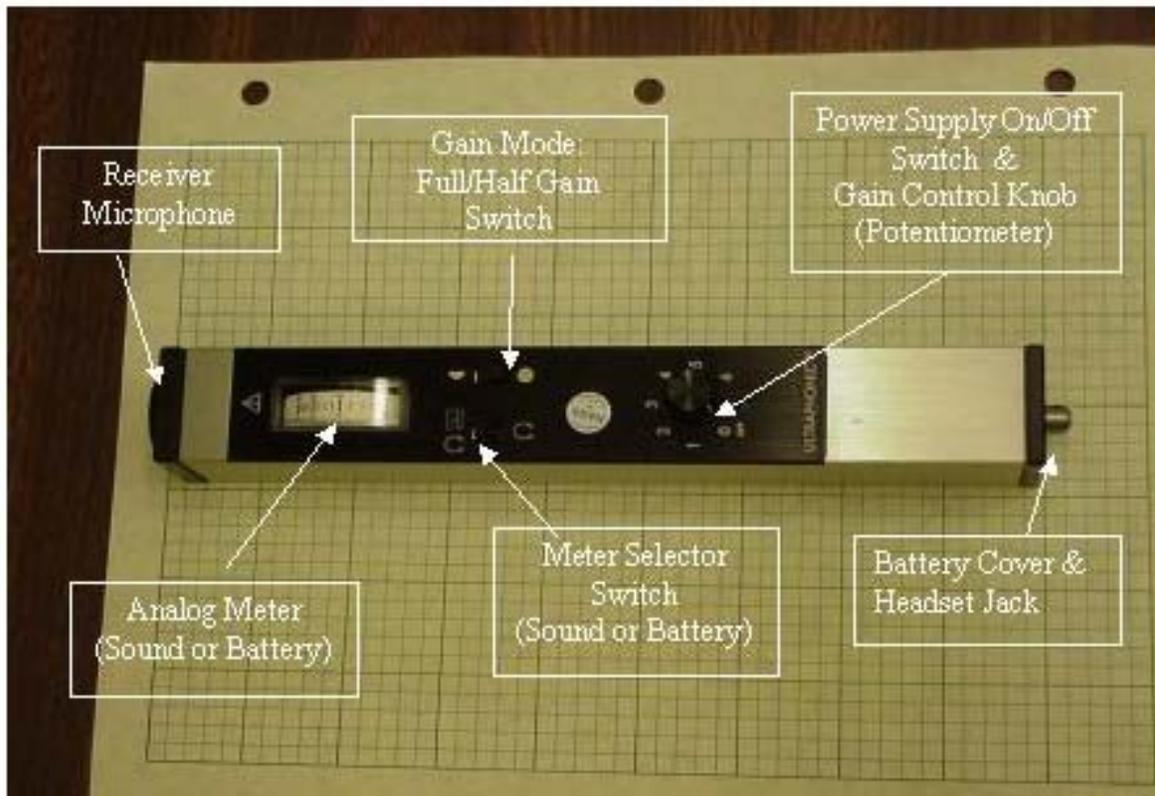


0033557. ART: 1

Item 123 Technical Information	
Location	
CCCD part number	CS 412231.002
CCCD drawing	
Weight	285.5 grams (without battery)
Manufacturer	CTRL Systems, Inc.
Quantity flown	One

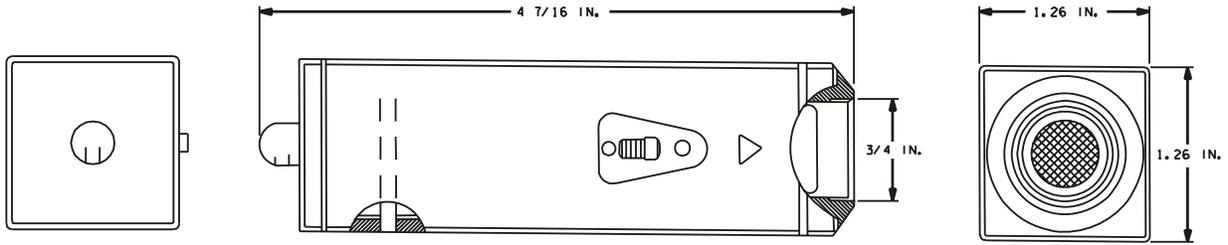
COMMENTS

This receiver is a battery-powered off-the-shelf ultrasonic detector that converts energy at frequencies around 40 kHz into audible sound heard with the attached headset and viewed on the analog meter. The unit is powered by a standard, replaceable 9V alkaline battery and has a potentiometer knob for the on/off and volume functions, an “on” indicator light, a meter/battery level switch, a sound level meter, and a half/full gain switch for the headset volume level. The ULD receiver is good for approximately 40 hours of continuous operation, and longer if operated for short periods of time. By moving the meter selector switch toward the meter, it reads battery level, but with it toward the potentiometer, the meter displays ultrasound level. To operate the receiver, the crewmember points it in the direction of the suspected leak and turns up the volume so that background noise can be heard. By noting the intensity and type of sound made, the operator can determine if there are any leaks in the area and can home in on the leak itself.



Receiver

TRANSMITTER



0033558, ART. 1

Item 124 Technical Information	
Location	
CCCD part number	CS 418231.005
CCCD drawing	
Weight	125.2 grams (without battery)
Manufacturer	CTRL Systems, Inc.
Quantity flown	One

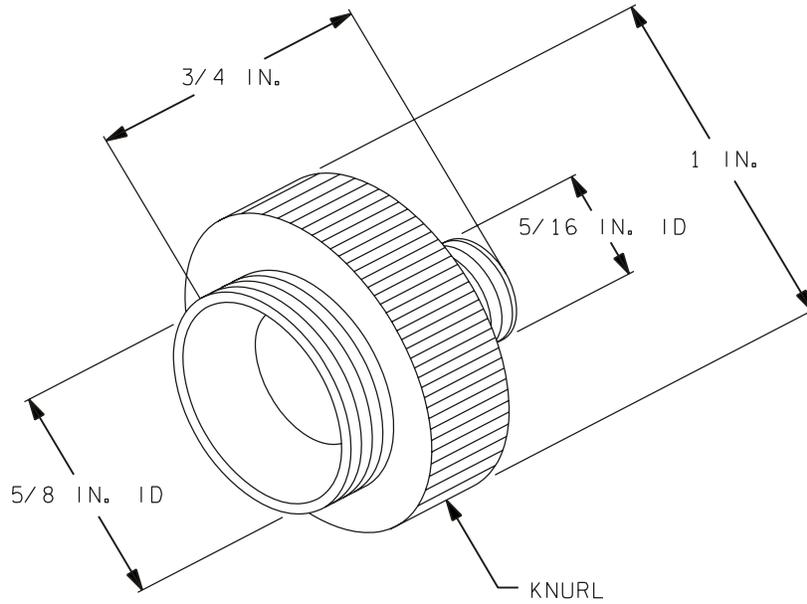
COMMENTS

This transmitter is a 5 milliwatt, 40 kHz ultrasound emitter that can be used inside sealed containers in conjunction with the receiver on the outside of the container to locate leaks.



Transmitter

ADAPTER



END ADAPTER

0033562. ISO# 1

Item 125 Technical Information	
Location	
CCCD part number	CS 713571.001
CCCD drawing	
Weight	9.3 grams
Manufacturer	CTRL Systems, Inc.
Quantity flown	One

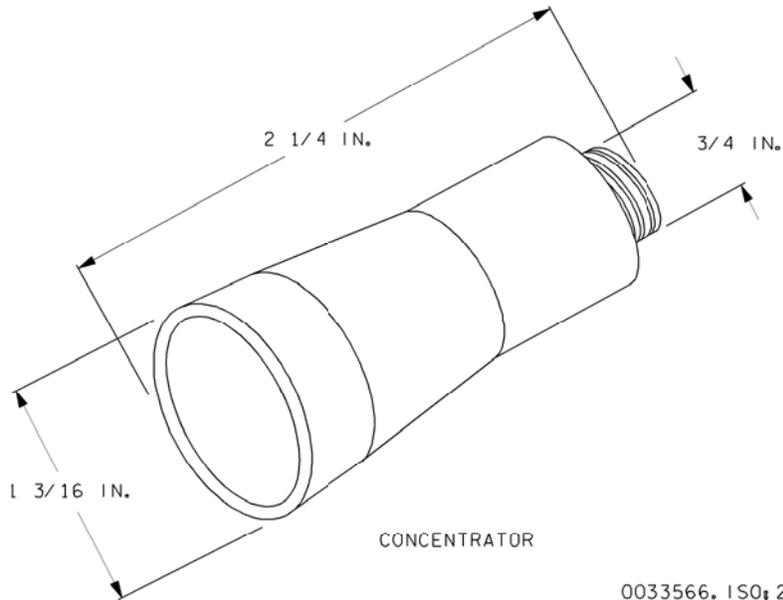
COMMENTS

The adapter is used to attach the accessories to the ULD.



Adapter

SMALL CONCENTRATOR



Item 126 Technical Information	
Location	
CCCD part number	CS 757893.002
CCCD drawing	
Weight	22.3 grams
Manufacturer	CTRL Systems, Inc.
Quantity flown	One

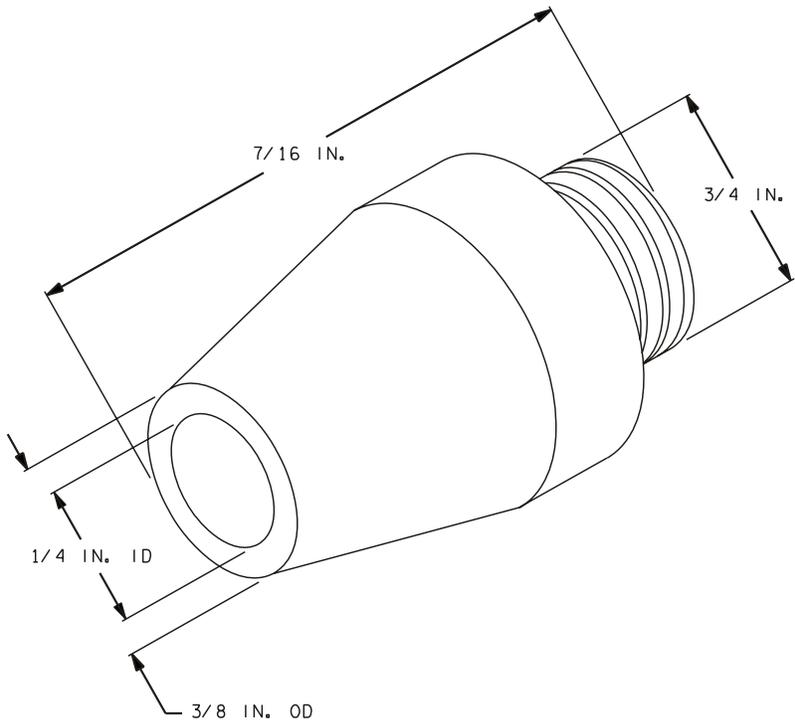
COMMENTS

The concentrator is a detachable, hard plastic (black Acetal) cone that narrows the field of view of the receiver from 90° to about 40°.



Small concentrator

ACOUSTIC TIP



0033565. ISO# 1

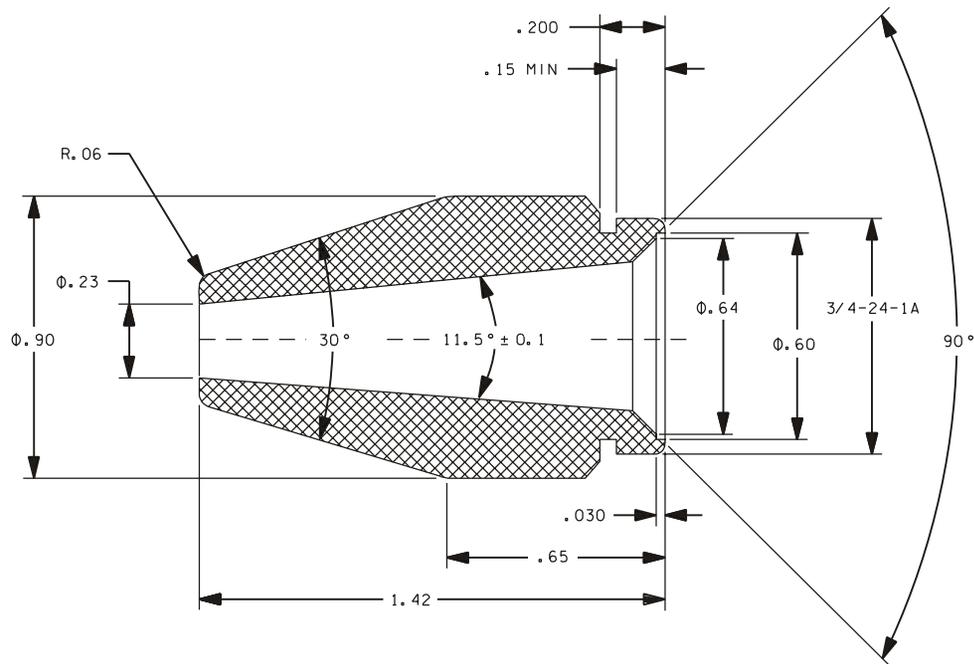
Item 127 Technical Information	
Location	
CCCD part number	CS 757895.005
CCCD drawing	
Weight	10.6 grams
Manufacturer	CTRL Systems, Inc.
Quantity flown	One

COMMENTS

The acoustic tip is used to listen for ultrasonic noise in structures by touching the tip of the solid probe to the suspected area.



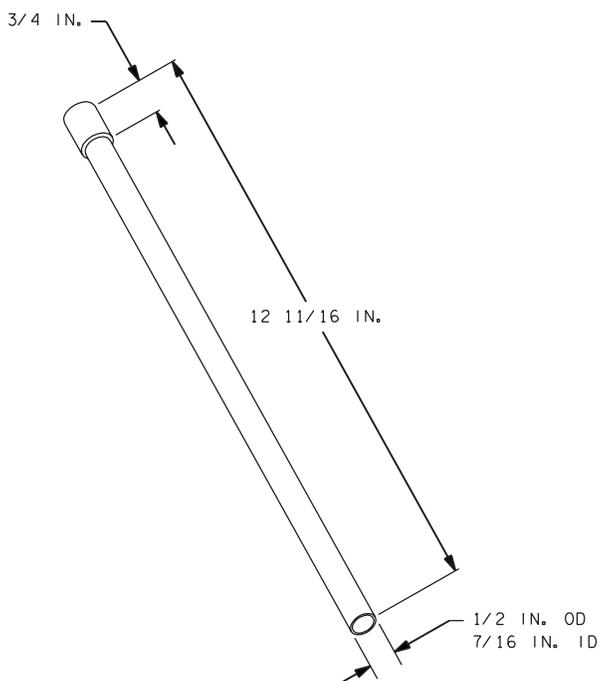
Acoustic tip



0033559. ART: 1

Acoustic tip

EXTENSION PROBE (ALUMINUM)

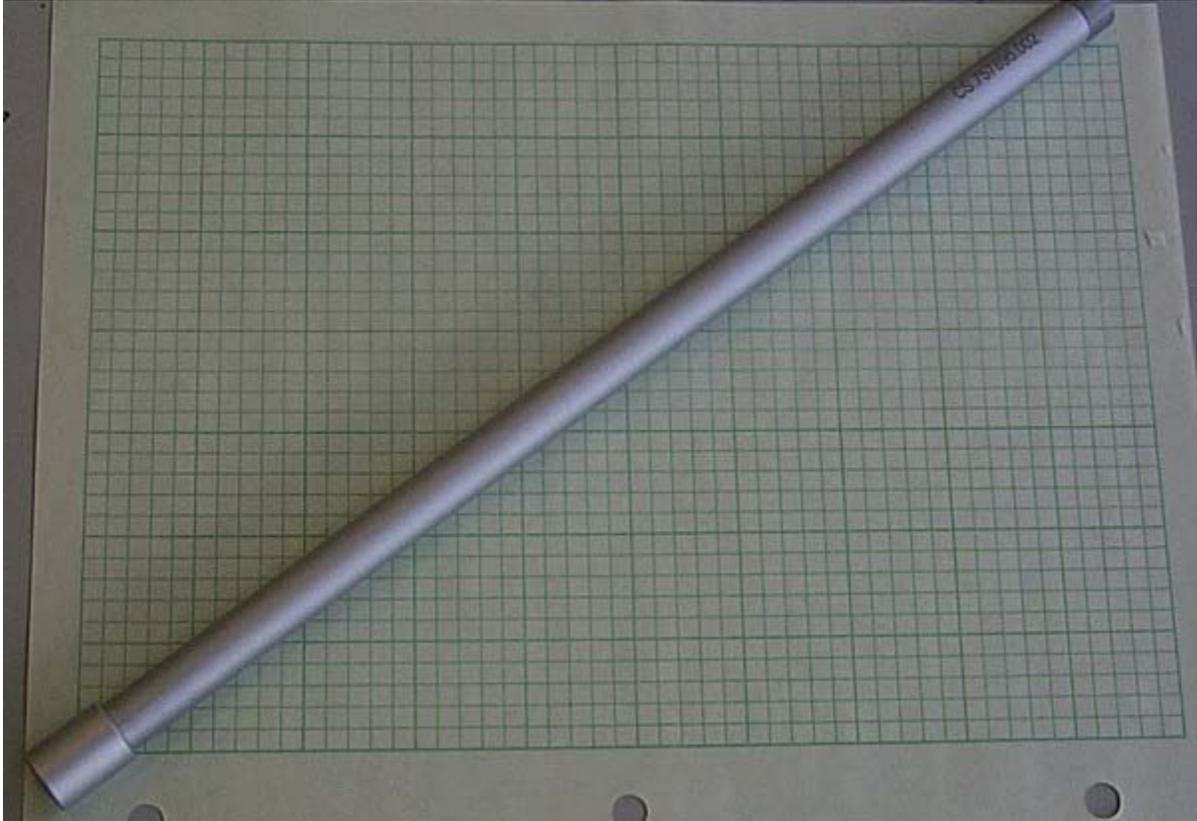


0033535. ISO: 2

Item 128 Technical Information	
Location	
CCCD part number	CS 757895.002
CCCD drawing	
Weight	41.7 grams
Manufacturer	CTRL Systems, Inc.
Quantity flown	Two

COMMENTS

This extension probe (aluminum) is used to get to hard-to-reach areas, such as behind panels.



Extension probe (aluminum)

HEADPHONES

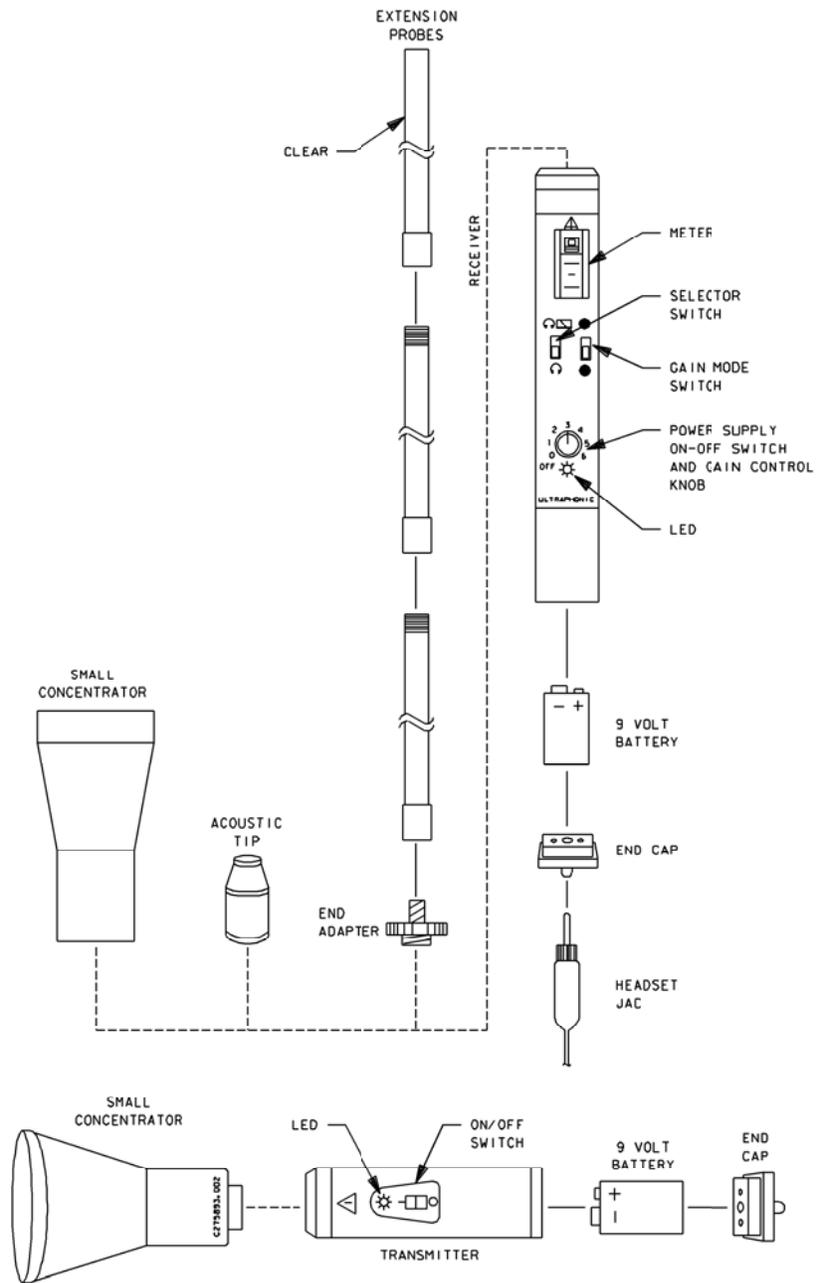


Item 129 Technical Information	
Location	
CCCD part number	40659G-01
CCCD drawing	
Weight	0.9 lb (408.4 grams)
Manufacturer	David Clark Co.
Quantity flown	One

COMMENTS

This (David Clark) headset is a 600 ohm resistance headset with a 3-foot curled cord that stretches to 6 feet. It interfaces with the receiver with a standard headset jack.

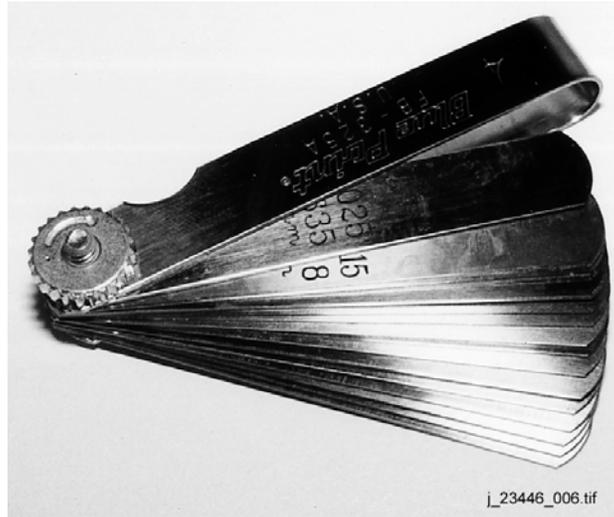
ULD COMPONENT CONNECTIONS



0033553. ART. 2

ULD components connections

FEELER GAUGE



Item 130 Technical Information	
Location	C/L camera locker
CCCD part number	528-41013-140
CCCD drawing	SED32106013
Other drawings	
Manufacturer	Snap-On/Boeing
Quantity flown	Four sets (25 blades each)

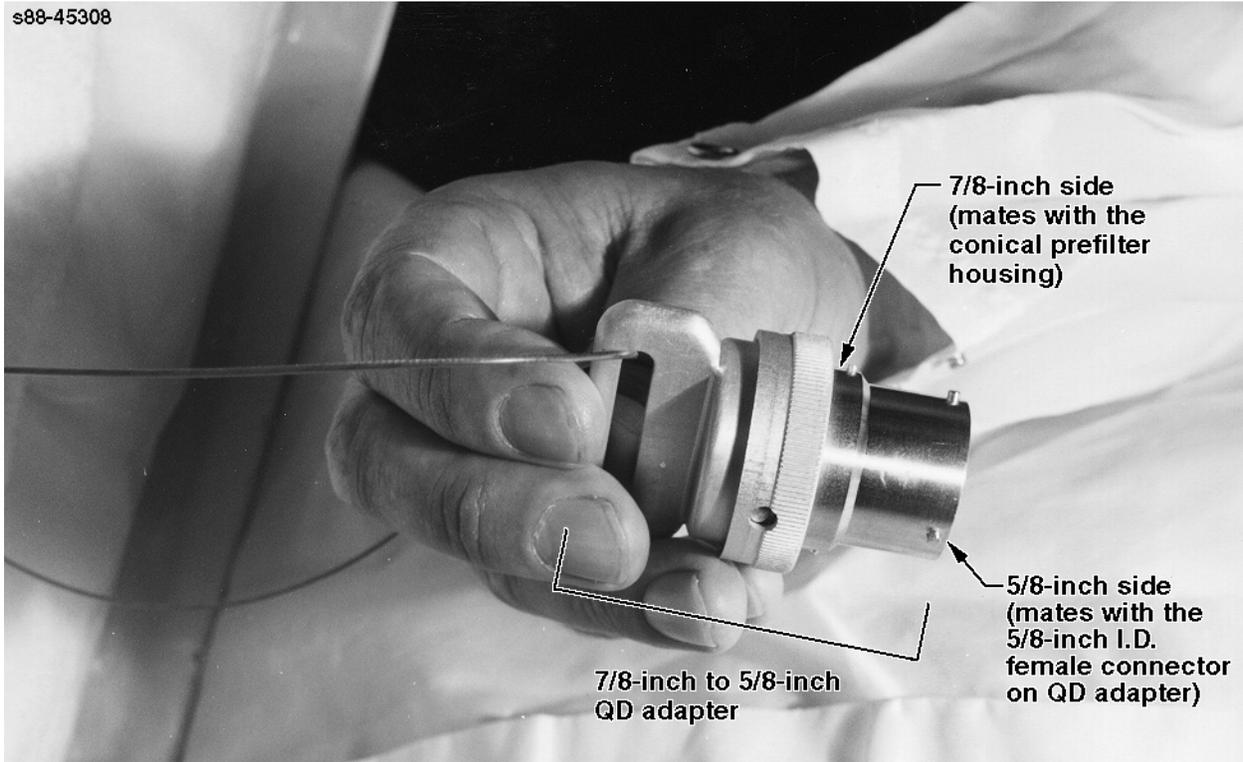
COMMENTS

General use feeler gauge (1/2 by 3-5/16 inch blades). Includes 25 blades in sizes: 0.0015 inch and 0.002 inch to 0.025 inch in 0.001-inch increments. Double stamped with decimal and metric sizes. They are stowed with the prime Center Line (C/L) camera.

Blade sizes

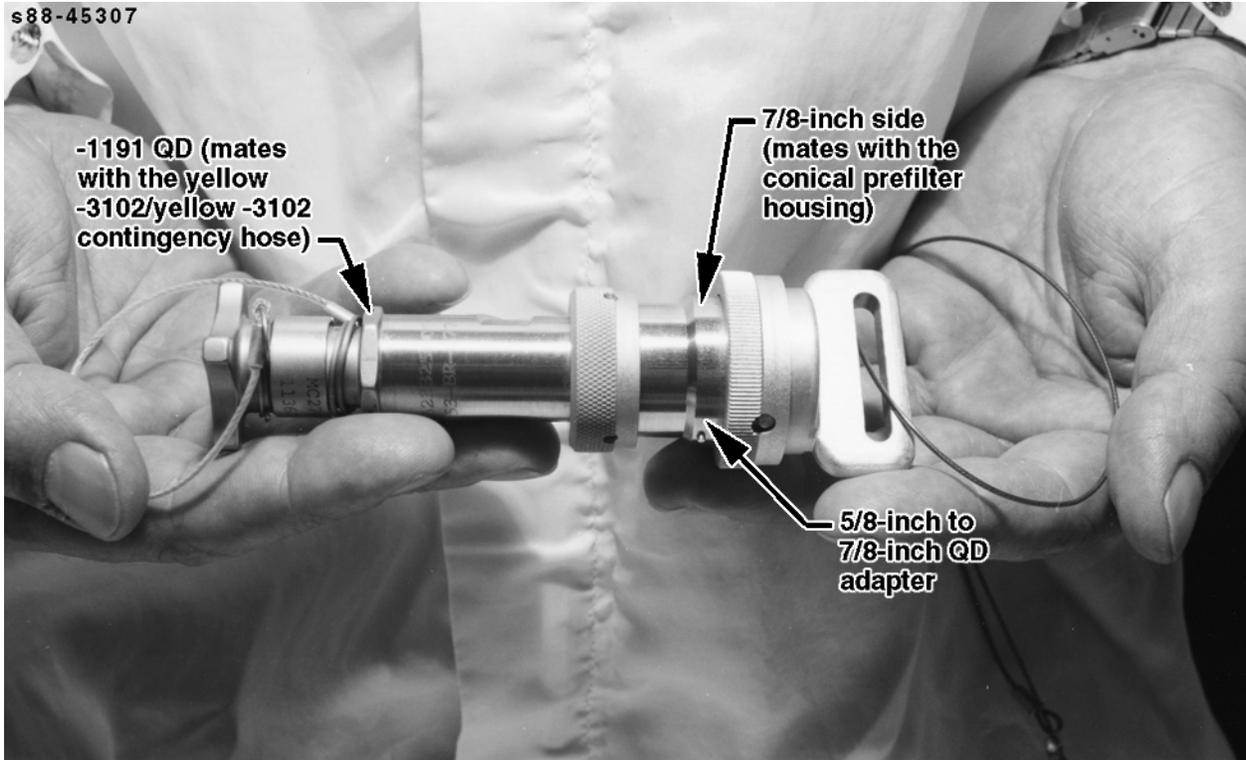
Decimal (in.)	Metric (mm)
0.015	0.038
0.002	0.051
0.003	0.076
0.004	0.102
0.005	0.127
0.006	0.150
0.007	0.178
0.008	0.203
0.009	0.229
0.010	0.254
0.011	0.279
0.012	0.305
0.013	0.330
0.014	0.356
0.015	0.381
0.016	0.406
0.017	0.432
0.018	0.457
0.019	0.483
0.020	0.508
0.021	0.533
0.022	0.559
0.023	0.584
0.024	0.610
0.025	0.635

7/8-INCH TO 5/8-INCH QD ADAPTER



Item 131 Technical Information	
Location	In the WMC hygiene kit at MA82H, attached to the urine QD adapter (see item 124)
CCCD part number	199C3087G1
CCCD drawing	SJD32100913
Other drawings	199C3087G1
Quantity flown	One

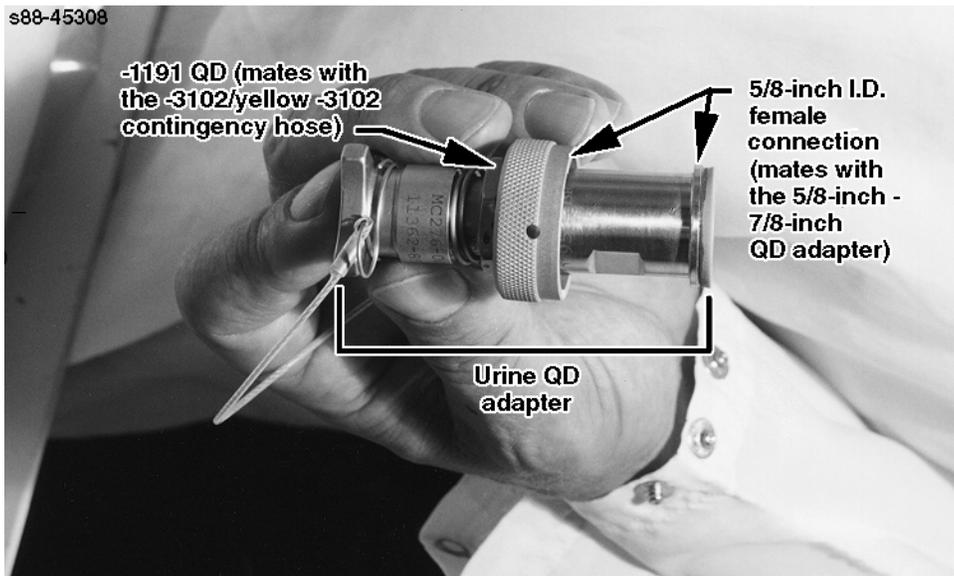
s88-45307



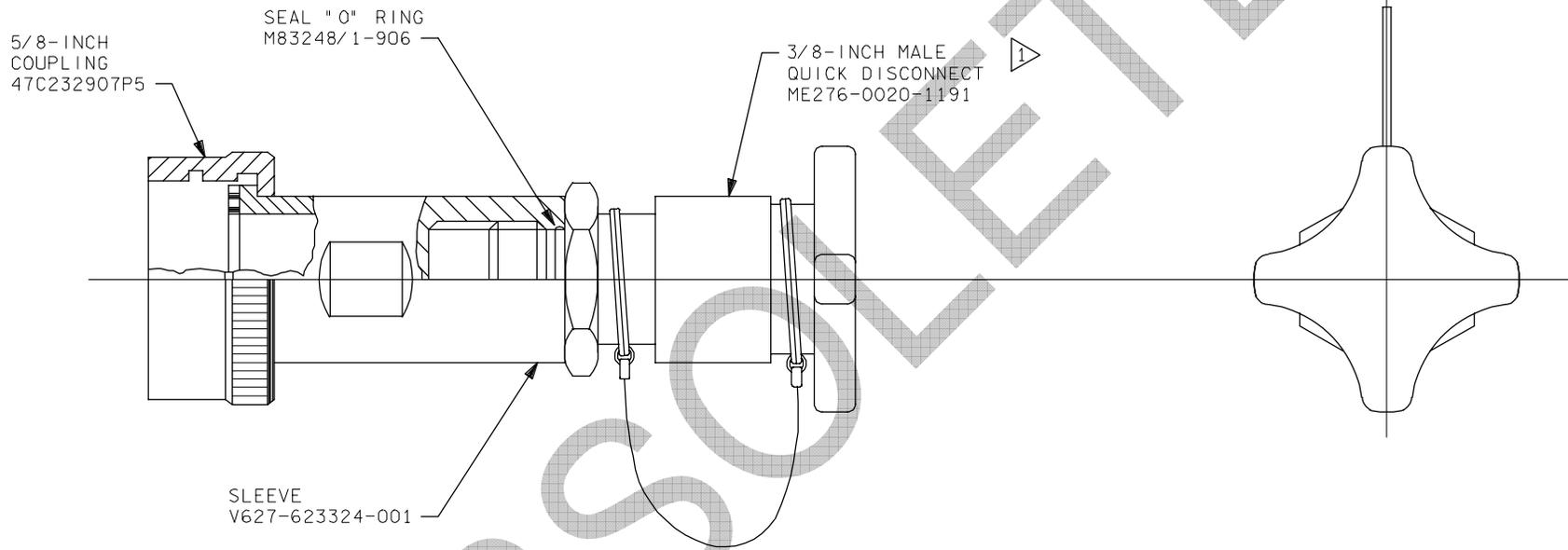
Urine QD adapters and 7/8-inch to 5/8-inch QD adapter

OBSOLETE

URINE QD ADAPTER



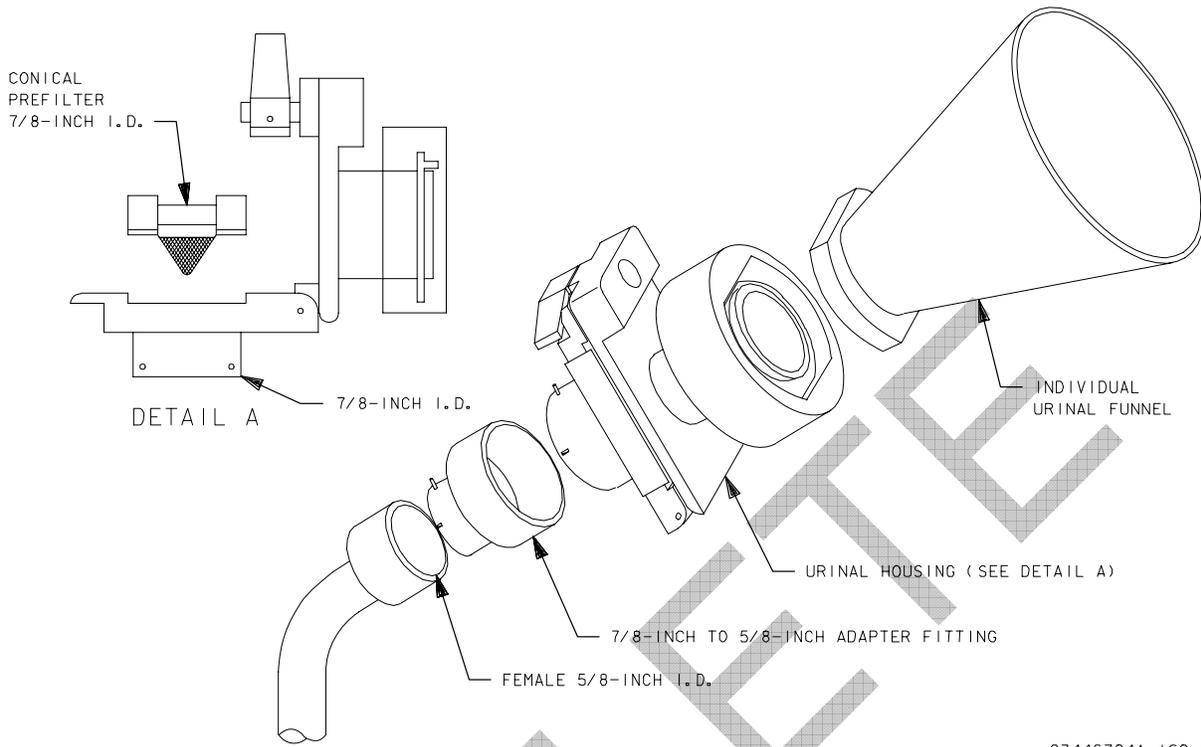
Item 132 Technical Information	
Location	In the WMC hygiene kit at MA82H attached to the 7/8-inch to 5/8-inch QD adapter (see item 123)
CCCD part number	V627-623325-003
CCCD drawing	SJD32100913
Other drawings	V627-623325 (Coupler - Urine Adapter, ECLSS, assembly of)
Manufacturer	Rockwell
Quantity flown	One



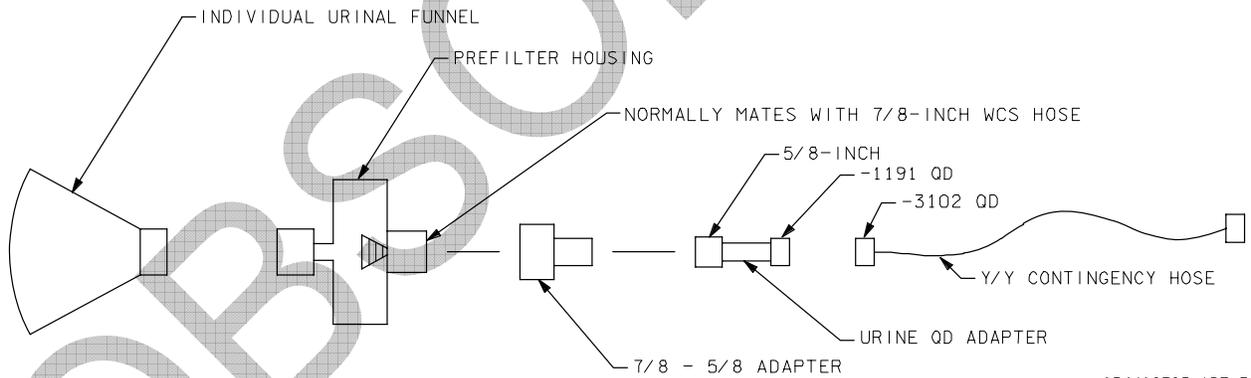
1 MATES WITH -3102 YELLOW
QD (SEE RECORDS #4 & #6)

234460704, ART: 3

Urine QD adapter



Normal WCS urinal housing configuration



WCS failed urinal (fan sep failure) IFM procedure configuration

COMMENTS

A urinal funnel, the prefilter housing the 7/8-inch to 5/8-inch QD adapter, and the urine QD adapter are connected to the contingency water x-tie waste QD, using the yellow/yellow contingency hose (with -3102 QDs) in the WCS - Failed Urinal (Fan Sep Failure) IFM Checklist procedure.

**APPENDIX A
COMMENT/REQUEST RETURN FORM**

Name _____
Organization _____
Mail Code _____
Phone Number _____

If you have any recommendations to improve the content or format of this document, please take a few moments to note your suggestions on this form. Submit comments or requests for additional copies to

Victor P. Badillo
NASA Johnson Space Center – DX44
Houston, Texas 77058

1. Technical content

2. Format and organization

3. Additions or deletions

4. Other comments

**APPENDIX B
SUPPLEMENTAL TOOLS/EQUIPMENT INFORMATION**

Quick disconnects

QD type *	Size (in.)	No.	Description	Location	See item
Male (MC276-0020-1XXX)	1/4	-1301	Blue/blue contingency hose, two -1301 QDs	IFM contingency hose and cable kit	3
			Contingency water dispenser	IFM contingency hose and cable kit	16
			Potable tank A and galley/OWDA microbial filter lower QD	Below middeck floor at MD25K accessed through LEB access panel (MD24I)	
	3/8	-1191	Contingency water container (CWC)	IFM contingency hose and cable kit	120
			Free fluid nozzle	IFM contingency hose and cable kit	17
Female (MC276-0020-3XXX)	1/4	-3142	Red/red contingency hose, two -3142 QDs	IFM contingency hose and cable kit	6
			Yellow/red adapter, red QD only	IFM contingency hose and cable kit	7
	3/8	-3302	A personal hygiene station hose assembly	Postinsertion locker	
		-3102	Yellow/yellow contingency hose, two -3102 QDs	IFM contingency hose and cable kit	4
			Yellow/red QD adapter, yellow QD only	IFM contingency hose and cable kit	7

* Reference: MC276-0020 Procurement Spec.

Quick disconnect mates

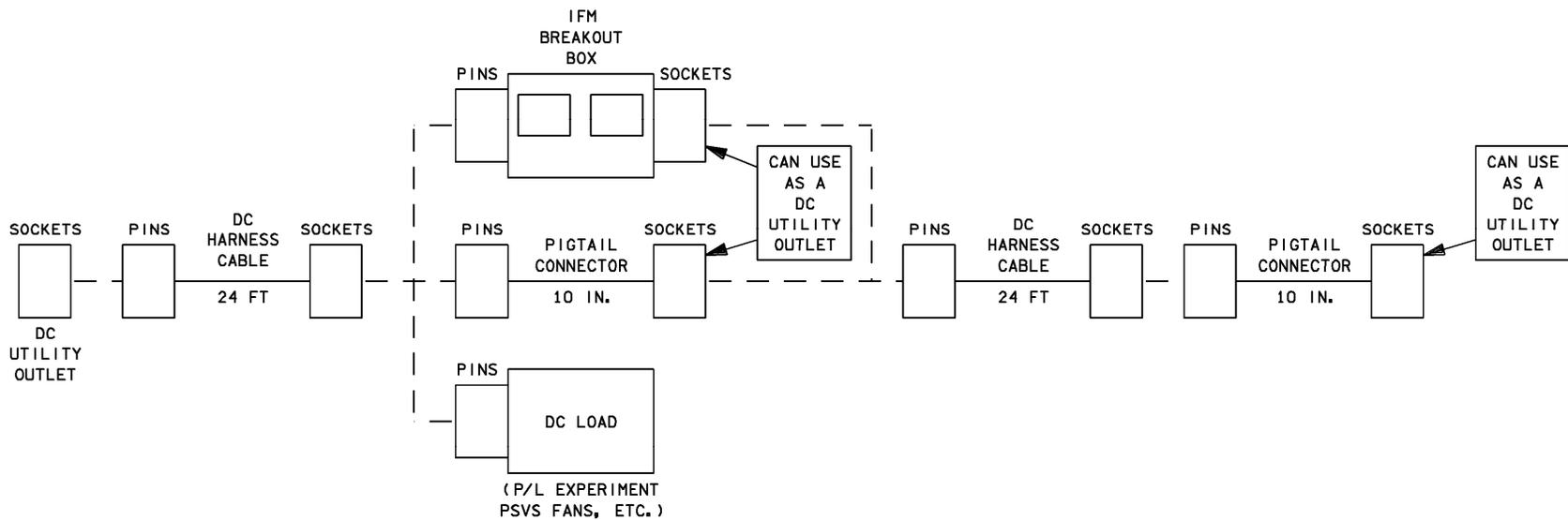
Size (in.)	Male	Female
1/4	-1201, -1301	-3142, -3202, -3302
3/8	-1101, -1191	-3102
3/8	-1103 (keyed)	-3104

Tool drives and drivers
IFM tool locker drawers 1, 2, and 3 (total: 61)

Tool type	Description	Quantity
1/4-in. drivers	• 1/4-in. driver handle	1
	• Battery-powered screwdriver	1
	• Robbins wrench (in drawer 2)	1
	• 4-in. ratchet wrench	1
	• 1/4-in. torque wrench	1
	Total:	5
1/4-in. drive	• Standard socket 1/4 drive 1/4-in., 5/16-in., 3/8-in., 7/16-in., 1/2-in., and 9/16-in.	6
	• Deepwell socket 1/4 drive 1/4-in., 5/16-in., 11/32-in., 3/8-in., and 7/16-in.	5
	• Hex head driver 7/64-in., 1/8-in., 1/16-in., 3/32-in., 5/64-in., 9/64-in., 7/32-in.	7
	• Hex head driver 5/32-in. (in the vacuum cleaner locker)	1
Note:	Another 5/32-in. hex head driver (with a 3/8-in. drive) is in locker.	
	• Hex ball tip driver 3/16-in. and 5/32-in.	2
	• 10-in., 6-in., 4-in. extension 1/4 drive	3
	• Adapter 1/4 in. - 3/8 in.	2
	• 1/4-in. socket in 1/4-in. driver handle	1
	• 1/4-in. connector strap wrench	1
	Total:	28
3/8-in. drivers	• 3/8-in. driver handle	1
	Total:	1
3/8-in. drive tools	• Standard socket 3/8 drive 1/4-in., 5/16-in., 3/8-in., 7/16-in., 1/2-in., 9/16-in., 5/8-in., 11/16-in., and 3/4-in.	9
	• Hex head driver 5/32-in., 3/16-in., 1/4-in., and 5/16-in.	4
Note:	Another 5/32-in. hex head driver with a 1/4-in. drive is in drawer 1 of the IFM tool locker.	
	• Seat adjustment tool 3/16-in.	1
	• Phillips driver 2, 3, and 4	3
	• Torque tip drivers 2, 4, 8, 6L, and 10L	5
	• Universal joint 3/8-in.	1
	• Adapter 3/8 in. - 1/4 in.	1
	• Locker tool (3/16-in. hex drive) (in drawer 2)	2
	• 7/16-in. torque adapter	1
	Total:	27
Note:	All the tools mentioned above are located in drawer 3 of the IFM tool locker, except for: (1) in drawer 2: the Robbins wrench and locker tools (3/16-in. hex drives) and (2) in drawer 1: the battery-powered screwdriver and the 1/4-in. drive 5/32-in. hex head driver.	

Screwdrivers
IFM tool locker drawer 4 (total: 17)

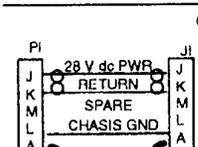
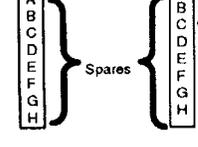
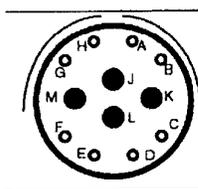
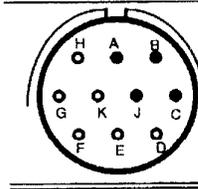
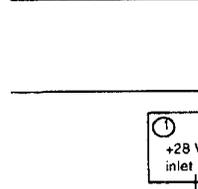
Screwdriver type	Description	Quantity	
Torque tip	<ul style="list-style-type: none"> • #6, #8, #10 	3	
Common	<ul style="list-style-type: none"> • Short, long 	2	
Phillips head	<ul style="list-style-type: none"> • #0, #1 	2	
Jewelers	<ul style="list-style-type: none"> • Standard 1/32-, 3/64-, 5/64-, 3/32-, 1/8-, and 9/64-in. 	6	
	<ul style="list-style-type: none"> • Phillips #1, #0, #00, and #000 	4	
	Total:	17	



0033533. ART# 1

Breakout box cable configuration

POWER CABLE SUMMARY

Cable	Length	# of wires	Size of wire	Connects to	#/Size of pins	
	(1) AC power transfer cable (1)	15 ft ± 2 in.	4	22 AWG	① AC utility outlets ② J37 on the payload station patch panel (behind panel L17) ③ J36 on the mission station patch panel (behind panel R18)	Two plugs → Both use four 20-gauge pins (NB6GE12-10PNT)
	(2) DC harness cable (2)	24 ft	3	16 AWG	① DC utility outlets ② Pigtail connector ③ IFM breakout box	One male plug (P1) → four 16- and eight 20-gauge pins (NB6GE14-12PNT2) One female receptacle (J1) → four 16-gauge and eight 20-gauge sockets (NB6GE14-12SNT2) (Only three 16-gauge pins and three 16-gauge sockets are connected)
	(3) Pigtail connector (2)	10 in.	3	16 AWG	① DC harness cable	One male plug (P1) → four 16-gauge and eight 20-gauge pins (NB1E14-12PNS) One female receptacle (J1) → four 16-gauge and eight 20-gauge sockets (is the same as a dc utility outlet) (NB1E14-12SNS) (Only three 16-gauge pins and three 16-gauge sockets are connected)
	(4) DC utility outlet(s) (7)	Location: Middeck: PNL M052J PNL M013Q PNL M030F	Flight deck: PNL O19 PNL F1 PNL A11 PNL A15	① DC harness cable	One jack with four 16-gauge and eight 20-gauge sockets (NB0E14-12SNT) (Only three 16-gauge sockets are connected): J = +28 V dc K = RETURN L = GROUND	
	(5) AC utility outlet(s) (4)	PNL M052J PNL M013Q	PNL F1 PNL A15A1	① AC power transfer cable	One jack with ten 20-gauge sockets (NB0E12-10SNT) (Only five 20-gauge sockets are connected): A = ΦA, 115 V to gnd B = ΦB, 115 V to gnd C = ΦC, 115 V to gnd J = NEUTRAL F = GROUND	
	(5) IFM breakout box (2)	Location: ① Top drawer of IFM tool locker ② Vacuum cleaner locker		① DC harness cable (J1) (with sockets)	Inlet: ① (NB0E14-12SNT2) (One jack with four 16-gauge and eight 20-gauge pins) (Only three 16-gauge pins are connected)	
	② DC harness cable (P1) (with pins)			② DC harness cable (P1) (with pins)	Outlets: ② (NB0E14-12PNT2) (One jack with four 16-gauge and eight 20-gauge sockets; same as a dc utility outlet) (Only three 16-gauge sockets are connected)	
	③ 22-, 20-, 16-, and 12-gauge pins			③ 22-, 20-, 16-, and 12-gauge pins	③ +28 V dc outlet with four instrument type fuse holders/one fuse cap and +, -, gnd sockets for 22-, 20-, 16-, and 12-gauge wires (only one gauge size can be selected at a time). Total = 12 sockets (three per gauge size)	
	④ 22-, 20-, 16-, and 12-gauge pins			④ 22-, 20-, 16-, and 12-gauge pins	④ +1.5 to 28 V dc outlet with four instrument type fuse holders/one fuse cap and +, -, gnd sockets for 22-, 20-, 16-, and 12-gauge (only one gauge size can be selected at a time). Total = 12 sockets (three per gauge size)	

Power cable summary

APPENDIX C REFERENCES

Numbered references in the text include the following:

1. Apex Fastener Tools Catalog. Apex Machine and Tools, Dayton, Ohio, 1987.
2. Fluke 80T-150U Universal Temperature Probe Instruction Sheet. John Fluke Manufacturing Co., Inc., January 1988.
3. Fluke 87 True RMS Multimeter User's Manual. John Fluke Manufacturing Co., Inc., August 1988.
4. Fluke Y8133/Y8134 Test Lead Set Instruction Sheet. John Fluke Manufacturing Co., Inc., April 1980.
5. Fuse, miniature, cartridge. Rockwell Spec ME451-0009, July 1978.
6. Fuse, subminiature. Rockwell Spec ME451-0018, July 1978.
7. In-Flight Maintenance (IFM) Checklist, JSC-17321, February 1988.
8. MultiCal™. 80T-150U Universal Temperature Probe Instruction Sheet. John Fluke Manufacturing Co., Inc., January 1988.
9. Operating Instructions, AEG Electric Rechargeable Battery Powered Screwdriver EZ502. AEG Power Tool Corporation, Norwich, Connecticut.
10. Postflight Manual for Flight Crew Equipment, JSC-19128, October 1988.
11. PR-855, Fire Stop - Penetration Seals (pamphlet). Semco Division Products Research and Chemical Corporation, May 1983.
12. PR-855, Fire Stop Sealant Description and Installation (pamphlet), Semco Division Products Research and Chemical Corporation, April 1984.
13. Protective Devices, Section 4.5.6.4. Shuttle Operational Data Book, Vol. I, January 1988.
14. Torque Wrenches Instructions. Snap-On Tools Corporation, Kenosha, Wisconsin.

Other references include the following:

1. Duxseal, MSDS-JMC/9484, Rev 2, August 1990.
2. EGIL Console Procedures Handbook, Circuit Protection Devices, Section 3.20, January 1988.
3. EVA Catalog, Tools and Equipment, JSC-20466, Rev A, April 1989.
4. Gentry, Dale, Boeing Aerospace Company, Clear Lake, Texas, November 1988 to December 1989. Phone conversations, interviews, and data concerning equipment weights and manufacturers.
5. Janes, Frank. IFM Breakout Box Note of Interest, NASA Johnson Space Center, November 19, 1985.
6. Product Knowledge Handbook, Snap-On Tools Corporation, Kenosha, Wisconsin.
7. Robbins, Richard L. and Pierson, Thomas E. Overriding Faulty Circuit Breakers, NASA Tech Briefs, P. 18, April 1987.
8. Silicone Compound, MSDS-MSL0736B00 and MSL0737B00, January 1994.
9. Snap-On Tool Catalog, Snap-On Tools Corporation, Kenosha, Wisconsin, June 1989.

Numerous Crew Compartment Configuration, Boeing-Aerospace Company, International Latex Corporation, NASA, and Rockwell drawings also were used.

APPENDIX D ACRONYMS

A/R	As Required
AC	Alternating Current
ACCU	Audio Central Control Unit
ANSI	American National Standards Institute
ARS	Air Revitalization System
assy	assembly
aux	auxiliary
AV	Avionics
AWG	American wire gauge
B/B hose	Blue/Blue Contingency Hose
BOB	Breakout Box
cb	circuit breaker
CCCD	Crew Compartment Configuration Drawing
CES	Crew Escape System
CHB	Console Handbook
CWC	Contingency Water Container
CWS	Caution and Warning System
DAP	Digital Autopilot
dc	direct current
DMAT	Docking Module Axial Target
ECLSS	Environmental Control and Life Support System
EMU	Extravehicular Mobility Unit
EVA	Extravehicular Activity
GFE	Government-Furnished Equipment
H ₂ O	water
HDRR	High Data Rate Recorder
ID	Identification
IFM	In-Flight Maintenance
ILC	International Latex Corporation
IMU	Inertial Measurement Unit
IVA	Intravehicular Activity
JSC	Lyndon B. Johnson Space Center
LCD	Liquid Crystal Display
LEB	Lower Equipment Bay
LED	Light Emitting Diode
LRU	Line Replaceable Unit

MSDS	Material Safety Data Sheet
N/A	Not Applicable
NASA	National Aeronautics and Space Administration
NPT	National Pipe Thread
OPS	Operations
OWDA	Operational Water Dispenser Assembly
P/L	Payload
PBI	Pushbutton Indicator
PDB	Power Distribution Box
PHS	Personal Hygiene Station
PLBD	Payload Bay Door
QD	Quick Disconnect
qty	quantity
R/R hose	Red/Red contingency hose
RCRS	Regenerative Carbon Removal System
RMS	Remote Manipulator System
RTV	Room Temperature Vulcanizing
SAIL	Shuttle Avionics Integration Laboratory
SELS	SPOC Electronic Library System
SMACAR	Safety and Mission Assurance Certification Approval Request
sply	supply
SPOC	Space Program Operations Contract
sw	switch
TIPS	Thermal Impulse Printer System
ULD	Ultrasonic Leak Detector
VACHS	Vacuum Attachment and Contingency Hose System
WCS	Waste Collection System
WMC	Waste Management Compartment
WWDF	Waste Water Dump Filter
X-tie	cross-tie
Y/R QD adapter	Yellow/Red Quick Disconnect adapter
y/y	yel/yel
Y/Y hose	Yellow/Yellow contingency hose