Scandinavian Airlines System

PAGE	DATE	CODE
AIRFRAMES SYSTEMS TAB		
CHAPTER 20 TAB		
STANDARD PRACTICES		
EFFECTIVE PAGES SEE LAST PAGE OF LIST FOR NUMBER OF PAGES		
20-CONTENTS		
1	DEC 22/06	SAS
2	APR 22/09	SAS
3	DEC 22/07	SAS
4	DEC 22/08	SAS
5	APR 22/09	SAS
6	BLANK	
20-00-00		
1	AUG 22/04	01
2	BLANK	
20-00-00		
201	DEC 22/05	01
R 202	AUG 22/09	01.1
20-10-01		
401	AUG 10/98	02
402	FEB 10/90	02
403	AUG 10/98	03
404	FEB 10/90	01
405	AUG 10/95	03
406	AUG 10/98	03
407	FEB 10/93	03
408	BLANK	
20-10-02		
401	DEC 22/05	01
402	BLANK	
20-10-03		
R 401	AUG 22/09	01.1
402	DEC 22/05	02
403	FEB 10/96	01
R 404	AUG 22/09	02.1
405	DEC 22/05	02
406	DEC 22/05	02
407	AUG 22/05	01
408	AUG 22/05	01
20-10-04		
401	APR 22/08	02
402	MAY 10/95	01
403	FEB 10/90	01
404	BLANK	
20-10-05		
401	FEB 10/90	01
402	FEB 10/90	01
403	FEB 10/90	01
404	BLANK	
20-10-06		
401	APR 22/05	01
402	APR 22/99	01
403	APR 22/05	01
404	APR 22/05	01
20-10-07		
401	AUG 22/04	01
402	AUG 01/82	01
403	AUG 22/04	01
404	FEB 10/90	01
20-10-08		
401	DEC 22/07	01
402	AUG 01/82	01
20-10-09		
401	AUG 22/08	02
402	APR 22/09	02
403	AUG 22/05	01
404	DEC 22/06	02
405	APR 22/06	01
406	APR 22/06	01
407	APR 22/06	01
408	DEC 22/07	01
409	AUG 22/05	01
410	APR 10/98	01
411	DEC 22/07	02
412	APR 10/98	01
413	APR 10/98	01
414	APR 10/98	01
415	APR 22/06	01
416	AUG 22/03	01
417	DEC 22/07	02
418	AUG 22/07	02
20-10-09		
801	DEC 22/08	02
802	APR 22/09	02
803	DEC 22/07	02
804	DEC 22/07	02
805	DEC 22/07	03
806	APR 22/05	01
807	AUG 22/06	03
808	DEC 22/08	02
809	AUG 22/06	02
810	AUG 22/04	01
811	AUG 22/03	01
812	AUG 22/03	01
813	AUG 22/03	01
814	AUG 22/03	01
815	AUG 22/06	02
816	AUG 22/06	02
20-10-09		CONT.
817	AUG 22/06	02
818	AUG 22/03	01
819	AUG 22/06	02
820	AUG 22/06	02
821	AUG 22/06	02
822	AUG 22/06	02
823	AUG 22/06	02
824	APR 22/04	01
825	AUG 22/03	01
826	DEC 22/08	02
827	DEC 22/08	01
828	APR 22/07	04
829	DEC 22/08	01
830	DEC 22/08	04
831	DEC 22/07	04
R 832	AUG 22/09	01.1
833	APR 22/06	01
834	DEC 22/06	01
835	DEC 22/07	02
836	DEC 22/06	02
837	DEC 22/07	02
838	DEC 22/07	02
839	DEC 22/07	02
840	AUG 22/07	02
841	AUG 22/07	02
842	AUG 22/07	02
843	AUG 22/07	02
844	AUG 22/07	02
845	AUG 22/07	02
846	AUG 22/07	02
847	AUG 22/07	02
848	AUG 22/07	02
R 849	AUG 22/09	02.1
850	AUG 22/07	02
851	AUG 22/07	02
852	AUG 22/07	02
R 853	AUG 22/09	02.1
854	AUG 22/07	02
855	DEC 22/08	02
856	DEC 22/08	02
857	AUG 22/07	02
858	AUG 22/07	02
859	AUG 22/07	02
860	AUG 22/07	02
861	AUG 22/07	02
862	AUG 22/07	02
863	AUG 22/07	02
864	AUG 22/07	02
865	AUG 22/07	02
866	AUG 22/07	02
867	AUG 22/07	02
868	AUG 22/07	02
869	AUG 22/07	02
870	AUG 22/07	02
871	AUG 22/07	02
872	AUG 22/07	02
873	AUG 22/07	02
874	AUG 22/07	02

Scandinavian Airlines System

PAGE	DATE	CODE
20-10-09		CONT.
875	AUG 22/07	02
876	AUG 22/07	02
877	AUG 22/07	02
878	AUG 22/07	02
879	AUG 22/07	02
880	AUG 22/07	02
880A	AUG 22/07	02
880B	AUG 22/07	02
880C	AUG 22/07	02
880D	AUG 22/07	02
880E	AUG 22/07	02
880F	AUG 22/07	02
880G	AUG 22/07	02
880H	DEC 22/08	02
880I	DEC 22/08	02
880J	DEC 22/08	02
880K	AUG 22/07	02
880L	AUG 22/07	02
880M	AUG 22/07	02
880N	AUG 22/07	02
880O	DEC 22/08	02
880P	AUG 22/07	02
880Q	AUG 22/07	02
880R	AUG 22/07	02
880S	AUG 22/07	02
880T	AUG 22/07	02
880U	AUG 22/07	02
880V	AUG 22/07	02
880W	AUG 22/07	02
880X	AUG 22/07	02
880Y	AUG 22/07	02
880Z	AUG 22/07	01
881	AUG 22/07	02
882	AUG 22/07	01
882A	AUG 22/07	01
882B	BLANK	
20-10-10		
401	AUG 22/04	01
402	AUG 22/04	01
403	AUG 10/98	01
404	BLANK	
20-10-11		
401	AUG 10/98	01
402	APR 22/99	01
403	APR 22/99	01
404	APR 22/99	01
20-10-12		
401	DEC 22/04	01
402	AUG 22/07	02
403	AUG 22/07	02
404	AUG 22/07	03
405	MAY 10/90	01
406	AUG 22/07	02
407	AUG 22/07	02
408	AUG 22/07	02

PAGE	DATE	CODE
20-10-12		
801	AUG 22/05	01
802	BLANK	
20-10-13		
401	AUG 10/98	01
402	AUG 10/98	01
403	MAY 10/90	01
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20-10-14		
401	AUG 22/04	01
402	DEC 22/07	02
403	FEB 10/91	01
404	FEB 10/91	01
405	AUG 10/96	01
406	DEC 22/07	02
20-10-15		
401	DEC 22/07	02
402	DEC 22/07	02
403	AUG 10/98	01
404	DEC 22/07	01
405	AUG 10/98	01
406	BLANK	
20-10-16		
401	APR 22/04	01
402	MAY 10/90	01
403	AUG 10/98	01
404	BLANK	
20-10-17		
401	MAY 10/90	01
402	BLANK	
20-10-18		
201	NOV 10/95	01
202	NOV 01/83	01
203	AUG 22/05	01
204	BLANK	
20-10-19		
401	MAY 10/94	01
402	MAY 10/94	01
403	MAY 10/94	01
404	BLANK	
20-10-21		
401	AUG 22/04	01
402	AUG 22/99	01
403	INT BLANK	
404	AUG 22/99	01
405	AUG 22/99	01
406	BLANK	

PAGE	DATE	CODE
20-10-21		
601	AUG 10/98	01
602	BLANK	
20-10-22		
701	APR 22/00	01
702	AUG 22/05	01
703	MAY 01/83	01
704	APR 22/00	01
705	AUG 22/04	01
706	BLANK	
20-10-23		
401	NOV 10/95	01
402	DEC 10/98	01
403	AUG 22/05	01
404	MAY 10/90	01
405	MAY 10/90	01
406	AUG 10/94	01
20-10-24		
201	DEC 22/99	08
202	DEC 10/98	01
203	DEC 10/98	03
204	AUG 22/05	02
205	DEC 10/98	03
206	DEC 10/98	09
207	DEC 10/98	04
208	NOV 10/96	17
20-10-25		
201	NOV 10/95	01
202	BLANK	
20-10-26		
201	AUG 10/96	01
202	FEB 10/91	01
20-10-27		
201	AUG 10/90	01
202	AUG 10/90	01
203	MAY 10/90	01
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20-10-29		
401	DEC 22/07	02
402	APR 22/06	01
403	APR 22/04	01
404	DEC 22/07	02
405	DEC 22/07	01
406	BLANK	
20-10-31		
201	AUG 22/06	02
202	AUG 22/06	02
203	AUG 22/06	02
204	BLANK	

Scandinavian Airlines System

PAGE	DATE	CODE
20-10-32		
201	DEC 22/08	03
202	BLANK	
20-10-34		
501	FEB 10/95	01
502	FEB 10/95	01
20-10-35		
401	APR 22/09	01
402	APR 22/09	01
403	APR 22/09	01
404	APR 22/09	01
20-11-00		
201	NOV 10/95	01
202	DEC 10/98	01
203	DEC 22/05	01
204	DEC 22/08	01
205	DEC 22/08	01
206	DEC 22/08	01
207	DEC 22/08	01
208	DEC 22/08	01
209	DEC 22/01	01
210	DEC 22/01	01
211	APR 22/06	01
212	APR 22/06	01
213	APR 22/06	01
214	DEC 22/06	01
215	DEC 22/01	01
216	BLANK	
20-15-01		
201	APR 22/01	01
202	DEC 22/00	01
20-15-11		
201	APR 22/02	01
202	AUG 22/05	01
203	AUG 22/01	01
204	AUG 22/01	01
205	APR 22/02	01
206	APR 22/07	01
207	AUG 22/01	02
208	AUG 22/01	02
209	AUG 22/01	02
210	DEC 22/04	02
211	AUG 22/01	02
212	AUG 22/01	02
213	DEC 22/00	01
214	DEC 22/00	01
215	DEC 22/00	01
R 216	AUG 22/09	01.1
20-20-02		
601	AUG 22/05	01
602	AUG 22/05	01
603	AUG 22/05	01
604	APR 22/03	01

PAGE	DATE	CODE
20-20-02		CONT.
605	DEC 22/01	01
606	BLANK	
20-30-00		
R 201	AUG 22/09	02.1
202	BLANK	
20-30-01		
201	AUG 22/00	01
202	APR 22/08	02
203	APR 22/08	02
204	AUG 22/08	01
205	AUG 22/05	01
206	AUG 22/05	01
207	AUG 22/05	01
208	NOV 10/96	01
209	AUG 10/91	01
210	APR 22/08	01
211	DEC 22/08	01
212	BLANK	
20-30-02		
201	AUG 22/05	02
202	DEC 22/05	01
203	DEC 22/05	01
204	DEC 10/98	02
205	AUG 22/07	02
206	APR 22/08	03
207	DEC 10/98	02
208	DEC 10/98	02
209	AUG 22/03	02
210	APR 22/08	03
211	APR 22/08	03
212	APR 22/08	04
213	APR 22/08	05
214	BLANK	
20-30-03		
201	AUG 22/01	01
202	APR 22/02	01
203	AUG 22/05	01
204	APR 22/08	01
205	DEC 22/01	01
206	DEC 22/01	01
207	AUG 22/01	01
208	AUG 22/01	01
20-30-04		
201	AUG 22/03	01
202	APR 22/06	02
203	APR 22/08	02
204	APR 22/08	02
205	AUG 22/07	02
206	APR 22/06	02
207	APR 22/06	02
208	AUG 22/06	02
209	APR 22/06	02
210	APR 22/06	01

PAGE	DATE	CODE
20-30-05		
201	NOV 10/96	01
202	DEC 22/04	01
20-30-07		
201	DEC 22/07	02
202	DEC 22/07	02
203	DEC 22/07	02
204	APR 22/08	02
205	APR 22/08	02
206	APR 22/08	02
207	NOV 10/96	01
208	NOV 10/96	01
209	DEC 22/07	01
210	AUG 22/99	01
211	NOV 10/96	01
212	NOV 10/96	01
213	DEC 22/07	03
214	AUG 22/01	01
215	NOV 10/96	01
216	AUG 22/05	01
217	DEC 22/05	02
218	DEC 22/05	02
219	DEC 22/05	02
220	APR 22/09	02
221	APR 22/09	02
222	BLANK	
20-30-80		
201	APR 22/02	01
202	AUG 22/05	01
203	DEC 22/07	01
204	BLANK	
20-30-81		
201	AUG 22/05	01
202	DEC 22/07	01
20-30-82		
201	APR 22/02	01
202	AUG 22/05	01
203	DEC 22/07	01
204	BLANK	
20-30-83		
201	AUG 22/05	01
202	AUG 22/05	01
20-30-84		
201	APR 22/02	01
202	AUG 22/05	01
20-30-85		
201	AUG 22/05	01
202	AUG 22/05	01

Scandinavian Airlines System

PAGE	DATE	CODE
20-30-86		
201	APR 22/02	01
202	AUG 22/05	01
20-30-87		
201	APR 22/02	01
202	AUG 22/05	01
20-30-88		
201	AUG 22/05	01
202	AUG 22/05	01
20-30-89		
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20-30-90		
201	AUG 22/05	01
202	AUG 22/05	01
20-30-91		
201	AUG 22/05	01
202	AUG 22/05	01
20-30-92		
201	AUG 22/05	01
202	AUG 22/05	01
20-30-93		
201	AUG 22/08	02
202	AUG 22/05	01
20-30-94		
201	AUG 22/05	01
202	BLANK	
20-30-95		
201	AUG 22/05	01
202	BLANK	
20-30-96		
201	APR 22/02	01
202	AUG 22/01	01
20-30-97		
201	AUG 22/05	01
202	BLANK	
20-30-98		
201	APR 22/02	01
202	AUG 22/05	01
203	DEC 22/05	01
204	DEC 22/05	01
20-30-99		
201	AUG 10/98	01
202	APR 22/04	01

PAGE	DATE	CODE
20-41-00		
201	AUG 22/08	02
202	DEC 22/07	02
203	DEC 22/07	02
204	APR 22/09	02
205	APR 22/09	02
206	APR 22/07	02
207	APR 22/07	01
208	BLANK	
20-41-01		
201	AUG 10/91	01
202	FEB 10/90	01
203	FEB 10/90	02
204	DEC 22/05	03
205	FEB 10/93	03
206	DEC 22/05	02
207	APR 22/01	02
208	DEC 10/98	02
209	DEC 22/05	02
210	APR 22/01	03
211	APR 22/01	03
212	DEC 22/05	02
213	APR 22/02	01
214	BLANK	
20-55-54		
R 601	AUG 22/09	01.1
R 602	AUG 22/09	01.1
R 603	AUG 22/09	01.1
R 604	AUG 22/09	01.101
605	APR 22/09	02
R 606	AUG 22/09	03.1
R 607	AUG 22/09	01.1
608	DEC 22/08	02
609	APR 22/09	03
R 610	AUG 22/09	03.1
611	APR 22/09	02
R 612	AUG 22/09	02.1
R 613	AUG 22/09	02.1
R 614	AUG 22/09	02.1
R 615	AUG 22/09	02.1
R 616	AUG 22/09	02.1
R 617	AUG 22/09	02.1
R 618	AUG 22/09	02.1
R 619	AUG 22/09	02.1
R 620	AUG 22/09	02.1
R 621	AUG 22/09	02.1
R 622	AUG 22/09	03.1
R 623	AUG 22/09	02.1
R 624	AUG 22/09	03.1
R 625	AUG 22/09	03.1
R 626	AUG 22/09	03.101
R 627	AUG 22/09	04.101
R 628	AUG 22/09	02.1
R 629	AUG 22/09	03.1
630	APR 22/09	02
R 631	AUG 22/09	02.1
R 632	AUG 22/09	02.1

PAGE	DATE	CODE
20-55-54		CONT.
R 633	AUG 22/09	01.101
R 634	AUG 22/09	01.101
R 635	AUG 22/09	01.101
R 636	AUG 22/09	01.101
R 637	AUG 22/09	01.101
R 638	BLANK	
20-56-01		
201	DEC 22/05	01
202	DEC 22/05	01
203	DEC 22/05	01
204	DEC 22/05	01
205	AUG 22/05	01
206	AUG 22/05	01
207	AUG 22/05	01
208	BLANK	
20-56-02		
201	DEC 22/05	01
202	DEC 22/05	01
203	DEC 22/05	01
204	DEC 22/05	01
205	DEC 22/05	01
206	AUG 22/05	01
207	AUG 22/05	01
208	AUG 22/05	01
209	AUG 22/05	01
210	BLANK	
20-56-03		
201	AUG 22/06	02
202	AUG 22/06	02
203	AUG 22/06	03
204	AUG 22/06	03
205	AUG 22/05	02
206	AUG 22/05	01
20-60-01		
201	APR 22/03	01
202	APR 22/01	01
203	AUG 22/07	02
204	BLANK	
20-60-02		
201	DEC 22/08	02
202	BLANK	
20-60-03		
201	APR 22/09	02
202	APR 22/09	02
20-60-04		
201	APR 22/09	02
202	BLANK	

Scandinavian Airlines System

PAGE	DATE	CODE
20-60-05		
201	APR 22/05	01
202	BLANK	
20-60-06		
201	DEC 22/07	01
202	BLANK	
20-60-07		
R 201	AUG 22/09	01.1
202	DEC 22/08	01
203	DEC 22/08	01
204	BLANK	

PAGE	DATE	CODE

PAGE	DATE	CODE

CHAPTER 20 - STANDARD PRACTICES - AIRFRAME

TABLE OF CONTENTS

Subject	Chapter Section Subject	Page	Effectivity
STANDARD PRACTICES - AIRFRAME	20-00-00		
Description and Operation		1	ALL
General		1	
Maintenance Practices		201	ALL
Airworthiness Limitations		201	
STANDARD PRACTICES	20-10-00		
ALUMINUM FOIL MARKERS	20-10-14		
Removal/Installation		401	ALL
BEARINGS AND BUSHINGS	20-10-02		
Removal/Installation		401	ALL
COAXIAL CABLES	20-10-32		
Maintenance Practices		201	ALL
CONTROL CABLE AIR SEALS	20-10-04		
Removal/Installation		401	ALL
CONTROL CABLE GROMMETS	20-10-06		
Removal/Installation		401	ALL
CONTROL CABLE PULLEYS	20-10-07		
Removal/Installation		401	ALL
CONTROL CABLE QUICK STOPS	20-10-08		
Removal/Installation		401	ALL
CONTROL CABLES	20-10-03		
Removal/Installation		401	ALL
E/E RACK MOUNTED COMPONENTS	20-10-01		
Removal/Installation		401	ALL
ELECTRICAL BONDING	20-10-21		
Removal/Installation		401	ALL
Inspection/Check		601	ALL
FLARELESS TUBING ASSEMBLY	20-10-09		
Removal/Installation		401	ALL
Approved Repairs		801	ALL
FLEXIBLE HOSES AND TUBING	20-10-10		
Removal/Installation		401	ALL
Flexible Hose		401	
FLIGHT CONTROL SURFACES SAFETY HARNESS RECEPTACLE	20-10-27		
Maintenance Practices		201	ALL
FLOOR PANEL PROTECTION	20-10-25		
Maintenance Practices		201	ALL
FLUID LINE TUBING CLAMPS	20-10-11		
Removal/Installation		401	ALL

CHAPTER 20 – STANDARD PRACTICES – AIRFRAME

TABLE OF CONTENTS

Subject	Chapter Section Subject	Page	Effectivity
HARTWELL TYPE LATCHES	20-10-34		
Adjustment/Test		501	ALL
HEAT GUNS, SOLDERING GUNS AND SOLDERING IRONS	20-10-26		
Maintenance Practices		201	ALL
LOCKWIRES	20-10-23		
Removal/Installation		401	ALL
LUBRICATION FITTINGS	20-10-29		
Removal/Installation		401	ALL
METAL SURFACES	20-10-22		
Cleaning/Painting		701	ALL
O-RINGS	20-10-19		
Removal/Installation		401	ALL
POWER DEVICE CARTRIDGE	20-10-35		
Removal/Installation		401	ALL
PRESSURE-SENSITIVE DECALS	20-10-12		
Removal/Installation		401	ALL
Approved Repairs		801	ALL
PRESSURE-SENSITIVE PLACARDS	20-10-13		
Removal/Installation		401	ALL
RADIOLUMINOUS MATERIAL (DISPOSAL)	20-10-18		
Maintenance Practices		201	ALL
RECESSED BOSS SEAL FITTINGS	20-10-16		
Removal/Installation		401	ALL
RIG PINS	20-10-24		
Maintenance Practices		201	ALL
SEALS ON OPEN ELECTRICAL TERMINALS IN FLAMMABLE LEAKAGE ZONES	20-10-31		
Maintenance Practices		201	ALL
STENCIL MARKINGS	20-10-15		
Removal/Installation		401	ALL
TEFLON BACKUP RINGS	20-10-17		
Removal/Installation		401	ALL
TURNBUCKLE LOCKING CLIPS	20-10-05		
Removal/Installation		401	ALL
STANDARD TORQUE VALUES	20-11-00		
Maintenance Practices		201	ALL
SOFTWARE	20-15-00		
OFF-AIRPLANE SOFTWARE INSTALLATION	20-15-01		
Maintenance Practices		201	ALL

CHAPTER 20 - STANDARD PRACTICES - AIRFRAME

TABLE OF CONTENTS

Subject	Chapter Section Subject	Page	Effectivity
ON-AIRPLANE SOFTWARE INSTALLATION	20-15-11		
Maintenance Practices		201	ALL
INSPECTION/CHECK	20-20-00		
CONTROL CABLES	20-20-02		
Inspection/Check		601	ALL
SPECIFICATIONS AND MATERIALS	20-30-00		
Maintenance Practices		201	ALL
ADHESIVES, CEMENTS, SEALERS	20-30-01		
Maintenance Practices		201	ALL
CLEANERS AND POLISHES	20-30-02		
Maintenance Practices		201	ALL
CLEANING SOLVENTS - (SERIES 80)	20-30-80		
Maintenance Practices		201	ALL
CLEANING SOLVENTS - (SERIES 81)	20-30-81		
Maintenance Practices		201	ALL
CLEANING SOLVENTS - (SERIES 82)	20-30-82		
Maintenance Practices		201	ALL
CLEANING SOLVENTS - (SERIES 83)	20-30-83		
Maintenance Practices		201	ALL
CLEANING SOLVENTS - (SERIES 84)	20-30-84		
Maintenance Practices		201	ALL
CLEANING SOLVENTS - (SERIES 85)	20-30-85		
Maintenance Practices		201	ALL
CLEANING SOLVENTS - (SERIES 86)	20-30-86		
Maintenance Practices		201	ALL
CLEANING SOLVENTS - (SERIES 87)	20-30-87		
Maintenance Practices		201	ALL
CLEANING SOLVENTS - (SERIES 88)	20-30-88		
Maintenance Practices		201	ALL
CLEANING SOLVENTS - (SERIES 89)	20-30-89		
Maintenance Practices		201	ALL
CLEANING SOLVENTS - (SERIES 90)	20-30-90		
Maintenance Practices		201	ALL
CLEANING SOLVENTS - (SERIES 91)	20-30-91		
Maintenance Practices		201	ALL
CLEANING SOLVENTS - (SERIES 92)	20-30-92		
Maintenance Practices		201	ALL
CLEANING SOLVENTS - (SERIES 93)	20-30-93		
Maintenance Practices		201	ALL

CHAPTER 20 - STANDARD PRACTICES - AIRFRAME

TABLE OF CONTENTS

Subject	Chapter Section Subject	Page	Effectivity
CLEANING SOLVENTS - (SERIES 94)	20-30-94		
Maintenance Practices		201	ALL
CLEANING SOLVENTS - (SERIES 95)	20-30-95		
Maintenance Practices		201	ALL
CLEANING SOLVENTS - (SERIES 96)	20-30-96		
Maintenance Practices		201	ALL
CLEANING SOLVENTS - (SERIES 97)	20-30-97		
Maintenance Practices		201	ALL
CLEANING SOLVENTS - (SERIES 98 & 98-1)	20-30-98		
Maintenance Practices		201	ALL
CLEANING SOLVENTS - (SERIES 99)	20-30-99		
Maintenance Practices		201	ALL
FINISHING MATERIALS	20-30-03		
Maintenance Practices		201	ALL
LUBRICANTS	20-30-04		
Maintenance Practices		201	ALL
MISCELLANEOUS MATERIALS	20-30-07		
Maintenance Practices		201	ALL
STRIPPERS	20-30-05		
Maintenance Practices		201	ALL
GROUNDING	20-40-00		
STATIC GROUNDING	20-41-00		
Maintenance Practices		201	ALL
ELECTROSTATIC DISCHARGE SENSITIVE DEVICES	20-41-01		
Maintenance Practices		201	ALL
SPECIAL PROCEDURES	20-50-00		
HIRF/LIGHTNING PROTECTION	20-55-00		
HIRF/LIGHTNING PROTECTION - FQIS WIRING AND BONDING	20-55-54		
Inspection/Check		601	ALL
HIRF/LIGHTNING RESISTANCE MEASUREMENT	20-56-00		
HIRF/LIGHTNING - JOINT RESISTANCE MEASUREMENT	20-56-03		
Maintenance Practices		201	ALL
HIRF/LIGHTNING - LOOP RESISTANCE MEASUREMENT	20-56-02		
Maintenance Practices		201	ALL

CHAPTER 20 – STANDARD PRACTICES – AIRFRAME

TABLE OF CONTENTS

Subject	Chapter Section Subject	Page	Effectivity
HIRF/LIGHTNING – LOOP RESISTANCE TESTER (LRT)	20-56-01		
Maintenance Practices		201	ALL
MISCELLANEOUS	20-60-00		
CIRCUIT BREAKER CYCLING	20-60-05		
Maintenance Practices		201	ALL
CIRCUIT BREAKER RESET	20-60-01		
Maintenance Practices		201	ALL
CLEANING TO REMOVE COMBUSTIBLE MATERIAL AROUND WIRING (EZAP)	20-60-02		
Maintenance Practices		201	ALL
DETAILED WIRING INSPECTION (EZAP)	20-60-03		
Maintenance Practices		201	ALL
ELECTRONIC LRU CLEANING	20-60-06		
Maintenance Practices		201	ALL
GENERAL VISUAL INSPECTION OF WIRE BUNDLES (EZAP)	20-60-04		
Maintenance Practices		201	ALL
WIRE BUNDLE PROTECTION (EZAP)	20-60-07		
Maintenance Practices		201	ALL

STANDARD PRACTICES – GENERAL – DESCRIPTION AND OPERATION

1. General
   A. This chapter contains these five general sections:
      (1) Standard Practices
         (a) This section contains procedures which apply to many areas of the airplane. General maintenance practices, removal and installation, and cleaning and painting procedures are given in this section.
         (b) Some standard practices in this chapter apply to the engine buildup components. Standard practices that apply to the basic engine are given in Chapter 70, Standard Practices – Engine.
      (2) Standard Torque Values
         (a) This section contains the standard torque values applied to bolts, nuts, clamps, couplings, and tube fittings.
      (3) Inspection/Check
         (a) This section contains inspection conditions for the control cables.
      (4) Specifications and Materials
         (a) This section contains all of the consumable materials specified in the Maintenance Manual. The materials are divided into these six groups:
            1) Adhesives, Cements, and Sealers – AMM 20-30-01/201
            2) Cleaners and Polishers – AMM 20-30-02/201
            3) Finishing Materials – AMM 20-30-03/201
            4) Lubricants – AMM 20-30-04/201
            5) Strippers – AMM 20-30-05/201
            6) Miscellaneous Materials – AMM 20-30-07/201
      (5) Grounding
         (a) This section contains procedures to attach a static ground onto the airplane and precautions for electrostatic sensitive devices.

TASK 20-00-00-912-001

1. Airworthiness Limitation Precautions

A. General

(1) Critical Design Configuration Control Limitations (CDCCLs)

(a) All occurrences of CDCCLs found in this chapter of the AMM are identified by this note after each applicable CDCCL design feature:

1) NOTE: CDCCL - Refer to the task: Airworthiness Limitation Precautions (AMM 20-00-00/201), for important information on Critical Design Configuration Control Limitations (CDCCLs).

(b) Design features that are CDCCLs are defined and controlled by Special Federal Aviation Regulation (SFAR) 88, and can be found in Section 9 of the Maintenance Planning Data (MPD) document. CDCCLs are a means of identifying certain design configuration features intended to preclude a fuel tank ignition source for the operational life of the airplane. CDCCLs are mandatory and cannot be changed or deleted without the approval of the FAA office that is responsible for the airplane model Type Certificate, or applicable regulatory agency. A critical fuel tank ignition source prevention feature may exist in the fuel system and its related installation or in systems that, if a failure condition were to develop, could interact with the fuel system in such a way that an unsafe condition would develop without this limitation. Strict adherence to configuration, methods, techniques, and practices as prescribed is required to ensure the CDCCL is complied with. Any use of parts, methods, techniques or practices not contained in the applicable CDCCL must be approved by the FAA office that is responsible for the airplane model Type Certificate, or applicable regulatory agency.

(2) Airworthiness Limitation Instructions (ALIs)

(a) All occurrences of fuel tank system ALIs found in this chapter of the AMM are identified by this step after the General section in the applicable ALI inspection task:

1) ALI - Refer to the task: Airworthiness Limitation Precautions (AMM 20-00-00/201), for important information on airworthiness limitation instructions (ALIs).

(b) Inspection tasks that are ALIs are defined and controlled by Special Federal Aviation Regulation (SFAR) 88, and can be found in Section 9 of the Maintenance Planning Data (MPD) document. These ALIs identify inspection tasks related to fuel tank ignition source prevention which must be done to maintain the design level of safety for the operational life of the airplane. These ALIs are mandatory and cannot be changed or deleted without the approval of the FAA officethat is responsible for the airplane model Type Certificate, or applicable regulatory agency. Strict adherence to methods, techniques and practices as prescribed is required to ensure the ALI is complied with. Any use of methods, techniques or practices not contained in these ALIs must be approved by the FAA office that is responsible for the airplane model Type Certificate, or applicable regulatory agency.

(3) Equivalent Tools, Fixtures, Test Equipment, and Consumable Materials

(a) Some of the procedures in this manual identify tools, equipment, and consumable materials but you can use equivalent alternatives. If you use alternate tools, equipment, or consumable materials, make sure they give the same results and are as safe to the parts and personnel as the tools, equipment, or consumable materials specified in the procedure.

B. Access

(1) Location Zones

100 Lower Half of Fuselage
200 Upper Half of Fuselage
500 Left Wing
600 Right Wing

C. Critical Design Configuration Control Limitations (CDCCLs)

S 912-002

WARNING: OBEY THE MANUFACTURER'S PROCEDURES WHEN YOU DO MAINTENANCE THAT HAS AN EFFECT ON A CDCCL. IF YOU DO NOT OBEY THE PROCEDURES, IT CAN INCREASE THE THE RISK OF A FUEL TANK IGNITION SOURCE.

(1) Make sure that you obey the procedures for items identified as CDCCLs.

D. Airworthiness Limitation Instructions (ALIs)

S 912-003

WARNING: OBEY THE MANUFACTURER'S PROCEDURES WHEN YOU DO MAINTENANCE THAT HAS AN EFFECT ON A ALI. IF YOU DO NOT OBEY THE PROCEDURES, IT CAN INCREASE THE THE RISK OF A FUEL TANK IGNITION SOURCE.

(1) Make sure that you obey the procedures for tasks identified as ALIs.

E/E RACK MOUNTED COMPONENTS - REMOVAL/INSTALLATION

1. General
   A. This procedure contains four tasks. The first task is the removal of the electrical/electronic (E/E) box from the rack. The second task is the installation of the E/E box. The third task is the removal of the circuit card assembly from the rack. The fourth task is the installation of the circuit card assembly.

TASK 20-10-01-004-005

2. Removal of the E/E Box (Fig. 401)
   A. References
      (1) AMM 20-41-01/201, Electro-Static Sensitive Devices
   B. Remove the E/E Box

S 864-006

(1) Open the applicable circuit breakers to remove electrical power.

S 034-007

(2) Remove the connections from the front of the E/E box, if applicable.

S 914-001

CAUTION: DO NOT TOUCH THE E/E BOXES BEFORE YOU DO THE PROCEDURE FOR DEVICES THAT ARE SENSITIVE TO ELECTROSTATIC DISCHARGE (AMM 20-41-01/201). SOME E/E BOXES ARE ELECTROSTATIC SENSITIVE. ELECTROSTATIC DISCHARGE CAN CAUSE DAMAGE TO DEVICES IN THE E/E BOX.

(3) Do the procedure for devices that are sensitive to electrostatic discharge (AMM 20-41-01/201).

S 034-008

(4) Turn the knob on the front hold-down extractor counterclockwise to disengage the clutch.

S 864-009

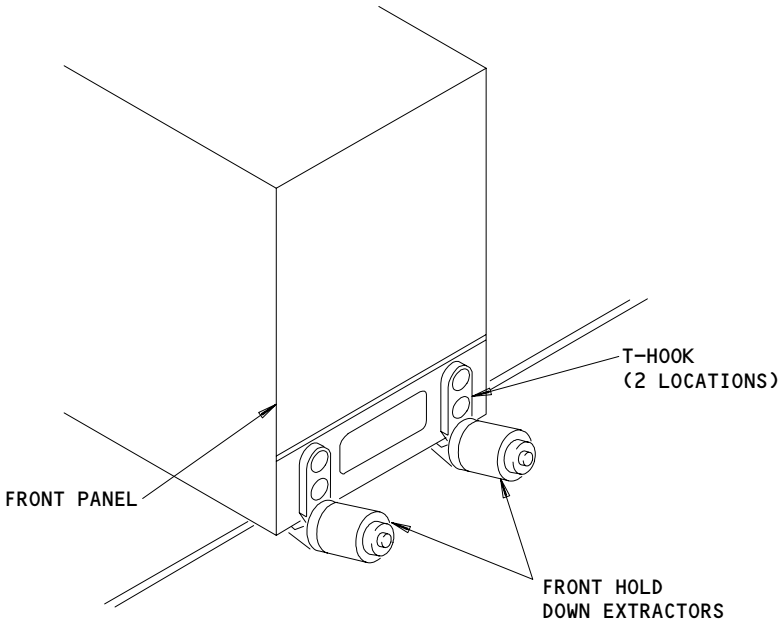
(5) Turn the keeper to align the deep slot with the T-hook. Lower the front hold-down extractor to be clear of the T-hook.

NOTE: Apply light pressure down on the E/E box handle while you disconnect the front hold-down extractor.

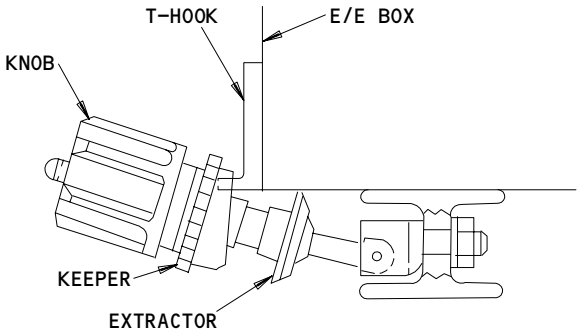
S 024-010

(6) Carefully move the E/E box out from the tray and remove the E/E box.

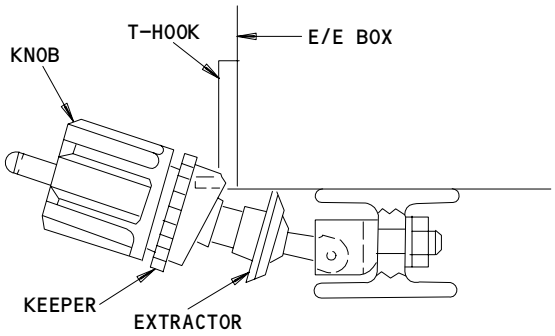
NOTE: Shake the front of the E/E box from right to left for approximately 1/8 inch to help disconnect the E/E box from the electrical connector.



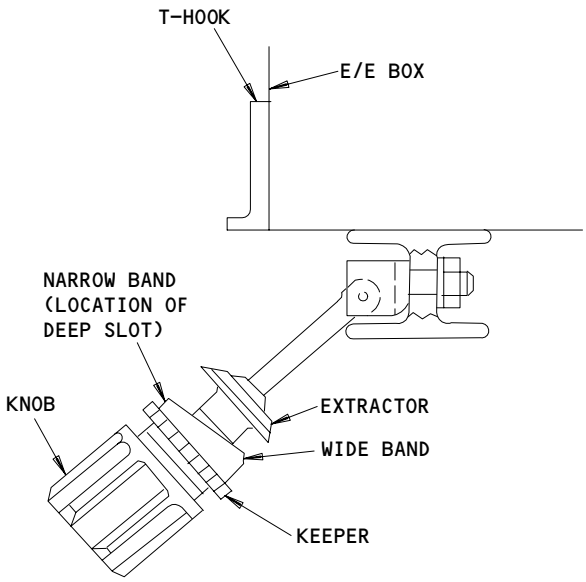
INSTALLED E/E BOX



INSTALLED E/E BOX WITH THE EXTRACTOR LOOSENED



INSTALLED E/E BOX WITH THE EXTRACTOR TIGHTENED



EXTRACTOR FREE POSITION

E/E Box Installation
Figure 401

S 434-011

(7) Install the dust cap on the E/E box electrical connector and the tray electrical connector.

TASK 20-10-01-404-013

3. Installation of the E/E Box

A. References

(1) AMM 20-41-01/201, Electro-Static Sensitive Devices

B. Install the E/E Box

S 214-014

(1) Make sure the rubber plugs are installed in the metering tray at the correct locations. Compare the orifice configuration on the metering tray with the one shown on the decal.

S 034-015

(2) Remove the dust caps from the electrical connectors.

S 214-016

(3) Make sure the tray gasket and restrictor plugs (variable number) are in the correct positions. Install if necessary.

S 214-017

(4) Visually make sure the guide pins on the tray will connect with the E/E box.

S 214-008

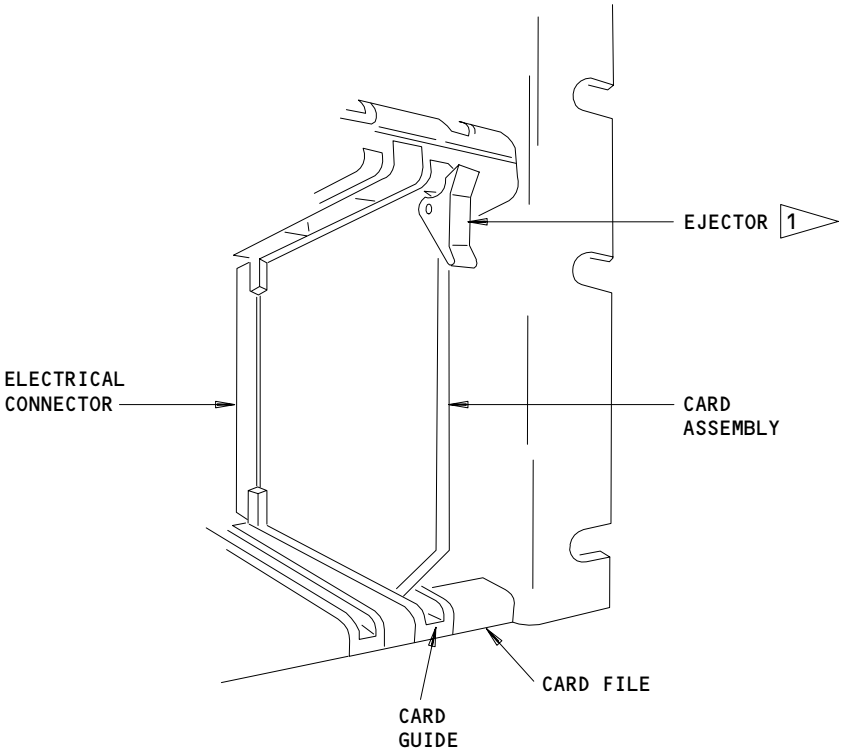
CAUTION: MAKE SURE THE ELECTRICAL PINS ON THE E/E BOX CONNECTOR AND TRAY CONNECTOR ARE NOT BENT OR DAMAGED. INSTALLATION OF THE E/E BOX WITH DAMAGED PINS CAN CAUSE DAMAGE TO THE E/E BOX, THE TRAY ELECTRICAL CONNECTOR, OR THE SYSTEM COMPONENTS.

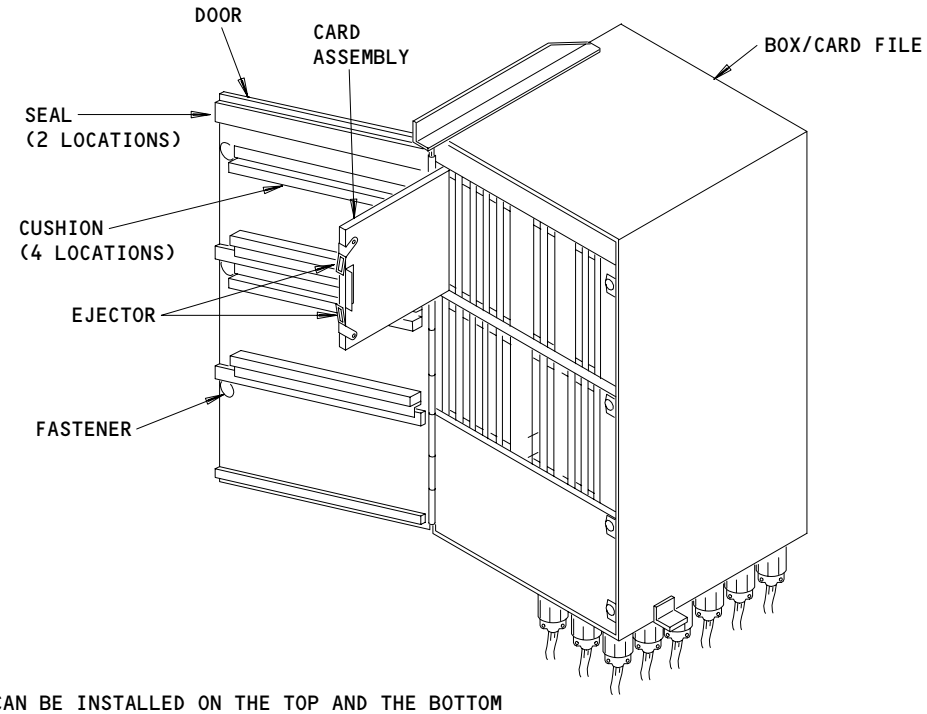
(5) Visually make sure the electrical pins of the E/E box and tray connector are not bent or damaged. Replace damaged components.

S 914-002

CAUTION: DO NOT TOUCH THE E/E BOXES BEFORE YOU DO THE PROCEDURE FOR DEVICES THAT ARE SENSITIVE TO ELECTROSTATIC DISCHARGE (AMM 20-41-01/201). SOME E/E BOXES ARE ELECTROSTATIC SENSITIVE. ELECTROSTATIC DISCHARGE CAN CAUSE DAMAGE TO DEVICES IN THE E/E BOX.

(6) Do the procedure for devices that are sensitive to electrostatic discharge (AMM 20-41-01/201).





1 CAN BE INSTALLED ON THE TOP AND THE BOTTOM

E/E Card Assembly Installation
Figure 402

S 424-003
(7) Carefully start to install the E/E box into the tray.

NOTE: For easier installation of the E/E box, lift the front of the E/E box approximately 1/8 inch above the tray surface.

S 424-019
(8) Continue to move the E/E box into the tray and engage the electrical connector.

NOTE: The E/E box will engage with the electrical connector easier if you shake the front of the E/E box from right to left for approximately 1/8 inch. While you shake the box, apply a light horizontal force to the front of the E/E box.

S 824-020
(9) Turn the keeper to put the deep slot near to and aligned with the T-hook.

S 434-021
(10) Put the extractor on the T-hook and turn the keeper 180 degrees.

S 434-022
(11) To tighten the front hold-down extractor, turn the knob clockwise until the clutch engages fully.

NOTE: You will feel clicks while you turn the knob.

S 214-023
(12) Shake the E/E box to make sure of a tight fit. Tighten the extractor.

S 214-024
(13) Make sure the electrical connector is engaged.

S 434-025
(14) Install the connections to the front of the E/E box, if applicable.

S 864-026
(15) Close all applicable circuit breakers.

TASK 20-10-01-004-043

4. Removal of the Circuit Card Assembly (Fig. 402)

A. References

(1) AMM 20-41-01/201, Electrostatic Sensitive Devices

B. Procedure

S 864-044

(1) Open applicable circuit breakers to remove electrical power.

S 014-045

(2) Open the card file door.

S 914-006

CAUTION: DO NOT TOUCH THE CARD ASSEMBLIES BEFORE YOU SO THE PROCEDURE FOR DEVICES THAT ARE SENSITIVE TO ELECTROSTATIC DISCHARGE. CARD ASSEMBLIES ARE ELECTROSTATIC SENSITIVE. ELECTROSTATIC DISCHARGE CAN CAUSE DAMAGE TO DEVICES IN THE CARD ASSEMBLIES.

(3) Do the procedure for devices that are sensitive to electrostatic discharge (AMM 20-41-01/201).

S 034-046

(4) Turn the ejectors on the card assembly until the card is loose in the guide.

S 024-047

(5) Carefully move the card out along the guide.

S 024-048

(6) Remove the card assembly.

TASK 20-10-01-404-011

5. Installation of the Card Assembly

A. References

(1) AMM 20-41-01/201, Electrostatic Sensitive Devices

B. Procedure

S 914-007

CAUTION: DO NOT TOUCH THE CARD ASSEMBLIES BEFORE YOU DO THE PROCEDURE FOR DEVICES THAT ARE SENSITIVE TO ELECTROSTATIC DISCHARGE. CARD ASSEMBLIES ARE ELECTROSTATIC SENSITIVE. ELECTROSTATIC DISCHARGE CAN CAUSE DAMAGE TO DEVICES IN THE CARD ASSEMBLIES.

(1) Do the procedure for devices that are sensitive to electrostatic discharge (AMM 20-41-01/201).

S 424-049
(2) Put the card assembly into the guide. Carefully push the card in until it correctly engages with the electrical connector.

S 214-050
(3) Make sure the ejectors touch the card.

S 864-051
(4) Close the applicable circuit breakers.

S 414-052
(5) Close the card file door.

BEARINGS AND BUSHINGS - REMOVAL/INSTALLATION

TASK 20-10-02-904-001

1. Bearings and Bushings - Removal/Installation

A. Procedure

S 904-002

(1) For the removal and installation of bearings and bushings, refer to SOPM 20-50-03.

CONTROL CABLES - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks. The first task is the removal of control cables. The second task is the installation of control cables.
   B. This procedure includes prefabricated and not prefabricated cables to make installation easier when portable swaging machines are available.
   C. If this procedure does not agree with specified maintenance procedures, use the specified maintenance procedure.
   D. The maintenance manual location for control cable fabrication data is found in Table 401

TABLE 401

CABLE	MM LOCATION
ENGINE THRUST CONTROL	76-11-03-2
FLIGHT CONTROLS	
- AILERON	27-00-01-2
- ELEVATOR	27-00-01-2
- FLAP/SLAT	27-00-01-2
- RUDDER	27-00-01-2
- STABILIZER TRIM	27-00-01-2
LANDING GEAR	
- ALTERNATE EXTENSION	32-00-25-2
- BRAKES	32-00-25-2
- DOOR GROUND RELEASE	32-00-25-2
- EXTENSION/RETRACTION	32-00-25-2
- NOSE WHEEL STEERING	32-00-25-2

TASK 20-10-03-004-002

2. Remove Control Cables
   A. Equipment
      (1) Cable Clamps - A20005-9

(2) Rig Pins - A20004-XX

B. Consumable Materials

(1) G00270 Masking Tape

C. References

(1) AMM 20-10-04/401 Control Cable Air Seal

(2) AMM 20-10-05/401 Clips - Turnbuckle Locking

(3) AMM 20-10-08/401 Control Cable Quick Stops

D. Procedure

S 934-003

(1) Use masking tape to make a mark on the cable and fittings.

NOTE: The masking tape lets you refer to the initial position when you install the new cable.

S 034-004

(2) Loosen the turnbuckles to release the tension (AMM 20-10-05/401).

S 034-005

(3) If you remove the applicable engine control cable section, remove the cable stops (AMM 20-10-08/401).

S 034-006

(4) If applicable, remove the control cable air seal (AMM 20-10-04/401).

S 434-007

(5) Install cable clamps on the cable you do not remove to keep light tension on the cable. If you can isolate the cable between the rigging pin locations, install the rigging pin through the applicable drum or quadrant.

NOTE: Light tension on the cable that you do not remove will prevent wind off on the cable drums. Light tension will also make sure the cables do not move out of the pulley guides.

S 834-008

(6) Install the new cable at the same time you remove the old cable. Use the old cable to pull the new cable into position.

NOTE: If you do not attach the new cable to the old cable before you remove the old cable, you will have a problem routing the new cable.

WIRE ROPE TYPE		CABLE DIAMETER (INCHES) 1									
		1/16	3/32	1/8	5/32	3/16	7/32	1/4	9/32	5/16	3/8
		PROOF LOAD (POUNDS)									
BMS 7-265 OR MIL-W-83420 COMP. "A" (CARBON STEEL)	7 x 7	288 +25 -0	552 +25 0	---	---	---	---	---	---	---	---
	7 x 19	---	600 +25 -0	1200 +60 -0	1680 +85 -0	2520 +125 -0	3360 +170 -0	4200 +210 -0	4800 +240 -0	5880 +295 -0	8640 +435 -0
BMS 7-265 OR MIL-W-83420 COMP. "B" (CRES)	7 x 7	288 +25 -0	552 +25 -0	---	---	---	---	---	---	---	---
	7 x 19	---	552 +25 -0	1056 +50 -0	1440 +70 -0	2220 +110 -0	3000 +150 -0	3840 +190 -0	4680 +230 -0	5400 +270 -0	7200 +360 -0

PROOF LOADS FOR CABLE ASSEMBLIES

MATERIAL:

CABLE - CARBON STEEL PER BMS 7-265, TYPE I, COMPOSITION A (TZ) (PREFERRED)
- CARBON STEEL PER BMS 7-265, TYPE I, COMPOSITION A (FIRST OPTION)
- CARBON STEEL PER MIL-W-83420, TYPE I, COMPOSITION A (SECOND OPTION)
- CARBON STEEL PER MIL-W-1511 (THIRD OPTION)

INTERCHANGABILITY INFORMATION:

YOU SHOULD REPLACE CABLES FOR BOTH SIDES OF A SYSTEM IF ONE OR BOTH SIDES HAS A BAD CABLE. USE CABLES OF THE SAME TYPE FOR BOTH SIDES. THIS WILL PREVENT UNEVEN CABLE STRETCH THAT CAN CAUSE PROBLEMS WITH THE RIGGING OF THE SYSTEM.

1 PROOF-LOADING OF NYLON JACKETED CABLE SHALL BE BASED UPON THE DIAMETER OF THE WIRE ROPE ONLY. DO NOT INCLUDE THE JACKET AS PART OF THE DIAMETER

Control Cables Installation
Figure 401

TASK 20-10-03-404-037

3. Install Control Cables

A. Equipment
   (1) Tensiometer - Commercially available.
   (2) Cable Clamps - A20005-9
   (3) Rig Pins - A20004-XX
   (4) AT520JK Cable Swager Kit

B. Consumable Materials
   (1) D00633 Grease, Corrosion Preventive - BMS 3-33 (Preferred)
   (2) D00015 Grease, Corrosion Preventive - BMS 3-24 (Alternate)
   (3) G00034 Cloth - Lint-free, dry
   (4) G00270 Masking Tape

C. References
   (1) AMM 20-10-04/401 CONTROL CABLE AIR SEAL
   (2) AMM 20-10-05/401 CLIPS-TURNBUCKLE LOCKING
   (3) AMM 20-10-07/401 CONTROL CABLE PULLEYS
   (4) AMM 20-10-08/401 CONTROL CABLE QUICK STOPS

D. Install Prefabricated Cable.

NOTE: You may wish to replace zinc-only coated cables with tin-over-zinc coated cables to minimize the amount of initial cable stretch.

S 014-009

(1) Remove the necessary pulleys (AMM 20-10-07/401) and control cable air seals (AMM 20-10-04/401). See the applicable chapter for cable location.

S 834-010

(2) Attach the new cable to the old cable. Pull the old cable out, which pulls the new cable through at the same time. Keep light tension on the new cable.

NOTE: If you do not attach the new cable to the old cable, you will have a problem in routing the new cable.

S 414-011

(3) Install the pulley (AMM 20-10-07/401) and control cable air seals (AMM 20-10-04/401).

S 434-035

(4) Finish installation according to procedures given in Section E.

E. Install Nonprefabricated Cable.

NOTE: You may wish to replace zinc-only coated cables with tin-over-zinc coated cables to minimize the amount of initial cable stretch.

S 834-012
(1) Identify the cable you remove. Prepare a new cable as told in the applicable system chapter.

S 434-013
(2) Install only those fittings that will permit cable installation.

S 424-039
(3) Use the portable cable swager kit to install the fittings.

S 834-014
(4) Apply proof load (Fig. 401) to the cable and installed fittings to do a check on the swaging and to make the cable longer initially.

NOTE: If you use prestretched cable, you do not have to put a load on all of the cable. You do not have to use proof load. You can use other applicable prodceures to do a check on the swaging.

S 164-015
(5) Rub the full length of the cable with a dry, lint-free cloth.

S 644-016
(6) Apply a light thin layer of grease to carbon steel cables, then wipe the cable with a clean rag to leave a thin film of grease between the wires on the cable. Do not grease CRES cables, they should only be wiped with a clean rag wetted with a light lubrication oil.

S 934-018
(7) Make marks on the positions of the fittings not installed on the cable before installation.

S 834-019
(8) Put tape on the old cable so it will not unravel.

S 834-001
(9) Cut off the cable end fitting of the old cable and make a splice to attach the old cable to the new cable.

NOTE: If you do not attach the new cable to the old cable, you will have a problem in routing the new cable. Make the splice of minimum diameter and sufficiently strong not to break when you pull the cable through. Make the splice on only the center strands of the cable. Put tape on the loose outer strands.

S 834-020
(10) Pull the old cable out with light tension on the new cable.

S 434-021
(11) Install the remaining fittings and apply a proof load to fittings (Fig. 401).

NOTE: You must apply the full proof load gradually. You must apply the full proof load in more than three seconds. You must hold the full proof load for at least five seconds.

S 434-036
(12) Finish installation according to procedures given in Section E.

F. Finish Installation (general)

S 164-022
(1) If necessary, remove unwanted material from the surface of the control cable with a dry, lint-free cloth. Clean the full length of travel through the fairleads, air seals, over the pulleys, quadrants, and drums.

S 644-023
(2) Apply a light thin layer of grease to carbon steel cables, then wipe the cable with a clean rag to leave a thin film of grease between the wires on the cable. Do not grease CRES cables, they should only be wiped with a clean rag wetted with a light lubrication oil.

S 434-024
(3) Install the turnbuckles with the turnbuckle barrel installed an equal distance on the two threaded terminals. Do not let more than three threads show out of the barrel.

S 034-025
(4) Remove the cable clamps and rigging pins from the control cable and drums.

S 434-026

(5) Tighten the cable as told in the temperature - tension chart in the system chapter.

NOTE: Use a tensiometer to do a check on the cable tension. Apply the tensiometer to the cable at least six inches from the turnbuckle terminal or other fittings. To make sure you have the correct cable tension, permit a minimum of one hour at constant ambient temperature (±5°F) for airplane temperature to become stable.

S 714-027

(6) If a new cable is installed, operate the system for a number of test cycles, with cables tightened to two times the working tension. See the applicable chapter for tension specifications.

S 834-028

(7) Make the last rigging adjustments. Refer to the applicable chapter for rigging load and test cycle tables.

S 214-029

(8) Make sure the air seals are correctly adjusted after installation (AMM 20-10-04/401).

NOTE: Correctly adjusted seals stop deflection of the cable and make sure the cable is free to move.

S 244-034

(9) The minimum clearances for control cables are as follows except when noted:

NOTE: The clearances that follow are general guidelines only. Refer to the applicable chapter to find any special conditions for a specific system.

(a) Between different cable systems:
1) The minimum dimension is 0.50 inch.

NOTE: A clearance of 2.00 inch is recommended.

(b) Between structure, wiring, tubing and fixed equipment:
1) The minimum dimension at a fairlead is 0.50 inch, the minimum dimension at a rubstrip is 0.10 inch.

NOTE: A clearance of 1.50 inches is recommended below the cable and 1.00 inches is recommended in the other directions.

(c) Between landing gear, doors and components that move:
1) The minimum dimension is 2.00 inches.

NOTE: A clearance of 4.00 inches is recommended.

S 434-030
(10) Install the turnbuckle locking clips on all the turnbuckles adjusted (AMM 20-10-05/401).

S 434-031
(11) Install the cable stop if applicable (AMM 20-10-08/401).

S 714-032
(12) Operate controls through full travel to make sure that they move freely and that too much force is not necessary.

CONTROL CABLE AIR SEAL - REMOVAL/INSTALLATION

1. General
   A. This procedure contains one task. The task is the replacement of the control cable air seal.

   TASK 20-10-04-964-001

2. Replacement of Control Cable Air Seal
   A. Consumable Materials
      (1) D00633 Grease, Corrosion Preventive BMS 3-33 (Preferred)
      (2) D00015 Grease, Corrosion Preventive BMS 3-24 (Alternate)
   B. Remove the Control Cable Air Seal (Fig. 401)

      S 034-002
      (1) Remove the seal retaining bolts.

      S 034-003
      (2) Remove the ball (2 pieces) from the seal cover.

      S 024-004
      (3) If it is necessary to replace the seal plate or seal cover, do these steps:
         (a) Disconnect the turnbuckle adjacent to the pressure bulkhead.
         (b) Remove the seal cover and the seal plate from the bulkhead.
   C. Install the Control Cable Air Seal (Fig. 401)

      S 424-005
      (1) If you removed the seal plate or seal cover, do these steps:
         (a) Replace them on the control cable.
         (b) Adjust the control cable as told in the system rigging instructions.

      S 644-006
      (2) Apply grease to carbon steel cable for its full length of travel in the seal per AMM 12-21-31/301.

      NOTE: Do not fill the seal with grease. Do not apply grease or oil to stainless steel control cables.

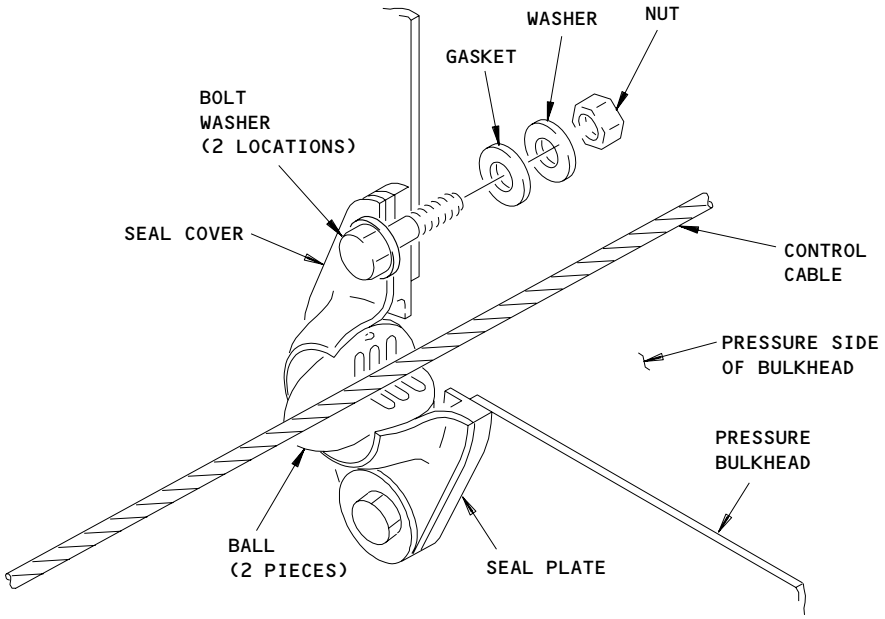
      S 434-007
      (3) Install the gasket to the pressure bulkhead.

      S 434-008
      (4) Connect the two ball pieces on the cable between the seal cover and seal plate.

S 434-009
(5) Loosely install the seal retaining bolts and washers.

S 434-011
(6) Adjust the seal to give minimum cable deflection and tighten the seal retaining bolts.

S 204-010
(7) Make sure the cable pressure seals are correctly adjusted after installation .
(a) Make sure there is no cable deflection.



Control Cable Air Seal Installation
Figure 401

(b) Make sure the cable moves freely.

CLIPS - TURNBUCKLE LOCKING - REMOVAL/INSTALLATION

1. General
   A. This procedure contains one task. The task is the replacement of the turnbuckle locking clips.

   TASK 20-10-05-964-001

2. Replacement of Turnbuckle Locking Clips
   A. Remove the Turnbuckle Locking Clips (Fig. 401)

      S 034-002
      (1) Twist the turnbuckle locking clip and push the locking hook out of the hole in the center of the turnbuckle barrel.

      S 024-003
      (2) Move the turnbuckle locking clip out from the turnbuckle slot.

   B. Install the Turnbuckle Locking Clips (Fig. 401)

      S 434-004

      CAUTION: DO NOT USE THE TURNBUCKLE LOCKING CLIPS AGAIN. THEY CAN BE DEFECTIVE IF USED AGAIN.

      (1) Tighten the turnbuckle until not more than three threads are out of the barrel and until you have correct cable tension.

      S 824-005
      (2) Align the slot in the barrel and the cable terminal.

      S 434-006
      (3) Put the straight end of the locking clip into the aligned slot.

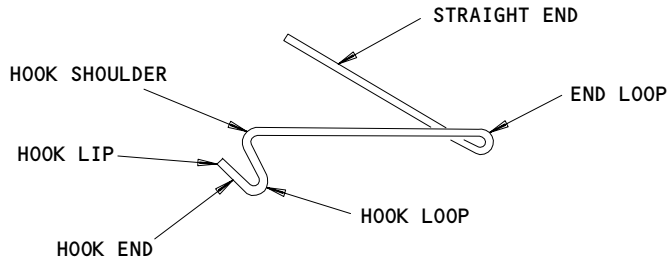
      S 424-007
      (4) Put the locking clip hook over the hole in the center of the turnbuckle. Engage the hook into the hole.

      S 424-008
      (5) Push the hook shoulder to engage the hook in the turnbuckle.

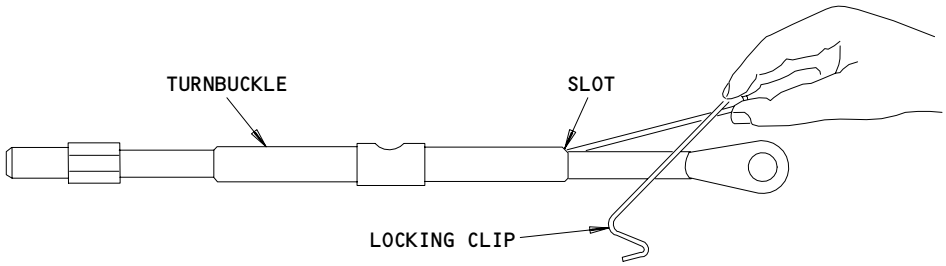
      S 424-009
      (6) Do the last four steps again to lock the second terminal.

      NOTE: You can put the locking clips in the same side or in the opposite side of the turnbuckle holes.

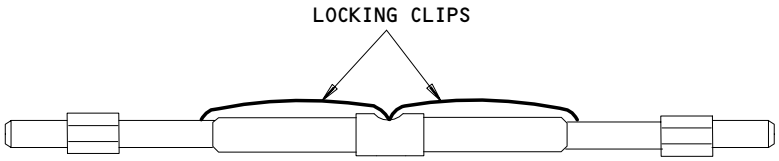
      S 824-010
      (7) To make sure the two turnbuckle locking clips are correctly installed, turn the turnbuckle slightly.



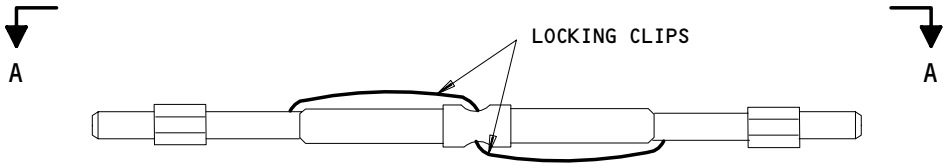
LOCKING CLIP



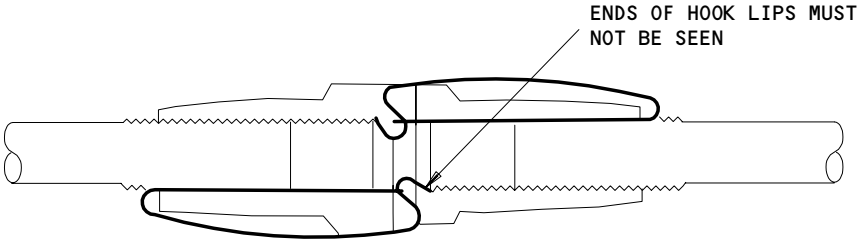
INSERT CLIP IN SLOT



LOCKING CLIP INSERTED IN SAME TURNBUCKLE BARREL HOLE



LOCKING CLIP INSERTED IN OPPOSITE TURNBUCKLE BARREL HOLE



A–A

Turnbuckle Locking Clip
Figure 401

S 214-011

(8) Visually examine the turnbuckle locking clip to make sure the hook is engaged in the turnbuckle.

CONTROL CABLE GROMMET - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks. The first task is the removal of the control cable grommet. The second task is the installation of the control cable grommet.
   B. You can replace the control cable grommets in the 3/4, 1, and 1-1/4 inch holes with the control cable removed or installed. You have two alternatives for the replacement of an NAS1368 plastic grommet with the control cable installed:
      - You can use a replacement NAS1368 grommet and cut one side of the grommet for installation
      - You can use a BACG20H nylon grommet, which is a divided grommet.

TASK 20-10-06-964-001

2. Replacement of the Grommets
   A. Equipment
      (1) Sharp Knife, Razor Blade, or Equivalent Equipment
      (2) Grommet Installation Set - A20006-32
   B. Consumable Materials
      (1) A00273 Adhesive, BMS 5-126 Type 2 Class 1 or Type 3 Class 1
      (2) A00119 Adhesive, BMS 5-55
      (3) B01051 Solvent - Cleaning of Phenolics or Nylon Series 98-1 (AMM 20-30-98/201)
   C. Remove the Grommet

      S 024-002

      (1) Cut the grommet to remove the grommet from the bulkhead.
   D. Install the Grommet with the Control Cable Removed (Fig. 401).

      S 114-003

      WARNING: DO NOT GET SOLVENTS IN YOUR MOUTH, OR YOUR EYES, OR ON YOUR SKIN. DO NOT BREATHE THE FUMES FROM SOLVENTS. SOLVENTS ARE HAZARDOUS MATERIALS. SOLVENTS MAY BE FLAMMABLE OR HARMFUL TO THE ENVIRONMENT. REFER TO PRODUCT MATERIAL SAFETY DATA SHEETS (MSDS) AND LOCAL REQUIREMENTS FOR PROPER HANDLING PROCEDURES.

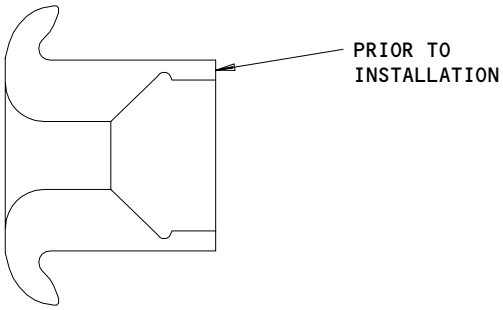
      (1) Clean the bulkhead area that will touch the grommet with solvent (Series 98-1) (AMM 20-30-98/201).

      S 644-004

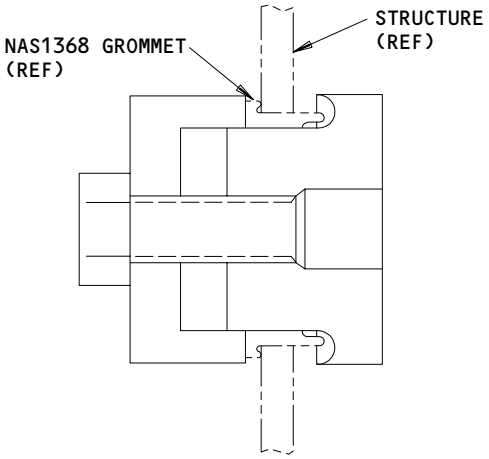
      (2) Apply BMS 5-126 adhesive on the NAS1368 grommet area that will touch the bulkhead.

      S 424-005

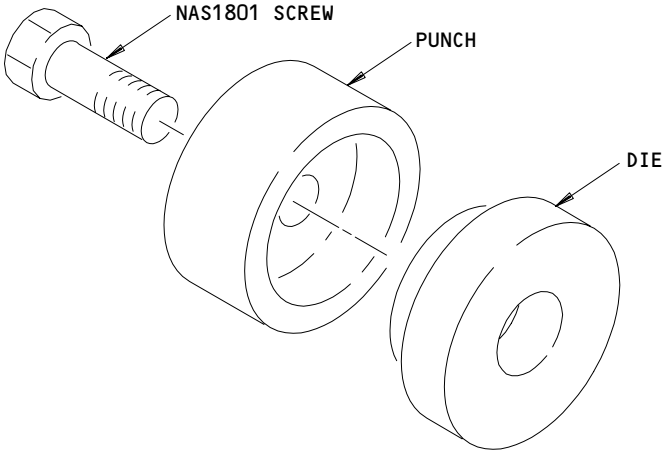
      (3) Install the grommet in the bulkhead hole.



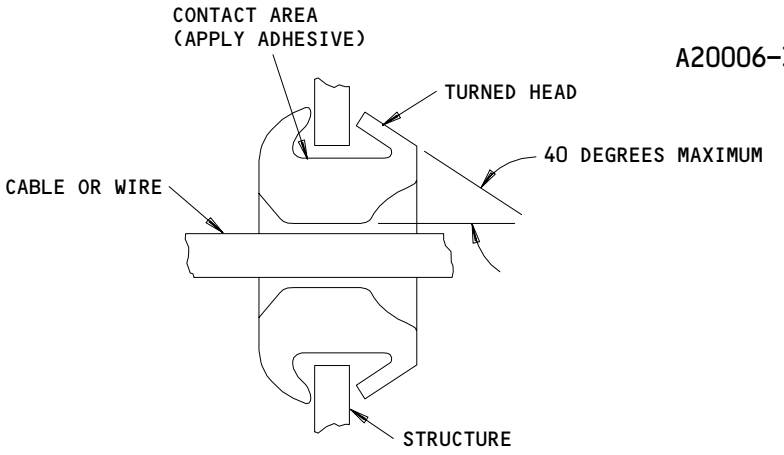
NAS1368 GROMMET



GROMMET DURING INSTALLATION



A20006-32 GROMMET INSTALLATION SET



GROMMET INSTALLED

FLIP-TYPE CABLE GROMMET (NAS1368)

Control Cable Grommets Installation
Figure 401

S 824-011

(4) Put the Grommet Installation Set tool around the grommet and tighten the NAS1801 screw.

S 024-013

(5) Remove the Grommet Installation Set tool.

NOTE: The grommet can be loose in the bulkhead hole, but you have to cut the grommet to remove the grommet from the hole.

E. Install the Grommet with the Control Cable Installed (Fig. 401).

S 114-012

WARNING: DO NOT GET SOLVENTS IN YOUR MOUTH, OR YOUR EYES, OR ON YOUR SKIN. DO NOT BREATHE THE FUMES FROM SOLVENTS. SOLVENTS ARE HAZARDOUS MATERIALS. SOLVENTS MAY BE FLAMMABLE OR HARMFUL TO THE ENVIRONMENT. REFER TO PRODUCT MATERIAL SAFETY DATA SHEETS (MSDS) AND LOCAL REQUIREMENTS FOR PROPER HANDLING PROCEDURES.

(1) Clean the bulkhead area that will touch the grommet with solvent (Series 98-1) (AMM 20-30-98/201).

S 424-007

(2) Use these steps to install the NAS1368 grommet:
   (a) Put the Grommet Installation Set tool around the grommet and tighten the NAS1801 screw.
   (b) Remove the Grommet Installation Set tool.
   (c) Cut one side of the NAS1368 grommet.
   (d) Place the grommet over the control cable.
   (e) Apply BMS 5-126 adhesive on the NAS1368 grommet area that will touch the bulkhead.
   (f) Install the grommet in the bulkhead hole.
   (g) Align the slit part of the grommet at the 12 o'clock position.

S 424-008

(3) Do this step to install the BACG20H grommet:
   (a) Apply BMS 5-55 adhesive on the BACG20H grommet area that will touch the bulkhead.
   (b) Install the grommet in the bulkhead hole.
   (c) Align the slit part of the grommet at the 12 o'clock position.

CONTROL CABLE PULLEYS - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks. The first task is the removal of the control cable pulleys. The second task is the installation of the control cable pulleys.
   B. Figure 401 shows examples of control cable pulleys. If this procedure does not agree with specified maintenance procedures, use the specified maintenance procedures.

TASK 20-10-07-004-001

2. Remove the Control Cable Pulleys (Fig. 401)
   A. Equipment
      (1) Control Cable Clamps - A20005-9
      (2) Rig Pins - A20004-XX
   B. Procedure

S 034-002

(1) Loosen the turnbuckle nearest to the control cable pulley to release tension (AMM 20-10-05/401).

S 034-003

(2) Install cable clamps on the cable between the pulley to keep light tension. If you can isolate the cable section between the rigging pin locations, install the rigging pins through the applicable drum or quadrant.

NOTE: Keep light tension on cables not removed so that cable drums will not unwrap and the cable will not move out of the pulley guides.

S 034-004

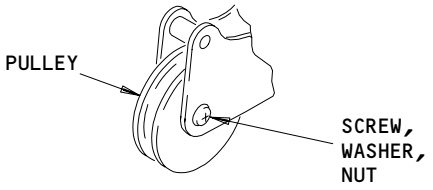
(3) Remove the bolt from the pulley disk.

S 024-005

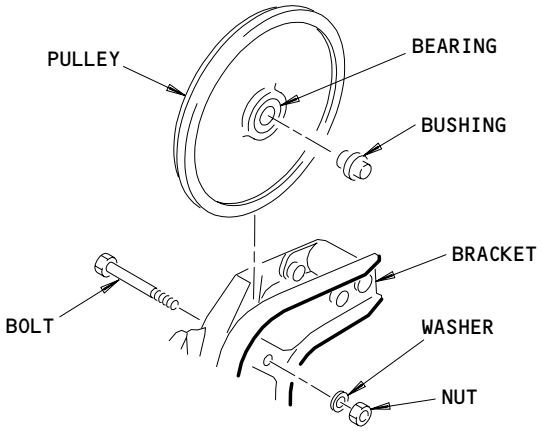
(4) Remove the pulley disk.

TASK 20-10-07-404-006

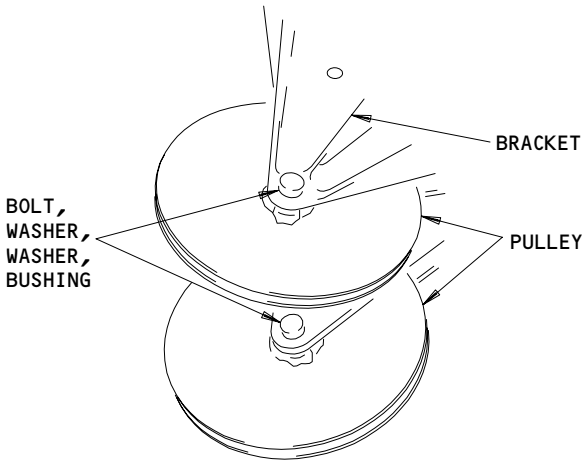
3. Install the Control Cable Pulley (Fig. 401)
   A. Equipment
      (1) Control Cable Clamps - A20005-9



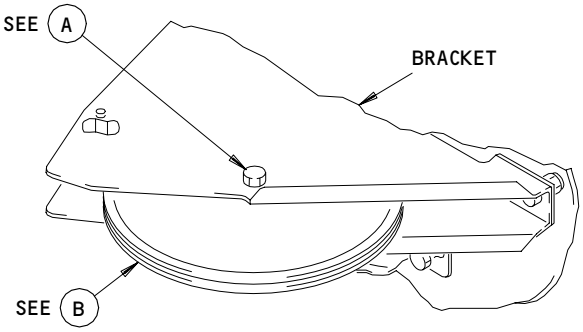
SINGLE PULLEY INSTALLATION



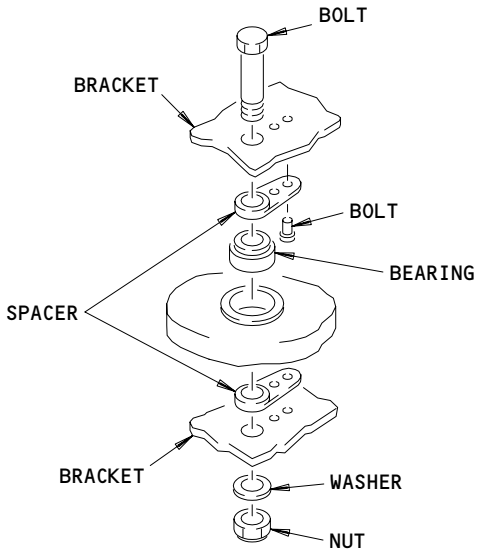
PULLEY WITH BEARING AND BUSHING



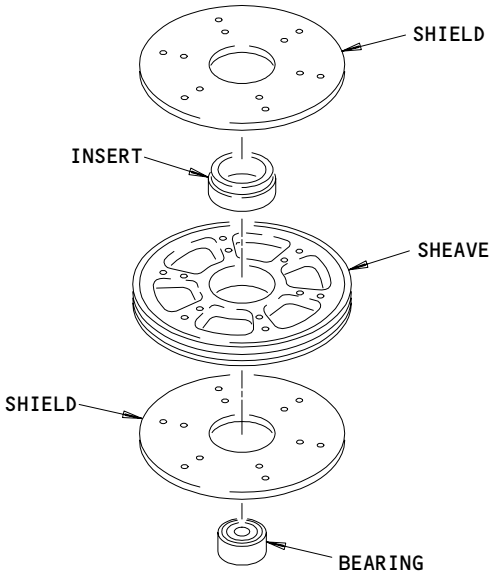
DOUBLE PULLEY INSTALLATION



DETAILED PULLEY



A



B

Control Cable Pulleys Installation
Figure 401

(2) Rig Pins - A20004-XX
(3) Tensiometer - commercially available

B. Procedure

S 424-007
(1) Install the components applicable to the control cable pulley on your airplane.

S 434-008
(2) Install the turnbuckles with the turnbuckle barrel installed an equal distance on the two treated terminals. Do not let more than three threads show out of the turnbuckle barrel.

S 034-009
(3) Remove the cable clamps and rigging pins from the control cable and drums.

S 434-010
(4) Tighten the cable as told in the temperature-tension chart in the system chapter.

NOTE: Use the tensiometer to do a check on the cable tension. Apply the tensiometer to the cable at least six inches from the turnbuckle terminal or other fittings. To make sure you have the correct cable tension, permit a minimum of one hour at constant ambient temperature (±5°F) for airframe temperature to become stable.

S 434-011
(5) Install the turnbuckle locking clips on all turnbuckles that you adjusted (AMM 20-10-05/401).

S 714-012
(6) Operate the controls, as told in the applicable system chapter, through full travel.
(a) Make sure the controls move freely.

(b) Make sure too much force is not necessary.

CONTROL CABLE QUICK STOPS - REMOVAL/INSTALLATION

1. General
   A. This procedure contains one task. The task is the replacement of the control cable stops.
   B. Control cable stops are for the protection of the control stand cable drums if an engine separation occurs.

   TASK 20-10-08-964-007

2. Replacement of the Control Cable Stop
   A. References
      (1) AMM 20-10-23/401, Lockwires
   B. Remove the Control Cable Stop (Fig. 401).

      S 034-001
      (1) Remove the lockwire that attaches the control cable stop to the swaged cable terminal stud.

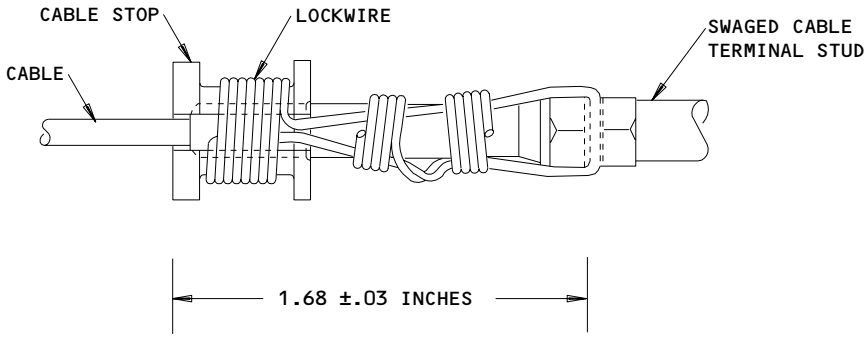
      S 024-002
      (2) Move the control cable stop longitudinally away from the swaged cable terminal stud until the control cable stop disengages. Then move the control cable stop laterally to let the cable go through the slot in the control cable stop.
   C. Install the Control Cable Stop (Fig. 401).

      S 434-003
      (1) Put the large center hole of the control cable stop near the swaged cable terminal stud. Move the slot of the control cable stop along the cable.

      S 424-004
      (2) Push the control cable stop on the end of the swaged cable terminal stud until the control cable stop fully engages.

      S 824-005
      (3) To adjust the control cable stop, twist the swaged cable terminal stud to get the dimension shown.

      S 434-006
      (4) Install a lockwire from the control cable stop to the swaged cable terminal stud (AMM 20-10-23/401).



Control Cable Stops Installation
Figure 401

FLARELESS TUBING ASSEMBLY - REMOVAL/INSTALLATION

1. General
   A. The following procedures do not apply to the Oxygen System Tubing. The customer should consult Boeing before performing any such repairs. This procedure contains six tasks:
      (1) The first task is to remove the flareless tubing assembly.
      (2) The second task is to install the flareless tubing assembly.
      (3) The third task is electrical resistance specifications in the fuel tank.
      (4) The fourth task is the installation of flareless fittings in pressurized areas, fuel tanks or cargo areas.
      (5) The fifth task is tubing clearances.
      (6) The sixth task is the space between tubing clamps.
   B. This procedure is used to remove and install all flareless tubing. The tubing assembly configuration and the tubing material must be identified before removal.
   C. When you disconnect the tubing, always use the necessary precautions to prevent leakage of fluids. If fluids fall on the airplane, identify the fluid and clean the area as specified for that fluid (Ref Chapter 12, Clean and Polish).
   D. When you remove, install, or do work with hydraulic tube assemblies, obey the guidelines that follow:
      (1) When you remove tubes make sure the tubes and port fittings have tags that identify the correct connection locations.
      (2) Do not move or change the tube bends. If you move or change a bend in the tube, these bad effects can occur:
         (a) If you move or change a bend in the tube, it can become possible that the tube will align with the incorrect port. If this occurs, incorrect reconnection or cross-connection of the tubes can become possible.
         (b) If you move or change a bend in the tube, it can be possible that the tube will have too much stress when it is connected. Stress can cause cracks in the tubes.
   E. You can use the nuts and fittings again if the seal areas give a good seal on the assembly. Also, you can use the nuts and fittings again if they are not damaged. The threads on the nuts and fittings must turn smoothly.
   F. Flareless BACS13AP sleeves that are not correctly set can cause leaks. We recommend that you set flareless sleeves by machine. Set the flareless sleeves by hand only when you cannot set them by machine.
   G. When you install the tubing, align the fittings and tubing so you can tighten the B-nuts by hand before you tighten the B-nuts with a wrench. Do not use the fitting nuts to align the tubing and connections.

      NOTE: If you use the nut to increase the length of the tubing, move the sleeve until it touches the mating surface. Leakage from the fittings or the tubing can occur if you cause damage to the fittings or the tubing.

H. Cadmium plated corrosion resistant steel (CRES) or cadmium plated steel fittings may be used as replacements for aluminum fittings in hydraulic system applications.

TASK 20-10-09-004-001

2. Flareless Tubing Assembly - Removal

A. General

B. References

C. Procedure

S 014-039

WARNING: REMOVE ALL PRESSURE FROM THE SYSTEM AS SPECIFIED IN THE APPLICABLE MAINTENANCE INSTRUCTIONS BEFORE YOU START THE REMOVAL OF THE FLARELESS TUBING ASSEMBLY. A PRESSURIZED SYSTEM CAN CAUSE INJURY.

WARNING: DO NOT USE THIS PROCEDURE ON OXYGEN TUBING. GREASE, DIRT, OR FLAMMABLE MATERIALS WHEN EXPOSED TO PRESSURIZED OXYGEN CAN IGNITE AND CAUSE AN EXPLOSION. A FIRE OR EXPLOSION CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

(1) Get access to the tube assembly fittings.

S 034-003

(2) Remove the support clamps on the tubing you will remove and on the adjacent tubing assemblies if it is necessary.

S 934-046

WARNING: MAKE SURE EACH TUBE AND THE PORT FITTING HAVE TAGS TO IDENTIFY THE CORRECT INSTALLATION LOCATION. IF YOU DO NOT PUT TAGS ON THE TUBES AND PORT FITTINGS, CROSS-CONNECTION OF THE TUBES CAN OCCUR DURING INSTALLATION. IF THIS OCCURS, UNINTENDED OPERATION OR MALFUNCTION OF AIRPLANE SYSTEMS CAN RESULT AND CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

(3) Install tags on the tubes and on the port fittings to clearly identify the correct connection locations.

S 034-004

(4) Loosen the adjacent tubing assemblies and clamps if it is necessary.

S 024-005

(5) Remove the tubing assembly from the airplane.

S 434-006

CAUTION: PUT CAPS ON THE HYDRAULIC LINES AND FITTINGS. UNWANTED MATERIAL CAN CAUSE CONTAMINATION OF HYDRAULIC LINES, DAMAGE TO SYSTEM COMPONENTS, AND LEAKAGE OF HYDRAULIC FLUID.

(6) Put caps on the tube assemblies and mating connections.

S 164-041

CAUTION: DO NOT LET HYDRAULIC FLUID LEAKAGE COLLECT. REMOVE IT IMMEDIATELY. HYDRAULIC FLUID CAN CAUSE DAMAGE.

(7) Remove hydraulic fluid leakage.

TASK 20-10-09-404-007

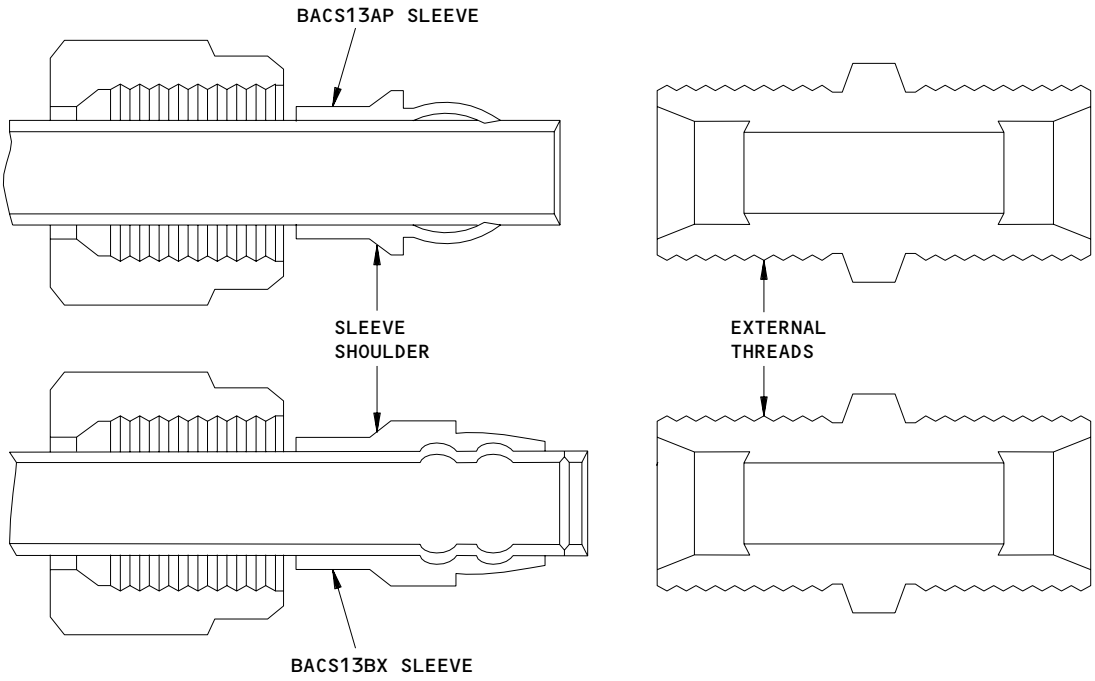
3. Flareless Tubing Assembly - Installation

A. General

B. Consumable Materials

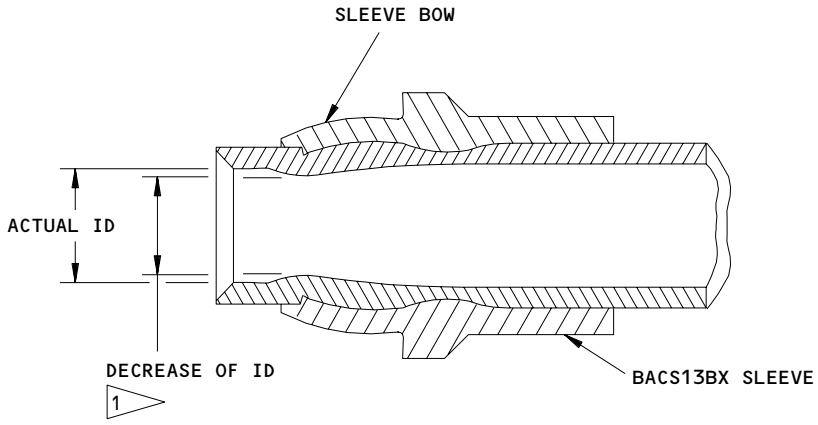
(1) Thread Compound - Use one from Table 401

Flareless Tubing Assembly - Thread Compounds Table 401	
TYPE OF SYSTEM	APPROVED THREAD COMPOUNDS (STRAIGHT THREAD FITTINGS)
Compressed Gas (Not oxygen)	B00624 Antiseize Compound BMS 3-28
Deicing or (Anti-icing)	
Instrument Air	B00624 Antiseize Compound BMS 3-28
Pneumatic	B00624 Antiseize Compound BMS 3-28 D00062 Pneumatic Grease MIL-G-4343
Air Conditioning	
Fire Protection	B00624 Antiseize Compound BMS 3-28 or D00053 Grease MIL-G-6032
Coolant	
Water Injection	B00624 Antiseize Compound BMS 3-28
Fuel	D00070 Hydraulic Fluid MIL-H-5606
Lubrication	
Hydraulic MIL-H-5606	D00070 Hydraulic Fluid MIL-H-5606
Hydraulic BMS 3-11	D00054 Skydrol Assy Lube MCS 352B
Hydraulic MIL-H-6083	D00070 Hydraulic Fluids MIL-H-5606 or D00106 Hydraulic Fluids MIL-H-6083
Misc Tubing	B00624 Antiseize Compound BMS3-28 or D00053 Grease MIL-G-6032



LUBRICATION POINTS

Flareless Tubing Assembly Lubrication Points
Figure 401



1 MAKE SURE THE DECREASE OF ID IS NOT MORE THAN 0.005 INCH AFTER PRESET OR 0.015 INCH AFTER MANY TIGHTENINGS.

Maximum Collapse of Preset Flareless Sleeve
Figure 402

TUBING SIZE (INCHES)		INSTALLATION TORQUE ON FLARELESS TUBING FITTINGS 3 4 (POUND-INCHES, ±5%) NOTE: USE CARE WHEN YOU SELECT THE CORRECT TORQUE FOR REDUCER FITTINGS. THE BOSS OR BULKHEAD SIZE GIVES THE FITTINGS INSTALLATION TORQUE.	
OD	TUBE DASH NO.	STEEL & TITANIUM TUBES 1	ALUMINUM & ANNEALED CRES TUBES 2
3/16	-3	100	80
1/4	-4	140	110
5/16	-5	190	140
3/8	-6	270	170
1/2	-8	500	280
5/8	-10	700	360
3/4	-12	900	450
1	-16	1200	750
1-1/4	-20	1600	900
1-1/2	-24	2000	900
2	-32	2000	---

1 TORQUE VALUES APPLICABLE TO THESE TUBE ENDS:
A. 21-6-9 CRES AND ALL OTHER CRES TUBE ENDS WITH BACS13BX SWAGED SLEEVE AND 21-6-9 CRES TUBE ENDS WITH CRYOLIVE SLEEVE
B. AMS-T-6845, MIL-T-8504 AND MIL-T-8808 CRES FLARED TUBE ENDS
C. AMS-T-6845 CRES WITH PRESET BACS13AP (FLAG NOTE 5) OR CRYOLIVE SLEEVES
D. HOSE END FITTINGS WITH STEEL INSERTS (NIPPLES)
E. ALL TITANIUM TUBE ENDS

2 TORQUE VALUES APPLICABLE TO THESE TUBE ENDS:
A. 6061-T6 ALUMINUM WITH BACS13BX SWAGED SLEEVES (SIZES 04 THROUGH 16) OR CRYOLIVE SLEEVE ASSEMBLIES (SIZES 04 THROUGH 12)
B. 6061-T6 ALUMINUM WITH PRESET BACS13AP SLEEVES 6
C. ANNEALED CRES WITH PRESET BACS13AP SLEEVES 6
D. FLARELESS TYPE HOSE END FITTINGS WITH ALUMINUM INSERTS (NIPPLES)
E. ALUMINUM FLARED TUBE ENDS

Installation Torque for Flareless Fittings
Figure 403 (Sheet 1)

3 USE CARE WHEN YOU SELECT THE CORRECT TORQUE FOR REDUCER FITTINGS. THE BOSS OR BULKHEAD SIZE GIVES THE FITTING INSTALLATION TORQUE.

4 TUBE MATERIAL SPECIFICATIONS:
A. 6061-T6 ALUMINUM - AMS-T-7081, WW-T-700/6
B. ANNEALED CRES - MIL-T-8504, MIL-T-8606, MIL-T-8808
C. 1/8 HARD CRES - AMS-T-6845
D 21-6-9 CRES - BMS 7-185
E. TI-3AL-2.5V - BMS 7-234

5 TORQUE VALUES ARE APPLICABLE TO STANDARD MS FLARELESS TUBE ENDS (BACS13AP SLEEVES) ON AMS-T-6845 (304-1/8 HARD) TUBING WITH A MINIMUM WALL THICKNESS AS GIVEN BELOW:

SIZE	-4	-5	-6	-8	-10	-12
WALL THICKNESS	0.020	0.020	0.028	0.035	0.049	0.049

TORQUE FOR SPECIAL THIN WALL AMS-T-6845 (304-1/8h) TUBING IS AS FOLLOWS:

SIZE	-8	-10	-12
WALL THICKNESS	0.028	0.035	0.042
TORQUE (POUND-INCHES)	375	575	725

6 TORQUE VALUES ARE APPLICABLE TO STANDARD MS FLARELESS TUBE ENDS (BACS13AP SLEEVES) OR CRYOLIVE SLEEVES ON 6061-T6 ALUMINUM AND MS FLARELESS TUBE ENDS (BACS13AP SLEEVES) ON ANNEALED CRES TUBING WITH A MINIMUM WALL THICKNESS AS GIVEN BELOW:

SIZE	-3	-4	-5	-6	-8	-10	-12	-16
WALL THICKNESS	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.035

TORQUE FOR SPECIAL THIN WALL ANNEALED CRES TUBING IS AS FOLLOWS:

SIZE	-6	-10	-12
WALL THICKNESS	0.020	0.020	0.020
TORQUE (POUND-INCHES)	160	250	325

Installation Torque for Flareless Fittings
Figure 403 (Sheet 2)

C. Procedure

S 214-008
(1) Examine the tube ends and fittings for defects or contamination that can have a bad effect on the seal of the installation.

S 214-037
(2) Look for worn areas or dents on the tube.

S 644-054
(3) Apply the thread compound applicable to your system (Table 401) (Fig. 401). Apply the thread compound immediately before installation. Apply the thread compound to the circumference of the external threads, shoulder, and conical seal surface of the flareless sleeve.

NOTE: Do not get the thread compound on the internal surfaces of the tube or the inner surface of the bore of the fitting. Do not apply a thread compound when you assemble Dri-Lubed B-nuts.

S 424-010
(4) Put the tubing assembly in the airplane and keep the tube clamps loose to permit you to align the tube in the fitting.

S 214-047
(5) Look at the tags to make sure the tubes are aligned with the correct fittings.

S 824-011
(6) Align the tube and fitting by hand and make the tube end touch the bottom of the fitting.

S 434-012
(7) Keep the tube end at the bottom and aligned in the fitting. Turn the B-nut by hand until the B-nut touches the bottom of the sleeve shoulder.

S 434-013
(8) To tighten the assembly, hold the union with a wrench and torque tighten the B-nut to the recommended value (Fig. 403).

NOTE: Do not use the B-nut to align the tube. Do not let the B-nut touch the bottom of the sleeve shoulder. If you have a leak, you can loosen and tighten the B-nut again.

S 434-042

(9) Tighten with your hand the nuts which you cannot tighten with a wrench. Hand tighten until a clear increase in torque occurs, then tighten 1/6 to 1/3 turn more.

NOTE: Tighten the flareless fittings with the BACS13AP sleeves two times (tighten, loosen, and tighten again). The maximum tube collapse permitted after you torque the BACS13AP sleeves is 0.015 inch less than the tube diameter (Fig. 402).

S 434-014

CAUTION: ALWAYS KEEP THE CLAMPS TIGHT. TIGHT CLAMPS KEEP THE AREA BETWEEN THE TUBE AND THE CLAMP SURFACES FREE OF UNWANTED MATERIALS AND CONTAMINATION. IF SURFACES ARE NOT CLEAN, DAMAGE BY FRICTION CAN OCCUR.

(10) Tighten all of the tube clamps.

S 714-048

(11) If you disconnected more than one hydraulic tube and you think there is a possibility you connected the tubes incorrectly or cross-connected the tubes, do an operational check:

NOTE: Use your own judgement to determine if a check is necessary.

(a) Do the post-installation test of one of more components to which the tubes are connected as a check.

S 714-049

(12) If you disconnected electrical wires to get access to the tubes and you think there is a possibility you connected the wires incorrectly or cross-connected the wires, do an operational check:

NOTE: Use your own judgement to determine if a check is necessary.

(a) Do the post-installation test of one of more components to which the wires are connected as a check.

S 794-052

(13) Do a leak test:

(a) Pressurize the system for a minimum of 5 minutes.

(b) With the system pressurized, rub the tube and fittings with a clean white cloth to find leakage.

NOTE: You can tighten the fittings again to the torque value specified above if you find leakage. If leakage occurs in subsequent leak tests, replace appropriate parts.

TASK 20-10-09-764-016

4. Electrical Resistance Specifications in the Fuel Tank

A. General

B. Equipment

(1) Bonding meter - Model T477W, Microhm Bridge, Avtron Manufacturing, Inc. Cleveland, Ohio

C. Procedure

S 764-017

WARNING: MAKE SURE THE BOND RESISTANCE IS NOT MORE THAN THE VALUES SHOWN. BOND RESISTANCE IS VERY IMPORTANT IF A LIGHTNING STRIKE OCCURS.

IF IT IS POSSIBLE, USE A METER THAT IS RESISTANT TO AN EXPLOSION. IF NOT, MAKE SURE THE AMOUNT OF DANGEROUS GAS, AS MEASURED BY A GAS DETECTOR, IS LESS THAN 10 PERCENT OF THE LOWER EXPLOSIVE LIMIT.

(1) Remove and install or replace the fittings which have resistances more than the values in Fig. 405 Sh. 2.

(a) Do a check on the resistance again. Do not use bonding jumpers to connect high-resistance hydraulic installations.

S 764-018

(2) Measure the resistance between the bulkhead fittings and hydraulic tubes (Fig. 405 Sh. 1). Make sure the resistance is less than the value in Fig. 405 Sh. 2.

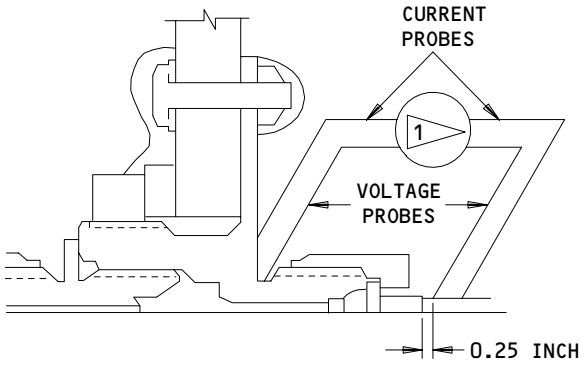
S 764-019

(3) Measure the resistance across the in-line union/tee fittings (tube-to-tube) (Fig. 405 Sh. 1). Make sure the resistance is less than the value in Fig. 405 Sh. 2.

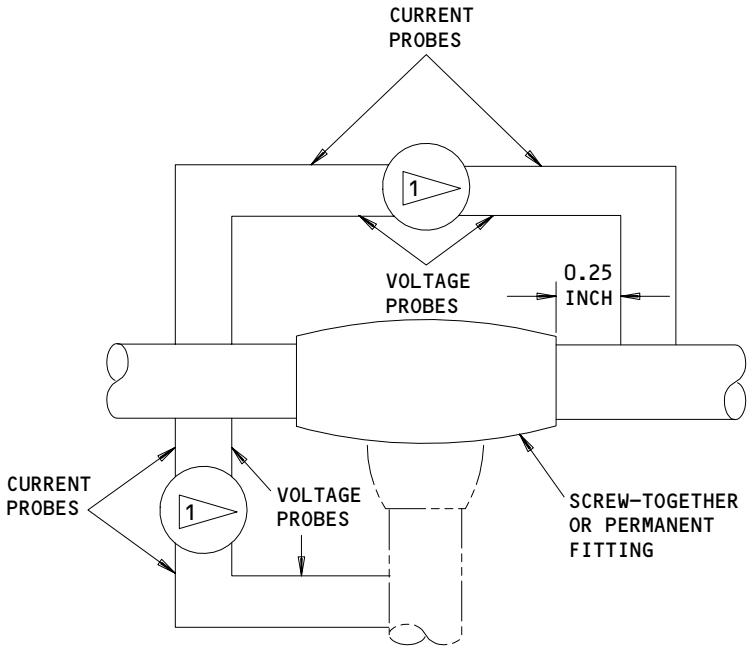
TUBE SIZE (INCH)	0.250	0.375	0.500	0.625	0.750	1.000
TITANIUM, CRES TUBE	210	400	750	1050	1350	1800
ALUMINUM TUBE	170	250	420	540	675	1125

INSTALLATION TORQUE

Installation Torques for Flareless Fittings in Pressurized Areas
Figure 404



SCREW TOGETHER WELD-ON BULKHEAD FITTING



UNION/TEE FITTINGS

1 MICRO-OHMMETER

Bulkhead and Union/Tee Fittings
Figure 405 (Sheet 1)

TUBE SIZE	MAXIMUM RESISTANCE (MILLIOHM)		
	ALUMINUM	TITANIUM	
		PERMASWAGE	WELD-ON
-04	____	6	12
-06	0.70	4	8
-08	____	2.5	5
-10	0.41	1.5	3

RESISTANCE BETWEEN BULKHEAD FITTINGS AND HYDRAULIC TUBE

TUBE SIZE	MAXIMUM RESISTANCE (MILLIOHM)	
	ALUMINUM	TITANIUM
-04	____	12
-06	1.30	8
-08	____	5
-10	0.75	3

RESISTANCE ACROSS UNION/TEE FITTINGS (TUBE-TO-TUBE)

Hydraulic Fitting Resistance Measurement
Figure 405 (Sheet 2)

F39163

TASK 20-10-09-004-020

5. Installation of Flareless Fittings in Pressurized Areas, Fuel Tanks, or Cargo Areas

A. General

B. Procedure

S 434-021

(1) Tighten the flareless fittings with the BACS13AP sleeves two times (tighten, loosen, and tighten again).

NOTE: Be careful to make sure that the fittings will not have leaks after you tighten the fittings.

S 434-022

(2) Tighten flareless fittings with BACS13BX, welded-on, or NAS1760-type sleeves as follows:
(a) Tighten the fitting to the torque shown in Fig. 403.
(b) Loosen the fitting to release the torque.
(c) Tighten the fitting to the torque shown in Fig. 404.

NOTE: Be careful to make sure the fittings will not have leaks after you tighten the fittings.

S 764-023

(3) For installation of the wing fuel tank, use the procedure, Electrical Resistance Specifications in the Fuel Tank.

S 304-024

(4) Make the necessary repairs. Use the procedure for Flareless Tubing Assembly - Approved Repairs (AMM 20-10-09/801).

S 794-025

(5) Do a leak test on the repair installations of the flareless fittings in pressurized areas:
(a) Pressurize the system for 5 minutes minimum.
(b) With the system pressurized, rub the tube-to-fitting interface with a clean white cloth to find hydraulic leakage.

NOTE: You can tighten the tube again to the torque value shown above, if you find leakage. If leakage occurs in subsequent leak tests, replace appropriate parts.

S 714-050

(6) If you disconnected more than one hydraulic tube and you think there is a possibility you connected the tubes incorrectly or cross-connected the tubes, do an operational check:

NOTE: Use your own judgement to determine if a check is necessary.

(a) Do the post-installation test of one of more components to which the tubes are connected as a check.

S 714-051

(7) If you disconnected electrical wires to get access to the tubes and you think there is a possibility you connected the wires incorrectly or cross-connected the wires, do an operational check:

NOTE: Use your own judgement to determine if a check is necessary.

(a) Do the post-installation test of one of more components to which the wires are connected as a check.

TASK 20-10-09-204-026

6. Tubing Clearances

A. General

(1) This task gives you the minimum clearances necessary between tubes and all other components (hoses, fittings, structure, and other tubes). These clearances prevent tube damage in all positions of operation.

B. Minimum Clearance Requirements for Tubing

S 224-053

(1) Installed tubing and fittings shall meet the following minimum clearance requirements.

(a) Supported and Unsupported Locations

1) Supported Locations

a) 0.10 inch from adjacent structure, fixed and moving equipment, and other tubing and fitting connectors.

b) Clearance may be cushion or clamp thickness where tubing is clamped directly to supporting structure.

2) Unsupported Locations
   a) 0.20 inch from adjacent structure, fixed and moving equipment, and other tubing and fitting connectors.
3) Fuel Systems
   a) 2.0 inches from electrical wiring.
4) Hydraulic Systems
   a) A minimum of 0.5 inch from electrical wiring installations.
   b) 0.25 inch under adverse conditions resulting from relative motion of adjoining components.

S 434-032

(2) To get the necessary clearances with the loop-type clamps, use BACS18AF3 or BACS18AF4 spacers to make the necessary height. On the U-type clamps, use BACS18AN spacers. Do not use NAS42 or NAS43 clamps on hydraulic tubes.

NOTE: Do not use more than four spacers together. If you use more than four spacers, find the cause and correct the problem.

S 224-033

(3) Make sure the tubes are clear of the control cables between the break points or the fairleads and the control cable linkage. The minimum clearance is 0.625 inch.

S 224-034

(4) Make sure the minimum clearance between the tubes in the clampblocks (65B80254) and the channels on the clampblocks is 0.060 inch. If this clearance is less, correct the spacer tube length (NAS43003-) or correct the force on the tubes in the clampblock.

S 224-055

(5) For APU bleed duct sections installed between STA 1140-1250 and STA 1355-1365, make sure there is a minimum clearanceof 0.75-inch between the coupling T-bolt and the adjacent fire extinguisher tube assembly (SB 26A0130, SB 26A0123).

NOTE: The clearance is measured from the outer surface of the insulation on the fire extinguisher tube to the nearest part of the coupling T-bolt.

TASK 20-10-09-204-035

7. Space Between Tubing Clamps

A. Procedure

S 224-036

(1) Keep the space between the tubing clamps in the limits shown in Table 402, unless it is specified differently.

Maximum Space Between Tubing Clamps
Table 402

Tubing OD (Inches)	Material	Clamp Space - Usual (Inches)	Clamp Space - Special *[1]
1/4	Steel, Titanium	16.0	12.0
3/8	Steel, Titanium	20.0	15.0
3/8	Aluminum	16.5	12.0
1/2	Steel, Titanium	23.0	17.0
1/2	Aluminum	19.0	14.0
5/8	Steel, Titanium	22.0	18.5
5/8	Aluminum	22.0	16.5
3/4	Steel, Titanium	27.5	20.5
3/4	Aluminum	24.0	18.0
1.0	Steel, Titanium	30.0	22.5
1.0	Aluminum	26.5	19.5
1 1/4	Steel, Titanium	31.5	23.5
1 1/4	Aluminum	28.5	21.0

*[1] Special: Wing Rear Spar, Engine Strut, Engine Aft Fairing

FLARELESS TUBING ASSEMBLY - APPROVED REPAIRS

1. General
   A. This procedures do not apply to the Oxygen System Tubing. Boeing should be consulted before performing any such repairs.
   B. This procedure contains these tasks:
      (1) Tube Repair.
      (2) Swage BACS13BX Flareless Sleeves with the Harrison Elastomer Swagers 5175, 5570, and 5720.
      (3) Swage BACS13BX Flareless Sleeves with the 6633K01 Harrison Roller Swaging Kit.
      (4) Swage Harrison 35211 sleeves and 35212 unions with the Harrison 6777 Roller Swage Machine.
      (5) Preset BACS13AP Flareless Sleeves.
      (6) Install the Cryolive Flareless Sleeve Assembly.
      (7) Install the BACC42W H-Coupling.
      (8) Install the 3P02111 or 3PHS111 Cryofit Coupling.
      (9) Install Permaswage Fittings.
      (10) Rynglok Union Installation.
      (11) Repair Hydraulic Tubing with Flexible Hoses.
      (12) Repair 6061-T4/T6 Aluminum Tubing (Hydraulic or Pitot-Static Tubing).

      (13) Aluminum Fuel Tubes, temporary weld repair method.
      (14) Part Marking of Flareless Tubing Assemblies.
   C. This procedure gives the approved repairs for hydraulic, pneumatic, water, fire extinguisher, electrical rigid conduit, and other tube assemblies. Repair procedures include the replacement of damaged tube ends or the replacement of small damaged tube parts. You can use flareless tubes and sleeves, H-Coupling assemblies, Cryofit couplings, Permaswage fittings, Cryolive assemblies, or Rynglok unions.

   D. You can use approved 304-1/8 Hard or 21-6-9 corrosion-resistant steel tube material for replacement or repair of titanium tube assemblies. You can also use approved 304-1/8 Hard corrosion-resistant steel tube material for replacement or repair of 21-6-9 corrosion-resistant steel tube assemblies. When a new tube is fabricated to replace an existing tube assembly, the replacement tube assembly should be marked with a part number similar to, but not the same, as the original tube. (Refer to the task for Part Marking of Flareless Tubing Assemblies.)

E. Replacements for aluminum lines may be made from Corrosion Resistant Steel (CRES) 304-1/8 Hard or 21-6-9 material. The replacement lines should be marked with a part number similar to, but not the same as, the original tube. (Refer to the task for Part Marking of Flarless Tubing Assemblies.)

F. When you do repairs, the type of flareless tube sleeves will tell you the installation method to use.
   (1) Use approved power swaging equipment, or roller swaging, to do all swaged-on sleeves and fittings.
   (2) You can preset BACS13AP flareless sleeves by machine. Preset by hand only when a hydraulic or pneumatic-operated presetting tool is not available. If you must preset by hand, we recommend that you preset some samples. Cut the samples into sections longitudinally and make an inspection of the ring cut depth before you preset the part to be repaired.
   (3) You can install the CRYOLIVE sleeve assembly, consisting of CRYOLIVE sleeve, coupling nut and protective cover/inspection tool, by removing the assembly from liquid nitrogen and sliding it on to the tube end. Note that the Size 10, Size 12 and Size 16 coupling nuts used with the CRYOLIVE sleeve are slightly longer than standard MS type coupling nuts and are not interchangeable with MS type coupling nuts.

G. The H-coupling assembly is a repair coupling which has a union coupling, a slide, and a nut. You can install the H-coupling assembly in straight sections of the tube. Use two end wrenches of applicable size. This assembly is approved for fuel and hydraulic high pressure lines of 21-6-9, titanium 3AL-2.5V, and 304-1/8 hard CRES tubing. The H-coupling assembly is also approved for the repair of 304 CRES annealed and 6061-T6 aluminum tubing lines of 3000 psi or less.

H. You can use a Cryofit coupling for the inline repair of 3AL-2.5V titanium tubing. To install the Cryofit coupling in a straight tube section, shrink fit the coupling in its position.

I. You can use the Permaswage coupling for inline repair of 6061-T6 aluminum, 21-6-9 CRES or 304-1/8 hard CRES, and 3AL-2.5V titanium tubing.

J. You can use the Rynglok union for inline repair of 6061-T6 aluminum, 21-6-9 CRES or 304-1/8 hard CRES, and 3AL-2.5V titanium tubing. Rynglok unions are made of lightweight 6AL-4V titanium alloy and are not to be used in oxygen systems, in fuel cells, or in the repair of tubes installed in engines

K. When you repair a section of a tube, correctly align the tube and the fittings. Make sure the fittings touch the bottom at the two ends of the repaired section. Do not use fitting nuts to align the fittings. Fitting nuts used to align fittings during the tube installation will increase the risk of leakage, blowoff, or other failure.

L. Do a leak check on all hydraulic tubes disconnected during the repair procedure.
   (1) Pressurize the hydraulic tubes for a minimum of 5 minutes.
   (2) Rub all the fittings with a clean white cloth.
   (3) Look for hydraulic fluid on the cloth to find leakage.

M. When you remove, install, or do work with hydraulic tube assemblies, obey the guidelines that follow:
   (1) When you remove tubes, make sure the tubes and port fittings have tags that identify the correct connection locations.
   (2) Do not move or change the tube bends. If you move or change the bend in the tube, these bad effects can occur:
      (a) If you move or change a bend in the tube, it can become possible that the tube will align with the incorrect port. If this occurs, incorrect reconnection or cross-connection of the tubes can become possible.
      (b) If you move or change the bend in the tube, it can be possible that the tube will have too much stress when it is connected. Stress can cause cracks in the tubes.
   (3) If you disconnected more than one hydraulic tube and you think there is a possibility you connected the tubes incorrectly or cross-connected the tubes, do an operational check:

      NOTE: Use your own judgement to determine if a check is necessary.

      (a) Do the post-installation test of one or more of the components to which the tubes are connected as a check.
   (4) If you disconnected electrical wires to get access to the tubes and you think there is a possibility you connected the wires incorrectly or cross-connected the wires, do an operational check:

      NOTE: Use your own judgement to determine if a check is necessary.

      (a) Do the post-installation test of one or more of the components to which the wires are connected as a check.

N. Hydraulic system pressure definitions are below.
   (1) Maximum working pressure:
      (a) Anytime repairs to the tubes are made on the airplane, or when any hydraulic component is to be checked.
   (2) Proof Pressure:
      (a) If the tubes are repaired and to be tested in the shop.
   (3) Burst Pressure:
      (a) This is for design reference only.

O. B-Nut torquing:
   (1) The correct torquing can be applied to B-nuts only if the tubing material is identified correctly (aluminum, titanium or steel).
   (2) If the normal finish color of the B-nut is covered by the grey Drilube coating, a color-coded ring is applied to the back side of the B-Nut.

TUBE MATERIAL	TUBE FINISH/COLOR	B-NUT (MAY BE COVERED WITH DRILUBE)
ALUMINUM	STANDARD 767 - GREEN PRIME	GOLD OR BROWN
CRES	STANDARD 767 - NO FINISH	Silver, Bright
TITANIUM	NO FINISH	Dull Gray

(3) If a steel or titanium B-nut connects to an aluminum tube or fitting, use the lower torque value (aluminum).

P. Use the tube materials as shown in Table 801. Use the approved tube materials/tube sizes/tube wall thicknesses as shown in Table 802 for 3000 psi hydraulic systems.

TABLE 801
CROSS REFERENCE OF TUBING TO BMS/MIL SPECIFICATION

TUBING MATERIAL	BMS	MIL	OTHER
ALUMINUM 6061-T4, 6061-T6	---	WW-T-700/6 WW-T-7081 *[1]	AMS-T-7081 AMS 4083
CRES 21-6-9	7-185	---	---
1/8 HARD CRES 304-1/8h	---	---	AMS-T-6845 AMS 5566
ANNEALED CRES 304	---	T-8504	AMS 5567
ANNEALED CRES 321	---	T-8808	AMS 5556 AMS 5557
TITANIUM 3AL-2.5V	7-234	---	AMS 4945

*[1] LOW PRESSURE, NON-HYDRAULIC SYSTEMS ONLY

Table 802
APPROVED TUBE MATERIALS

	Tube Size	04	06	08	10	12	16	20
Tube Material	21-6-9 CRES (BMS 7-185)	0.016	0.020	0.026	0.033	0.039	0.052	n/a
	3AL-2.5V Titanium (AMS 4945)	0.016	0.019	0.026	0.032	0.039	0.051	0.074
	304 1/8 Hard CRES (AMS-T-6845)	0.020	0.028	0.035	0.049	0.058	0.065	n/a
	6061-T6 Aluminum AMS 4083 (AMS-T-7081) Return/Supply /Suction Only	0.035	0.035	0.035	0.035	0.035	0.035	0.049

NOTE: CONSULT BOEING BEFORE USING ALTERNATE TUBE MATERIAL/WALL THICKNESS COMBINATIONS FOR 3000 PSI HYDRAULIC SYSTEM APPLICATIONS

TASK 20-10-09-308-074

2. Tube Repair
   A. General
      (1) Use Hydraulic System Design Pressure as shown in Table 803 during repairs.

TABLE 803
HYDRAULIC SYSTEM DESIGN PRESSURES

COMPONENT	Maximum Working Pressure psi	Proof Pressure psi	Burst Pressure psi
Pressure lines (including hoses and fittings) and units with air under full system pressure (such as accumulators).	3000	6000	12000
Return and case drain lines, fittings and units	600	900	1500
Return line hoses	600	1500	3000
Pump Supply reservoirs, units, lines and fittings	65	100	200
Airbleed Line (Upstream of regulator)	250	500	1000
Drains and vents open to atmosphere	15	50	75

(2) When you remove, install, or do work with hydraulic tube assemblies, obey the guidelines that follow:
   (a) When you remove tubes, you must make sure the tubes and port fitings have tags that identify the correct connection location.
   (b) Do not move or change the tube bends. If you move or change the bend in the tube, these bad effects can occur:
      1) If you move or change a bend in the tube, it can become possible that the tube will align with the incorrect port. If this occurs, incorrect reconnection or cross-correction of the tubes can become possible.

2) If you move or change the bend in the tube, it can be possible that the tube will have too much stress when it is connected. Stress can cause cracks in the tubes.

(c) If you must bend the tube assemblies to fit the installation, do not bend more than permitted by the ovality limits in Fig. 801. We recommend that you use a bend block or tool equivalent to the Parker G-824 hand bender. Make sure the bend block supports the tube bend beyond the neutral axis of the bend, as shown in Fig. 801, and that bend-ovality allowables are not exceeded.

(d) Do not repair dents or chafed areas. Replace the tube or tube section if the defect depth is more than the values in Fig. 803. It is not necessary for you to repair or replace tubes with defect depth less than these values.

(3) Electrical rigid conduit repair.

(a) Smooth dents are permitted to the electrical rigid conduit with these limits as shown in Fig. 841.

1) Dent depth damage is not more than 20 percent of the outer diameter.
2) The conduit is not dented or has a crack that causes it to have kinks, to rub, or to show the inner wire.
3) The dent is smooth and does not make a sharp wrinkle on the outer surface of the conduit.
4) There are no cracks in the conduit.
5) Dents are not permitted on rigid electrical conduits in the fuel tanks.

(b) Repair or replace electrical rigid conduits if the damage is more than the limits.

(c) If you must form the electrical rigid conduit tube to fit an installation, do not bend more than permitted by the forming limits as shown in Fig. 842.

(4) To repair a damaged tube section, cut out the damaged tube section and replace it with a fitting or with an assembled tube and fitting assembly.

(5) To replace a BACU24AB swage union, cut out the damaged fitting and replace it with a B-nut, BACS13AP sleeve or BACS13BX sleeve or a CRYOLIVE flareless sleeve assembly and an MS21924 bulkhead union, using the procedures of Fig. 807 and Fig. 808.

(6) To replace a BACA14BP fitting, you must use another BACA14BP fitting. To install the new BACA14BP or D10203 fitting on the new tube section, refer to The Installation of Permaswage Fittings. To verify electrical resistance where required, refer to AMM 20-10-09/401.

NOTE: Use BACA14BP fittings only for replacement of other BACA14BP fittings unless approved by The Boeing Company on a case-by-case basis. The MS screw-together ends on this fitting are prone to deformation and galling from repeated assembly and disassembly and may leak.

(7) To make tube repairs, use tube sections of the same material and use the fittings as shown in Fig. 802. You can make a splice repair of 21-6-9 and Ti-3AL-2.5V tube with 304-1/8 Hard tube of the wall thickness shown in Fig. 821 or Fig. 824. You can also make a splice repair of a Ti-3AL-2.5 tube with 21-6-9 tube of the wall thickness shown in Fig. 821 or Fig. 824.

(8) The permitted limits of hydraulic line damage caused by dents, chafes, or the corrosion removal process per the Corrosion Prevention Manual, are shown in Fig. 803

(9) A repair of a tube section can be in one of three groups. The groups have a relation to the location of the tube damage and the quantity of damage. The three groups are as follows:
   (a) Replace a tube end section that has a flareless end fitting you can move apart, with an assembled tube and fitting assembly (Fig. 806).
   (b) Replace a tube center section that has a short damaged segment with a single union (Fig. 805).
   (c) Replace a tube center section that has very much damage with an assembled tube and fitting assembly (Fig. 809).

(10) If you disconnected more than one hydraulic tube and you think there is a possibility you connected the tubes incorrectly or cross-connected the tubes, do an operational check:

NOTE: Use your own judgement to determine if a check is necessary.

   (a) Do the post-installation test of one of more components to which the tubes are connected as a check.

(11) If you disconnected electrical wires to get access to the tubes and you think there is a possibility you connected the wires incorrectly or cross-connected the wires, do an operational check:

NOTE: Use your own judgement to determine if a check is necessary.

(a) Do the post-installation test of one of more components to which the wires are connected as a check.

B. Repair of a Tube (Make a Splice)

S 948-286

WARNING: DO NOT USE TITANIUM FITTINGS WHEN YOU REPAIR THE OXYGEN SYSTEM TUBES. TITANIUM FITTINGS CAN CAUSE A FIRE OR INJURY TO PERSONS.

(1) Make a decision about the type of repair necessary. Use Fig. 802 to make a decision about the group the repair is in.

S 948-076

(2) Refer to Fig. 805 to find the necessary tube cutout length when you use a single union to replace a damaged tube area.

S 438-077

(3) To use assembled tube ends or a center section to do a repair, find the cutout length and install as follows:
(a) Make an estimate of the total length (L1) of the repair section necessary to replace the damaged tube (see Fig. 806 & 809).
(b) Cut and trim the repair tube as follows: (see Fig. 804)
1) Use the correct size ratchet chipless cutter.
2) Turn the cutter drive screw counter clockwise to retract the cutter wheel.
3) Put the cutter over the tube.
4) Turn the screw clockwise until the cutter touches the tube at the necessary cut location.
5) Turn the screw 1/8 to 1/4 turn and rotate the cutter until the cutter is easy to rotate. The tube should now be cut.
6) Remove the tool.
7) To deburr the tube use the correct stem subassembly and deburring tool. To assemble the tool refer to Fig. 804.
8) Push down on the plunger and install the tool into the end of the tube.
9) Release the plunger. Let the plug fill the inside of the tube.
10) Rotate the deburring tool until the inside burr is removed.

11) Remove the tool with the plug expanded. The expanded plug should remove metal particles from the inside of the tube.

NOTE: Make sure you do not drop metal particles in the area of the repair.

(c) Swage the necessary flareless sleeves to the repair tube as told in the applicable section:
- Swage BACS13BX Flareless Sleeves with the Harrison Elastomer Swagers 5175, 5570, and 5720.
- Swage BACS13BX Flareless Sleeves with the 6633K01 Harrison Roller Swaging Kit.
- Preset BACS13AP Flareless Sleeves.
- Remove the CRYOLIVE sleeve/coupling nut protective cap assembly from the liquid nitrogen and slide the assembly on to the tube, allowing it to warm to room temperature.

(d) Assemble and tighten the flareless fittings which are part of the repair section (Ref AMM 20-10-09/401 Removal/Installation).

(e) Measure all of the tube assembly length (L1) (see Fig. 806 and Fig. 809).

(f) To find the necessary cutout length (L2) as shown on Fig. 806 and 809, use the procedure given in Fig. 810.

(g) Remove the pressure from the systems where you will do the repairs.

(h) Cut out the damaged tube (L2). Trim the tube ends as shown in Fig. 804.

(i) When you make the installation, refer to the applicable section as follows:
1) To use the Harrison elastomer swager to install BACS13BX flareless sleeves, refer to "Swage the BACS13BX flareless sleeves with the Harrison elastomer swagers 5175, 5570 and 5720".
2) To use the 6633K01 Harrison roller swaging kit to install BACS13BX flareless sleeves, refer to "Swage the BACS13BX Flareless Sleeves with the 6633K01 Harrison Roller Swaging Kit."
3) To install BACS13AP flareless sleeves, refer to "Preset the BACS13AP Flareless Sleeves".
4) If you use H-couplings (BACC42W) for repair, refer to "Install the BACC42W H-coupling".
5) If you use Cryofit unions (3P02111 or 3PHS111) for repair, refer to "Install the 3P02111 or 3PHS111 Cryofit Coupling".
6) If you use Permaswage unions (D10283) for repair, refer to "Install the Permaswage Fittings".

7) To install Cryolive flareless sleeve assembly, refer to "Install the Cryolive Flareless Sleeve Assemblies".

NOTE: Use only the complete Cryolive flareless sleeve assembly, consisting of a Cryolive sleeve, coupling nut and plastic cap. The Cryolive flareless sleeve assembly, in Sizes 10, 12 and 16, requires use of a longer length coupling nut. The longer length coupling nuts are not interchangeable with standard BACN10- and MS21921 coupling nuts.

8) If you use Rynglok tube to tube unions for repair, refer to "Rynglock Union Installation".

(j) Install the repair section and tighten the nuts (AMM 20-11-00/201).

(k) When you use a Cryofit Union or H-Coupling in the repair section, install it after you tighten the flareless fittings in their positions.

(l) When you use a Permaswage union in the repair section, you must make allowance for swage growth. Tighten the repair section in position after installation of the Permaswage union.

(m) When you replace a tube bend section, make sure you keep the minimum straight length specifications for all fittings (Fig. 812).

(n) When you use a CRYOLIVE flareless sleeve/coupling nut in conjunction with a permanent Cryofit, H-Coupling or Permaswage union, tighten the flareless coupling nut hand tight before installing the permanent fitting to minimize axial preload on the CRYOLIVE sleeve.

TASK 20-10-09-308-078

3. Swage the BACS13BX Flareless Sleeves with the Harrison Elastomer Swagers 5175, 5570 and 5720 (Fig. 813)

A. Equipment

(1) Harrison Portable Swagers - 5175 and 5720
Harrison Stationary Swager - 5570
(Sierracin-Harrison - 3020 Empire Ave. -
Burbank, California 91504)

(2) "Tiplar" bore gauge or "Mueller" bore gage or equivalent

(3) Regulated air pressure (0 - 100 psi)

B. Consumable Materials

(1) D00324 Lubricant - Extreme Pressure, Anti-Scoring No. 3

C. Procedure

S 948-208

WARNING: POINT THE TUBE AWAY FROM PERSONS AND EQUIPMENT WHEN YOU SWAGE. DRAW-BOLTS CAN BREAK AND COME QUICKLY OUT OF THE TUBE. THE DRAW-BOLTS CAN HIT PERSONS OR EQUIPMENT AND CAUSE INJURY OR DAMAGE.

(1) Get the necessary tools as shown in the instruction manual supplied with the Harrison elastomer swager.

S 648-080

(2) Apply a light layer of antiscoring lubricant to the outer surfaces of the bushings and expanders of the drawbar assemblies. Make sure the tube and sleeve are clean and dry.

NOTE: Do not let the lubricant go into the grooves of the sleeve. Lubricant in the grooves will prevent correct swaging.

S 348-081

(3) Apply the specified swage pressure and hold the pressure for a minimum of two seconds. See Fig. 814 for specified pressure.

S 228-082

(4) Do a check of the groove depth with a Tiplar or Mueller bore gage. See Fig. 816 for groove dimensions.

S 228-083

(5) Do a check on the external dimensions of the swaged fitting. See Fig. 815.

S 228-084

(6) Make sure the tooling die marks on the tube O.D. do not have a height or depth larger than 10% of the tube wall specified thickness. Other permitted defects include marks or scratches on the outer tube which are less than 0.20 inch in length and 0.002 inch in depth.

S 218-085

(7) Make sure the seal areas of the sleeves and unions are not scratched or damaged during fabrication. Make sure each seal area keeps the usual finish specifications.

S 228-086

(8) Make sure the tool and die marks on the external skirt and shoulder areas of the sleeves and unions, are not more than 0.002 inch in height. Also, these marks must not touch the nut.

TASK 20-10-09-308-087

4. Swage the BACS13BX Flareless Sleeves with the 6633K01 Harrison Roller Swaging Kit

A. Equipment

(1) Harrison Roller Swage Tube Repair Kit - 6633K01 (Sierracin Harrison)

B. Procedure

S 948-088

(1) Get the necessary tools as listed in the operating instruction manual supplied with the Harrison Roller Swage Tube Repair Kit.

S 358-089

(2) Apply the specified torque to the expander mandrel (Fig. 817).

S 228-090

(3) After you swage, make sure the BACS13BX sleeve and tube agree with the specifications of Fig. 817.

NOTE: Do not trim the tube after you roller swage. If it is necessary, remove burrs with an approved deburring tool.

S 218-091

(4) Make sure the seal areas of the sleeves are not scratched or damaged during fabrication. Make sure each seal area keeps the 63 RHR (no annular tool marks) finish specifications of its standard.

S 228-092

(5) Make sure the die marks on the external skirt and shoulder areas of the sleeves are not more than 0.002 inch in height. Also, make sure the die marks to not touch the nut.

S 218-093

(6) Make sure the tube inner surfaces at the swage area do not have scratches or marks caused by defective rollers.

TASK 20-10-09-308-094

5. Preset the BACS13AP Flareless Sleeves

A. General

(1) We recommend you pressure preset and do not preset by hand. If you must preset by hand, we recommend you preset some samples first. Then you can preset the section to repair. On samples, cut away the sleeve to make sure the ring cut on the tube makes a circle around the tube circumference and has a depth of 0.002 inch.

B. Equipment
   (1) Cherry Lockbolt Gun used with hand presetting tool - Model G87D is the preferred tool and Model G85D is optional (Textron Aerospace Fasteners, Cherry Div., 1224 East Warner Ave, Box 2157, Santa Ana, California 92707)
   (2) Presetting tool used with Cherry Lockbolt gun - ST878D
   (3) Hand Presetting tool and holding fixture - ST879A and ST879AF

C. Consumable Materials
   (1) D00324 Lubricant - Extreme Pressure, Anti-Scoring No. 3

D. Procedure

S 358-095

(1) To do the pressure preset with the Cherry, Lockbolt Gun G85:
   (a) Attach the thrust sleeve and die holder to the Cherry Lockbolt Gun.
   (b) Install the mandrel and the preset die (see Fig. 818) in the Cherry Lockbolt Gun.
   (c) Connect the air pressure line and use the correct pressure (Fig. 818). Do several cycles of the Cherry Lockbolt Gun and make sure the pressure is set correctly.
   (d) Assemble the split-clamp die, the clamp nut, and the sleeve. Put the assembly into the die holder.
   (e) Put the B-nut on the tube and make the tube end touch the bottom of the die holder.
   (f) Start the Cherry Lockbolt Gun. Hold the tube in its position while the die installs the sleeve on the tube. Maintain the pressure while you preset the sleeve on the tube.
   (g) Unclamp the nut. Remove the tube and die from the holder. Open the die to show the preset sleeve.

S 358-096

(2) To preset the sleeve by hand do the following:
   (a) Use the correct mandrel for the preset tool ST879A (Fig. 819).
   (b) Lubricate the threads, sleeve shoulder, and conical seal area of the fitting. Do not lubricate the tube.
   (c) Assemble the sleeve on the tube. Insert the tube into the tool ST879A union. Tighten the nut as shown in Fig. 821.
   (d) If the ST879A preset tool is not available, you can preset the sleeves with a carbon steel union and nut as shown in procedure A or B of Fig. 821.

S 228-097

(3) After you preset, make sure the BACS13AP sleeve and tube joint have the following properties (Fig. 820):

(a) Corrosion resistant steel tubing (AMS-T-6845):

Make sure the sleeves have a maximum of 0.005 inch longitudinal end play. Make sure the sleeves do not turn freely on the tube under finger pressure (without the use of force).

(b) Annealed corrosion resistant tubing (MIL-T-8504 and MIL-T-8808) and aluminum alloy tubing (AMS-T-7081 or WW-T-700/6):

Sleeves can have 0.015 inch maximum longitudinal end play and turn on the tube under finger pressure.

(c) These conditions apply to all tubing materials:

1) Make sure the tube inner diameter does not decrease more than 0.005 inch (Fig. 820).
2) Make sure the sealing surface of the sleeve bow is free of scratches, marks, or other defects.
3) The tube end is permitted to flare if the flare diameter does not prevent entrance of the MS21902 or MS21924 union into the MS flareless fitting end.

TASK 20-10-09-408-212

6. Install the CRYOLIVE Flareless Sleeve Assembly (Fig. 832)

A. General

(1) The Cryolive flareless sleeve, shown in Figure 832 and Figure 802, is installed as part of an assembly consisting of the sleeve, a coupling nut and plastic cap that acts as an assembly tool and a protective cover for the tube end until the tube is installed in the airplane. The assembly is stored in liquid nitrogen until ready for use. During installation, the assenbly is removed from the liquid nitrogen, slipped on to the tube end and allowed to warm to room temperature. The sleeve shrink fits into position at the correct distance from the the tube end as it warms to room temperature.

(2) The Cryolive flareless sleeve assembly can be used, as shown in Figure 833 and Figure 802, with 304 1/8 hard CRES, Ti-3Al-2.5V and 21-6-9 CRES tube and 6061-T6 aluminum tube. Titanium coupling nuts (part of Cryolive Assembly 921721T--) or CRES coupling nuts (part of Cryolive Assembly 921721J--) can be used with the Cryolive sleeve on 304 1/8 hard CRES, Ti-3Al-2.5V or 21-6-9 CRES tube. Aluminum coupling nuts (part of Cryolive Assembly 921721W--) and aluminum mating fittings must be used to avoid galvanic corrosion when the Cryolive flareless sleeve assembly is installed on 6061-T6 aluminum tube.

(3) The coupling nut used with the Cryolive flareless sleeve assembly in Sizes 10, 12 and 16 is longer than the standard MS21921/BACN10- coupling nut in the same sizes and is not interchangeable with the MS21921/BACN10- nuts.

(4) Ensure that the Cryolive flareless sleeve assembly is installed so that the joint is not subjected to axial preload during final torquing of the joint.

B. Equipment

(1) Cryolive Flareless Sleeve/Coupling Nut/Protective Cap Assemblies (Advanced Metal Components Incorporated, 1374 Willow Road, Menlo Park, California 94025)

(2) Tongs (any suitable, also available from Advanced Metal Components, Incorporated by P/N AT911067 -01).

(3) Insulated Gloves (available from Advanced Metal Components, Incorporated by P/N OE-Glove-Liner, S-M-L or from Damart Corporation, 1811 Woodbury Avenue, Portsmouth, New Hampshire 03805 by P/N 264E).

(4) Work Box, Insulated (available from Advanced Metal Components, Incorporated by P/N WB910825-01).

(5) Safety Glasses (commercially available).

(6) Face Shield (commercially available).

C. Consumable Materials

(1) G00262 Liquid Nitrogen

(2) B01000 Solvent - General Cleaning of Metal (Series 80)

D. Procedure

S 868-290

WARNING: DO NOT USE CRYOLIVE FLARELESS SLEEVE ASSEMBLIES ON OXYGEN LINES DO NOT USE THEM ON FLUID LINES IN THE FIRE ZONES OF THE ENGINES OR APU. THESE ASSEMBLIES ARE INCORRECT FOR THESE COMPONENTS AND AREAS. INJURIES TO PERSONNEL, AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Remove pressure from the system where you will do repairs and allow the hydraulic fluid to drain into a suitable container.

S 218-214

(2) Make sure that the tube end where you will install the Cryolive flareless sleeve assembly is round, smooth and free of scratches and burrs.

S 118-215

WARNING: DO NOT GET SOLVENTS IN YOUR MOUTH, OR YOUR EYES, OR ON YOUR SKIN. DO NOT BREATHE THE FUMES FROM SOLVENTS. SOLVENTS ARE HAZARDOUS MATERIALS. SOLVENTS MAY BE FLAMMABLE OR HARMFUL TO THE ENVIRONMENT. REFER TO PRODUCT MATERIAL SAFETY DATA SHEETS (MSDS) AND LOCAL REQUIREMENTS FOR PROPER HANDLING PROCEDURES.

(3) Use solvent, Series 80 (AMM 20-30-80/201) to clean the tube in the area where you will install the Cryolive flareless sleeve.

S 948-251

WARNING: USE EXTREME CAUTION WHEN USING LIQUID NITROGEN. THE TEMPERATURE OF LIQUID NITROGEN IS 320 DEGREES BELOW ZERO. PROVIDE PROPER VENTILATION AS LIQUID NITROGEN VAPORS CAN DISPLACE OXYGEN IN CONFINED AREAS. USE SAFETY GLASSES, A FACE SHIELD, AND INSULATED GLOVES WHEN USING LIQUID NITROGEN. MISSUSE OF LQUID NITROGEN CAN CAUSE INJURY TO PERSONS.

(4) Put on insulated gloves, safety glasses, and face shield.

S 948-217

(5) Put liquid nitrogen BB-N-411, Type II, MIL-P-27401, Type II (-320 °F), into a small, insulated container.

S 948-252

WARNING: SLOWLY AND CAREFULLY SUBMERGE WARM ITEMS IN LIQUID NITROGEN TO PREVENT RAPID BOILING OFF AND SPLASHING. MISSUSE OF LIQUID NITROGEN CAN CAUSE INJURY TO PERSONS.

(6) Remove the Cryolive flareless sleeve/coupling nut/protective cap assembly from the main storage container and put it into the small container of liquid nitrogen. Make sure the assembly is fully covered by the liquid nitrogen.

S 948-218

(7) Move the Cryolive flareless sleeve/coupling nut/protective cap assembly in the liquid nitrogen (-320 °F) to the repair location.

S 948-231

(8) Put the tongs into the liquid nitrogen.

S 038-219

(9) Using cooled tongs, remove the Cryolive flareless sleeve assembly from the liquid nitrogen and allow the excess liquid nitrogen to run off.

S 438-224

WARNING: DO NOT PUT GLOVED HAND IN LIQUID NITROGEN. THE LIQUID NITROGEN CAN "WICK" INTO THE GLOVE MATERIAL AND CAUSE INJURY TO YOUR HAND.

(10) Hold the Cryolive flareless sleeve assembly with the gloved hand and immediately slide it on to the tube end until the assembly bottoms on the tube. Ensure that the tube end is visible in the slotted end of the protective cap.

S 438-221

CAUTION: THE TUBE END MUST BE FULLY BOTTOMED AGAINST THE INSIDE END OF THE CAP SO THAT THE SLEEVE IS CORRECTLY POSITIONED ON THE TUBE END. IF THE TUBE END IS NOT BOTTOMED AGAINST THE INSIDE END OF THE CAP, REMOVE THE PLASTIC CAP AND MEASURE THE TUBE PROTRUSION PER THE "P" DIMENSION REQUIREMENT OF FIGURE 811. IF THE "P" DIMENSION IS INCORRECT, THE INSTALLATION MUST BE REPLACED.

(11) Allow the Cryolive flareless sleeve to warm and shrink on to the tube.

S 438-223

(12) When ready to complete final joining/torquing of the coupling nut/Cryolive flareless sleeve to the mating fitting, remove and discard the plastic cap by unscrewing the coupling nut (see Fig. 833).

NOTE: The plastic caps are manufactured from polycarbonate material and may be recycled.

TASK 20-10-09-408-098

7. Install the BACC42W H-Coupling (Fig. 822)

A. General

(1) The BACC42W H-coupling has a union, coupling, slide, and nut. You can use the H-coupling on fuel and hydraulic high pressure (3000 psi) lines of Ti-3AL-2.5V, CRES 21-6-9, and CRES 304 1/8 hard tubing. This repair is also approved for line repair of CRES 304 annealed and 6061-T6 aluminum lines in 3000 psi or lower pressure applications. You can use this repair on tubing that is installed and in use.

(2) You can repair defects that have a maximum width of 3/8 inch. You must make splices on larger defects. The minimum workable splice section with two H-couplings and a length of tube is 4.5 inches (Fig. 809).

B. Equipment

(1) Tube Coupling Assembly - BACC42W( ), (Sierracin/Harrison, 3020 Empire Way, Burbank, California)

NOTE: The number after the W in the part number gives the size of the coupling in sixteenths. For example, BACC42W6 fits 3/8-inch tube size. The BACC42W is superceded by BACC42W-T which is used on Ti-3AL-2.5V and all other hydraulic tubing. You can use BACC42W on all hydraulic tubes except Ti-3AL-2.5V.

(2) Consumable Materials

(a) G00270 Masking Tape

(b) B01000 Solvent - General Cleaning of Metal (Series 80)

C. Procedure

S 868-287

WARNING: DO NOT USE BACC42W H-COUPLINGS ON ANY OXYGEN LINES OR ON FLUID LINES IN THE FIRE ZONES OF THE ENGINES OR APU'S. DAMAGE TO EQUIPMENT OR INJURY TO PERSONS CAN OCCUR.

CAUTION: DO NOT TIGHTEN THE COUPLING ASSEMBLY BY HAND AFTER YOU REMOVE IT FROM THE SHIPPING CONTAINER OR BEFORE YOU INSTALL IT ON THE TUBE. THE COUPLING ASSEMBLY HAS NO MORE THAN ONE THREAD ENGAGED. YOU CAN COMPRESS THE UNION AND MAKE THE COUPLING ASSEMBLY DIFFICULT TO PUT IN POSITION.

(1) Remove pressure from the systems where you will do repairs.

S 118-210

WARNING: DO NOT GET SOLVENTS IN YOUR MOUTH OR YOUR EYES, OR ON YOUR SKIN. DO NOT BREATHE THE FUMES FROM SOLVENTS. SOLVENTS ARE HAZARDOUS MATERIALS. SOLVENTS MAY BE FLAMMABLE OR HARMFUL TO THE ENVIRONMENT. REFER TO PRODUCT MATERIAL SAFETY HANDLING DATA SHEETS (MSDS) AND LOCAL REQUIREMENTS FORPROPER HANDLING PROCEDURES.

(2) Use solvent, Series 80 (AMM 20-30-80/201) to clean the tube in the area where you will install the H-coupling.

S 358-170
(3) Cut the tube.

S 118-171
(4) Chamfer and remove burrs from the ID and OD edges. Clean the edges with solvent, Series 80 (AMM 20-30-80/201).

S 948-172
(5) Install tape on the nut side of the clearance with a minimum of 0.56 inch from the tube end and a maximum of 0.675 inch from the center of the clearance (Fig. 822).

S 948-173
(6) Use the same measurements to make a mark (index line) on the coupling side of the tube.

S 948-174
(7) Find and make a mark (marking dots) on the nut and coupling side of the tube (Fig. 822).

NOTE: These marks will be used for the last inspection check (dimension "C").

S 428-175
(8) Install the coupling assembly over the coupling side of the tube.

S 218-176
(9) Make sure the large radius and the large diameter end of the sleeve are toward the center of the union.

S 438-177
(10) Install the nut and sleeve over the tape on the nut side of the tube.

S 218-178
(11) Make sure the sleeve large bore is toward the clearence.

S 828-179
(12) Align the tubes and move the union until it touches the tape on the nut side on the tube.

S 218-180
(13) Make sure the union meets or covers the index line on the coupling side of the tube.

S 948-181
(14) Install tape on the coupling side of the tube, with the tape edge even with the end of the union.

S 438-182
(15) Push the sleeve and coupling body on the ends of the union.

NOTE: Make sure the tape does not move and the coupling body does not turn.

S 838-183
(16) Engage the threads of the nut with the coupling body and tighten the nut handtight.

S 438-184
(17) Hold the coupling body with a wrench and tighten the coupling assembly nut to the stop.

S 218-185
(18) Examine the completed repair to make sure you can see the two marking dots (Fig. 822). If you cannot see the two dots, this shows that the sleeve and coupling are not fully seated against the center land of the union.

S 218-186
(19) Make sure dimension "C" did not increase.

S 208-187

(20) Do an inspection as follows:

(a) Remove the nut.

(b) Make sure the slide and coupling are no more than 0.015 inch from the union shoulder.

(c) Make sure the union touches the tape.

(d) If the clearance between the slide or coupling and the union is more than 0.015 inch, install the nut and tighten it until you get the necessary clearance (Fig. 822).

(e) Install the nut again and tighten the nut to the necessary torque value.(See BACC42W Standard).

(f) If the union does not touch the tape, you must remove the coupling and a sufficient tube length. Install a new repair section.

TASK 20-10-09-408-108

8. Install the 3P02111 or 3PHS111 Cryofit Coupling (Fig. 823)

A. General

(1) The Cryofit coupling is a fitting which you can use to repair Ti-3AL-2.5V tubing as shown in Fig. 802. To install the fitting in a straight section, shrink fit it in its position.

B. Equipment

(1) Cryofit repair kit - FRK3P02111-001 (Aerofit Products, Inc. 6460 Dale Street, Buena Park, California 90621).

(2) (commercially available) Safety Glasses

(3) (commercially available) Face Shield

C. Consumable Materials

(1) G00262 Liquid nitrogen

(2) B01000 Solvent - General Cleaning of Metal (Series 80)

(3) A00558 Loctite 290

(4) G00270 Masking Tape

D. Procedure

S 868-288

WARNING: DO NOT USE CRYOFIT COUPLINGS ON ANY OXYGEN LINES OR ON FLUID LINES INSIDE THE FIRE ZONES OF ENGINES OR APU'S. DAMAGE TO EQUIPMENT OR INJURY TO PERSONS CAN OCCUR. THE CRYOFIT COUPLING IS NOT QUALIFIED FOR THESE APPLICATIONS.

(1) Remove pressure from the systems where you will do repairs.

S 118-226

WARNING: DO NOT GET SOLVENTS IN YOUR MOUTH, OR YOUR EYES, OR ON YOUR SKIN. DO NOT BREATHE THE FUMES FROM SOLVENTS. SOLVENTS ARE HAZARDOUS MATERIALS. SOLVENTS MAY BE FLAMMABLE OR HARMFUL TO THE ENVIRONMENT. REFER TO PRODUCT MATERIAL SAFETY DATA SHEETS (MSDS) AND LOCAL REQUIREMENTS FOR PROPER HANDLING PROCEDURES.

(2) Use solvent, Series 80 (AMM 20-30-80/201) to clean the tube in the area where you will install the Cryofit coupling.

S 438-111

(3) Use tape to make a mark on the tube to make sure you put the Cryofit coupling over the center of the tube repair.

S 328-112

(4) Cut the tube.

S 118-113

(5) Chamfer and remove burrs from the ID and OD edges. Clean the edges with solvent, Series 80 (AMM 20-30-80/201).

S 948-253

WARNING: USE EXTREME CARE WHEN USING LIQUID NITROGEN. THE TEMPERATURE OF LIQUID NITROGEN IS 320 DEGREES BELOW ZERO. PROVIDE PROPER VENTILATION AS LIQUID NITROGEN VAPORS CAN DISPLACE OXYGEN IN CONFINED AREAS. USE SAFETY GLASSES, A FACE SHIELD, AND INSULATED GLOVES WHEN USING LIQUID NITROGEN. MISSUSE OF LIQUID NITROGEN CAN CAUSE INJURY TO PERSONS.

(6) Put on the insulated gloves, the safety glasses, and the face shield.

S 948-114

(7) Put liquid nitrogen (-320°F) into a small, insulated container.

S 948-254

WARNING: SLOWLY AND CAREFULLY SUBMERGE WARM ITEMS IN LIQUID NITROGEN TO PREVENT RAPID BOILING OFF AND SPLASHING. MISSUSE OF LIQUID NITROGEN CAN CAUSE INJURY TO PERSONS.

(8) Remove the Cryofit coupling from the main storage container and put it into the small container of liquid nitrogen. Make sure the coupling is fully covered by the liquid nitrogen.

S 948-115

(9) Move the Cryofit coupling in the liquid nitrogen (-320°F) to the repair location.

S 948-234

(10) Put the tongs and the tube chiller into the small container of liquid nitrogen.

S 438-196

(11) Slip the test coupling (from the installation kit) over the tube ends to ensure that tubes are round and free of burrs. The test coupling should slide freely.

S 438-198

(12) Remove the test coupling and place the marking gauge over one of the tube ends. Using the marking pen, color in the rectangular slot in the gauge to provide an installation mark on the tube. Follow the same procedure to mark the remaining tube end.

S 438-199

(13) Place an installation stop ("O" ring) or snap-on coupling in the middle of the mark on one of the tube ends. Check the location by positioning the test coupling so that it is butted against the stop. Both tube ends should be visible in the window and the test coupling should cover approximately half the installation mark on each tube. Adjust the tubes and installation stop as necessary. Remove the test coupling.

S 438-200

(14) Ensure that the tube ends, within half the coupling length of the end, are free of scratches. If a fitting must be installed over a tube end containing a scratch, apply a thin layer (one to two drops) of Loctite 290 around the tube circumference in the area under the serrations. Be careful not to let the Loctite into the tube. No Loctite application is required for tube ends without scratches.

S 438-202

(15) Place the cooled tube chiller over the tubes to be joined. Remove the chiller after 20 to 30 seconds.

NOTE: This step may be omitted. However, placing the Cryofit coupling in contact with a tube which has not been pre-chilled with liquid nitrogen may initiate premature warming and shrinkage of the coupling.

S 438-203

(16) Install the coupling by following the steps below in rapid sequence:
- (a) Remove the tube chiller from the tubes.
- (b) Using the cooled tongs, remove the Cryofit installation package from the liquid nitrogen and grasp the package between thumb and forefinger.
- (c) Deflect the tube without the installation stop to allow the coupling to be slipped over the tube end.
- (d) Slip the coupling on to the tube, realign the tubes and slide the coupling against the installation stop.
- (e) Ensure that the Cryofit coupling is against the installation stop and that the fitting is in correct position relative to the installation marks.
- (f) Allow the coupling to warm and shrink on to the tube. Remove the Cryofit installation package and the installation stop.
- (g) Verify that both ends of the coupling lie within the installation marks on both tubes.

NOTE: If one or both ends of the fitting do not cover a portion of the installation mark, the installation is incorrect and must be replaced.

TASK 20-10-09-408-118

9. Install the Permaswage Fittings

A. General

WARNING: DO NOT USE PERMASWAGE FITTINGS ON ANY OXYGEN LINES OR ON FLUID LINES INSIDE THE FIRE ZONES OF ENGINES OR APU'S. DAMAGE TO EQUIPEMENT OR INJURY TO PERSONS CAN OCCUR.

WARNING: DO NOT USE PERMASWAGE FITTINGS TO REPAIR THE FOLLOWING COMPONENTS. IF YOU USE PERMASWAGE FITTINGS FOR THESE COMPONENTS. INJURIES TO PERSONNEL AND DAMAGE TO EQUIPMENT CAN OCCUR.

CAUTION: SWAGE FITTINGS ARE NOT APPROVED FOR REPAIRS ON POTABLE WATER SYSTEM PIPING. CAVITIES EXIST IN SWAGE FITTING CONNECTIONS THAT WILL ENTRAP CONTAMINANTS.

(1) Boeing does not approve Permaswage fittings for these applications:
   (a) For the repair of tubing in the fuel system (such as fuel pressure sensing lines)
   (b) On pneumatic ducts
   (c) Fire extinguishing lines
   (d) Potable water lines or waste water drain lines.
   (e) The repair of electrical conduits

(2) To do the Permaswage repair procedure, use the DLT series swaging tool and the BACU24BS or D10282 in-line tube unions (sizes 04, 06, 08, 10, 12, and 16). You can use CRES Permaswage fittings, as shown in Fig. 824 and Fig. 802, with 304-1/8 hard CRES tube to repair Ti-3AL-2.5V and 21-6-9 CRES. Repair 6061T6 aluminum tubing with aluminum Permaswage fittings with D suffix in the basic part number.

   NOTE: In-line tube union D10036 may be used as an alternative to D10282.

   NOTE: Permaswage repair is not suitable to the potable water lines because microbes may grow in the cavity of the seal.

(3) When you do a repair, remove the part of the tube with the defect. Put in a tube splice and install the splice with two fittings. Fittings and tubing material sizes are shown in Fig. 824.

(4) When you remove tubes, make sure the tubes and port fittings have tags that identify the correct connection locations.

(5) The splice must be shorter than the removed tube section. At a maximum length, make the splice shorter than the tube section by four times the growth value shown in Fig. 827 (four fittings). This permits an increase in length as a result of swaging. As a minimum length, make the splice longer than 0.300 inch less than the cut-out. This permits tube gaps (not more than 0.150 inch) as shown in Fig. 827.

NOTE: Include the length growth caused by swaging when you work with short tube sections with small flexibility. Short tube sections or tube repairs between rigidly installed fittings can buckle.

B. Equipment
(1) DMC Permaswage Kit - DLTFRPSKT330 (Sizes 4, 6, 8, 10, 12, 16, 20, 24)
(2) DMC Permaswage Lightweight series (DLT Series) - Tool numbers are listed in Fig. 825. You can get tool kits in different size combinations. Contact DMC for tool kit part numbers. Make sure that the DLT Series tooling has been inspected to the following DMC Tooling Control Documents:

NOTE: One pump is required to actuate the power units, as shown in Fig. 825 (Designed Metal Connections, P.O. Box 61188, 14800 S. Figueroa St, Los Angeles, CA 90061).

(a) MCP-016 - Inspection Criteria of DMC, DLT Series, Swage Head Assembly - Standard Permaswage, 3,000 psi Application
(b) SOPG-01-05 Instruction Manual 3000 PSI System
(c) DMC-1350-DLT - Tools Prevention Maintenance

C. Consumable Materials
(1) C00064 Alodine - 1200 or 1200S
(2) C00259 Primer - BMS 10-11, Type 1
(3) B00010 Solvent - General Cleaning of Metal (Series 80)
(4) B00138 Abrasive cloth - 240-grit, P-C-451

D. References
(1) AMM 20-10-09/401, Flareless Tubing Assembly
(2) AMM 20-30-80/201, Airplane Structure Cleaning Solvents (Series 80)

E. Prepare Tube for Installation

S 868-127
(1) Remove pressure from the systems where you will do the repair.

S 948-285
(2) Use the tools shown in Fig. 825.

S 948-120
(3) Cut out the damaged section of the tube:
  (a) Make sure the section you cut out of the tube is a straight section with a minimum straight length as shown in Fig. 826. This will make sure the fitting and swage tool will fit.
  (b) Use one Permaswage fitting for the repair if the damaged section is no more than 0.150 inch long. In this case, the cut can be through the center of the damaged section.
  (c) If the damage is too near to a bend (less than 1/2 "A", Fig. 826) or longer than 0.150 inch, use a tube splice and two fittings to make the repair.

S 948-121
(4) For tube cutouts with a bend, use the cutout tube section as a template to mark and cut the new tube segment.

NOTE: The maximum gap between the tube ends is approximately 0.150 inch for the union installation.

S 118-122
(5) Clean the tube in the swage area:
  (a) Clean the not painted tube sections that you will repair with solvent, Series 80 (AMM 20-30-80/201).
  (b) Make sure the sections are free of dirt, grease, and other unwanted material for a distance equal to the values shown in Fig. 826.
  (c) Remove paint and anodize from the tubes in an area equal to the values shown in Fig. 826. Use the methods shown in Fig. 828.
  (d) Make sure the cleaned surfaces are smooth, uniform, bright, and free of unwanted materials.
  (e) Use a brush to apply a layer of Alodine 1200 to the open surfaces of aluminum tubes.

S 948-123

(6) Remove burrs from the tube ends:

(a) To remove burrs from the inner bore of the tube ends, use DMC plug-type deburring tools or equivalent. Refer to Fig. 804 for the correct deburring procedure.

NOTE: You must remove burrs from the tube inner diameter each time you cut the tube. Make sure the tube shavings do not get into the system.

Do not release the spring pressure of the deburring tool while you pull the tool from the tube.

(b) It is not usually necessary to remove burrs from the tube outer diameter. If it is necessary, use 240-grit abrasive cloth. Use a clean cloth to remove particles.

S 948-124

(7) Use one of these steps to apply witness marks:

(a) Use a felt pen or equivalent to apply witness marks as shown in Fig. 829. Use DMC tools D12580-1, -2, -3 only or equivalent.

(b) Make marks directly on the tube to show the minimum insertion depths as shown in Fig. 829. Swage fittings to the marks.

S 378-125

(8) Apply paint to bare areas. For example, tool marks and areas where you removed paint (fittings and painted tubes).

S 378-126

(9) Apply alodine 1200 to open areas of aluminum and BMS 10-11 primer to all other tubes and fittings.

F. Procedure

S 948-128

(1) Use a union and a tube as shown in Fig. 824.

NOTE: Keep the Permaswage fittings in their container until you are ready to install them.

S 358-129

(2) Make sure the tube is sufficiently long to do the repair (Fig. 826).

S 118-130
(3) Clean the tube as shown in Fig. 828, then cut the tube.

NOTE: Seal the tube ends with a cap if you do not join the tubing immediately.

S 218-131
(4) Examine the unions for silicone seals (see NOTES, Fig. 824).

S 428-132
(5) Move the union over the tube ends. Center the union on the witness marks or put it in position at the correct insertion depth.

S 358-133

WARNING: MAKE SURE YOU MAKE NO PUMP ADJUSTMENT THAT CAN CAUSE THE SWAGE TOOL HYDRAULIC PRESSURE TO BE MORE THAN THE MANUFACTURER RECOMMENDED. DLT SERIES TOOLS ARE IS 10000 PSI +/-250 PSI MAXIMUM. IF PRESSURE IS GREATER THAN ABOVE MAXIMUM/MINIMUM VALUES INJURY OR DAMAGE CAN OCCUR.

(6) Swage the union to the tube as shown in the manufacturer's recommended procedures.

S 358-134
(7) Swage each end three times.

NOTE: After the initial swage, move the swage head between 30 and 45 degrees from the previous swage position before you swage again.

S 118-135
(8) Lubricate the head and lower die blocks regularly.

S 218-136
(9) Examine the end plates for loose retaining screws.

S 228-137
(10) Examine the finished swage as shown in the manufacturer's recommended procedure or measure with Vernier caliper for dimensions as shown in Fig. 830.

S 768-138
(11) In the fuel tanks and vapor areas, do a check of the electrical resistance specifications across each tube/fitting interface (AMM 20-10-09/401).

S 768-139
(12) Make resistance measurements for all Permaswage repair installations in wing tanks and fuel vapor areas (AMM 20-10-09/401).

S 798-140
(13) For Permaswage fitting repairs in general areas, do a leak test as follows:
(a) Pressurize the system for a minimum of 5 minutes.
(b) Rub the tube and fittings with a clean white cloth to find leakage.

S 218-141
(14) Examine the tube-to-fitting interface for hydraulic leaks you can see.

NOTE: When dimensional or leakage specifications are not met, you can swage again. Then do a leak test. You must replace fittings you cannot seal.

S 378-142
(15) Apply BMS 10-11 primer to the Alodine areas of the finished tube joint where the bare metal is open.

TASK 20-10-09-408-255

10. Rynglok Union Installation (Fig. 834)

A. General

WARNING: DO NOT USE RYNGLOK FITTINGS ON ANY OXYGEN LINES. DAMAGE TO EQUIPMENT OR INJURY TO PERSONS CAN OCCUR.

WARNING: DO NOT USE RYNGLOK FITTINGS TO REPAIR THESE COMPONENTS. IF YOU USE RYNGLOK FITTINGS FOR THESE COMPONENTS, INJURIES TO PERSONNEL AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Boeing does not approve Rynglok fittings for these applications:
  (a) For the repair of tubing in the fuel system (such as fuel pressure sensing lines) or fuel tanks.
  (b) On pneumatic ducts
  (c) Fire extinguishing lines
  (d) Potable water lines or waste water drain lines.
  (e) The repair of electrical conduits
(2) Rynglok tube to tube fittings are not to be used on fluid lines inside airplane fuel tanks, in engine areas, or on lines used in oxygen systems. The rynglok tube to tube fitting is not qualified for these applications.
(3) The Rynglok in-line tube unions (Fig. 834), sizes 04, 06, 08, 10, 12, and 16 are used with 304 1/8 hard CRES to repair Ti-3AL-2.5 and 21-6-9 CRES. The same unions plus a size 20 are used with 6061-T6 aluminum tube to repair 6061-T6 aluminum tube, provided the bare areas of the tubing are painted after swaging to limit the possibility of galvanic corrosion occurring.
(4) When you do a repair, remove the part of the tube with the damage. If the area of the tube damage is less than the value listed in Fig. 805), use one Rynglok union for repair.
(5) If the tube damage is longer than the value listed in (Fig. 805), put in a tube splice and install the splice with two fittings. The splice must be equal to or slightly shorter than the removed tube section. The minimum length of tubing to be removed is shown in (Fig. 836). Fittings and tubing material sizes are shown in (Fig. 835).

B. Equipment
(1) Swager - Hydraulic Fitting RTSK8-02-006 (Aeroquip Corporation, Jackson Plant, 300 S. East Ave., Jackson, MI 49203-1972)

C. Consumables
(1) B00068 Alcohol, ethyl (denatured) - MIL-E-51454, Type II
(2) C00064 Coating, Surface Treatment (Alodine) - MIL-C-81706, MIL-C-5541, Type II
(3) C00259 Primer, chemical and solvent resistant finish, epoxy resin primer - BMS10-11, Type I

D. Procedure

S 948-256
(1) Remove pressure from the system where you will do the repair.

S 358-257
(2) Use the tools (Fig. 837) contained in swager, RTSK8-02-006.

S 358-258
(3) Cut out the damaged section of the tube using a chipless tube cutter (Fig. 804) and the following:
  (a) Make sure the section you cut out of the tube is a straight section with a minimum straight length as shown in (Fig. 812). This will make sure the fitting and the swage tool will fit.

(b) Use one Rynglok union for the repair if the damaged section is not longer than the dimensions listed in (Fig. 805). If the damage is within the dimensions, the cut can be through the center of the damaged section.

S 158-259

(4) Remove the paint and the anodize from the tubes to the dimensions shown in (Fig. 812).

S 118-260

(5) Clean the non-painted tube sections that you will repair with alcohol, MIL-E-51454, Type II.

S 398-261

(6) Use a brush to apply coating, MIL-C-81706, MIL-C-5541, Type II to the cut ends of the tube.

S 628-262

(7) Seal the tube ends with a cap if you do not join the tubing immediately.

S 948-263

(8) Apply positioning and inspection marks on the tube to be repaired using the appropriate gage from the swager, RTSK8-02-006 and a Sanford Sharpie (or equivalent) felt tip pen with a fine or extra fine point (Fig. 837, Fig. 838). Bottom the gage on the cut edge of the tube before making the marks.

S 948-264

(9) Move the Rynglok union over the tube ends.

S 948-265

(10) Put the edge of the fitting ring over the center of the positioning mark (nominaltube insertion) as shown in (Fig. 839). The edge of the fitting ring may be anywhere along the length of the positioning mark but the nominal position is recommended.

S 368-266

WARNING: MAKE SURE YOU MAKE NO PUMP ADJUSTMENT THAT CAN CAUSE THE SWAGE TOOL HYDRAULIC PRESSURE TO BE OUTSIDE THE MANUFACTURER'S RECOMMENDATIONS. THE AEROQUIP RECOMMENDATION FOR THE TOOL IS 8000 PSI TO 8500 PSI MAXIMUM. IF PRESSURE IS GREATER THAN THIS VALUE, INJURY AND DAMAGE CAN OCCUR.

(11) Swage the union to the tube as shown in the Aeroquip Installation Guide supplied with the swager, RTSK8-02-006.

NOTE: The fitting must always be fully installed in the tool to maximize tool life.

S 368-267

(12) Examine the finished installation for correct ring advancement using the appropriate size inspection gage from the swager, RTSK8-02-006. The inspection gage should fit over the ring area as shown in (Fig. 841) so that the ring is flush with the center portion of the union.

S 948-268

(13) Pressurize the hydraulic system to operating pressure for the system which was repaired.

S 368-269

(14) Examine the tube-to-union interface for hydraulic leakage. If leakage is found, the union must be cut out and a tube repair by section replacement must be done.

S 378-270

(15) Apply coating, MIL-C-81706, MIL-C-5541, Type II to bare areas of the aluminum tubing where paint was removed, followed by a coat of primer, BMS10-11, Type I.

TASK 20-10-09-358-151

11. Repair Hydraulic Tubing With Flexible Hoses

A. General

(1) The Boeing Company recommends that the operator do these procedures:

(a) Make a record of the flexible hoses that you install as temporary repairs for rigid lines.

(b) Make a schedule for the regular inspection of flexible hose installations. Make sure the installation stays an airworthy repair until the system is put back to its initial configuration.

(c) Make a procedure to make sure the flexible hoses that are installed as temporary repairs are replaced as soon as possible. You must replace the hoses no later than the scheduled time check approved by the assigned principal maintenance inspector.

(2) You can use many different repair techniques. The Boeing Company cannot know about or control these repair techniques. It is your responsibility to decide if this procedure is applicable to your repair techniques.

(3) This procedure is not acceptable for engine hydraulic tube repair or for the replacement of rigid or flexible coiled tubing. Engine hydraulic tubes are those tubes below or forward of the firewall, and within the engine cowls. Consult Boeing when considering a repair to any Engine Hydraulic or coiled tube.

B. References
(1) AMM 20-10-10/401, Flexible Hose - Installation
(2) AMM 29-11-00/201, Main Hydraulic Systems

C. Consumable Materials
(1) Hydraulic Tubing Repair Kit - P/N 65-92528-1 or equivalent

D. Install the Flexible Hose

S 228-143

(1) Use a flexible hose that has the specifications that follow:
(a) Make sure the flexible hose is specified for at least the same operating pressure and fluid type as the system in which you will install the flexible hose.
(b) Make sure the new flexible hose has a minimum of the same inner diameter as the damaged tube.
(c) Make sure the new flexible hose is sufficiently long to replace the damaged tube or the damaged section of the tube.
(d) Make sure the new flexible hose has sufficient slack, flex, twisting, bending, clearance, and support specifications as shown below and on Fig. 831.
1) Slack - Do not install the hose assemblies in a way that will cause a mechanical load on the hose. Hoses will change length from +2 to -4 percent when pressurized. Supply sufficient slack or bend to make the allowance for a change in length and length tolerances.
2) Flex - When hose assemblies will have much vibration or flexing, make sure there is sufficient slack between the rigid fittings. Install the hose so flexing does not occur at the end fittings. The hose must stay straight for at least two hose diameters from the end fittings. Do not use clamp locations that will restrict or prevent the hose from flexing.
3) Twisting - Make sure you install the hoses without twists to prevent loose nuts and possible rupture of the hose. You can use swivel connections at one or two ends to release the twist stresses.

4) Bending - To prevent sharp bends in the hose assembly, use elbow fittings, hose with elbow type end fittings, or the applicable bend radii, as shown in Table 804.

TABLE 804

AS 115 HOSE	HOSE INNER DIAMETER (INCH)	MINIMUM HOSE BEND RADIUS MEASURED AT INNER BEND (INCH)
–04	1/4	1.50
–06	3/8	2.50
–08	1/2	2.88
–10	5/8	3.25
–12	3/4	4.00

5) Clearance - Make sure the hose assembly is clear of all other lines, equipment, and adjacent structure under all operating conditions. The hoses must have the minimum clearance specifications shown in Table 805.

TABLE 805

HOSE CLEARANCE TO	MINIMUM CLEARANCE (INCH)
CONTROL CABLES AND LINKAGES	1.0 *[1]
CABLE AT PULLEYS	0.5
CABLE AT MID-SPAN	2.0
ELECTRICAL WIRING	0.5
HYDRAULIC TUBES OR HOSES	0.2

*[1] Measured at a relative position where the hose is closest to the cable or linkage.

6) Support - Make sure the hose assembly has supports that do not cause deflection of rigid lines because of the relative motion that can occur. Use sufficient clamps to follow the contour of the structure to prevent hose abrasive wear, kinking, and entanglement during flexing. At a minimum, put clamps at locations where the tube clamps were.

Make sure the hose is not rigidly supported by tight, rigid clamps around its outer diameter. If a hose between rigid connections must move longitudinally, clamps must be of a type that will not cause wear on the hose casing. Make sure the connections have supports at the tube, not at the hose.

S 868-144

(2) Remove pressure from the hydraulic system where you will do the repair (AMM 29-11-00/201).

S 968-145

(3) If you can replace all of the damaged tube with a flexible hose, do these steps:
(a) Remove the damaged tube.
(b) If necessary, prepare the ends of the tubes to which you will install the flexible hose. Use the applicable fittings as shown in the Tubing Repair paragraph.

S 968-146

(4) If the damaged tube is too long to replace by a flexible hose, do the steps that follow:
(a) Cut out the damaged tube section to accept the flexible hose.
(b) Prepare the ends of the cut tube with the applicable fittings as told in the Tubing Repair paragraph.

S 428-147

(5) Install the flexible hose (AMM 20-10-10/401).

S 868-148

(6) Supply the usual operating pressure to the repaired tube.

S 218-149

(7) Examine the hose and connections for leaks.

S 228-150

(8) Make sure the repair agrees with all specifications for slack, flex, twisting, bending, clearance, and support.

TASK 20-10-09-208-279

12. Repair 6061-T4/T6 Aluminum Tubing (Hydraulic or Pitot-Static Tubing)

A. General

(1) The aluminum tubing in the pitot-static system is 6061-T6 aluminum. The hydraulic system contains both 6061-T4 and T6 aluminum tubes.

(2) This is a repair method that applies only to 6061-T4/T6 aluminum tubes in Sizes 16 (1 inch) and 20 (1-1/4 inch) and uses 6061-T6 aluminum tube material. 6061-T6 material may be used as an alternate material for repair of 6061-T4 aluminum tubes but 6061-T4 aluminum tube material may NOT be used to repair 6061-T6 aluminum tubes.

(3) Repair is accomplished using only the BACS13BX sleeve, the elastomer swaging process and other applicable methods specified in this MM for flareless tube repairs. No tube-to-tube fitting repairs are approved for 6061-T6 aluminum hydraulic tube.

(4) The wear depth for 6061-T4/T6 tubes is 1/3 the wall thickness of the tube.

B. Repair 6061-T4/T6 Aluminum Tubing

S 308-280

WARNING: DO NOT USE TITANIUM FITTINGS WHEN YOU REPAIR THE OXYGEN SYSTEM TUBES. TITANIUM FITTINGS CAN CAUSE A FIRE OR INJURY TO PERSONS.

(1) Do the repair:

(a) Decide if a tube splice is necessary or if the damage is small enough to repair by installing a flareless MS21902 union between two BACS13BX sleeves.

(b) Refer to (Fig. 805) to find the necessary tube cutout length when you use a single flareless MS21902 union to replace a damaged tube area.

(c) To use assembled tube ends or a center section to do a repair, find the cutout length and install as follows:

1) Make an estimate of the total length (L1) of the repair section necessary to replace the damaged tube (Figs. 806, 809).

2) Cut and trim the repair tube as follows: (Fig. 804)

a) Use the correct size ratchet chipless cutter.

b) Turn the cutter drive screw counter clockwise to retract the cutter wheel.

c) Put the cutter over the tube.

d) Turn the screw clockwise until the cutter touches the tube at the necessary cut location.

e) Turn the cutter screw 1/8 to 1/4 turn and rotate the cutter until the cutter is easy to rotate. The tube should now be cut.

f) Remove the tool.

g) To deburr the tube, use the correct stem subassembly and deburring tool. To assemble the tool refer to (Fig. 804).

h) Push down on the plunger and install the tool into the end of the tube.
i) Release the plunger. Let the plug fill the inside of the tube.
j) Rotate the deburring tool until the inside burr is removed.
k) Remove the tool with the plug expanded. The expanded plug should remove particles from the inside of the tube.

NOTE: Make sure you do not drop metal particles in area of the repair.

3) Swage the necessary flareless BACS13BX sleeves to the repair tube using the applicable section: Swage BACS13BX Flareless Sleeves with the Harrison Elastomer Swagers 5175, 5570, 5720.
4) Assemble and tighten the flareless fittings which are part of the repair section (AMM 20-10-09/401) Removal/Installation.
5) Measure all of the tube assembly length with BACS13BX sleeves (L1) (Figs. 806, 809).
6) To find the necessary cutout length (L2) as shown in (Figs. 806, 809), use the procedure given in (Fig. 810) for BACS13BX sleeves and Harrison Portable Swagers with MS21902 unions.
7) Remove the pressure from the systems where you will do the repairs.
8) Cut out the damaged tube (L2). Trim the tube ends as shown in (Fig. 804).
9) When you make the installation, refer to the section: "Swage the BACS13BX Flareless Sleeves with the Harrison Elastomer Swagers 5175, 5570, 5720".
10) Install the repair section and tighten the nuts (AMM 20-11-00/201).

TASK 20-10-09-208-188

13. Aluminum Fuel Tubes - Temporary Weld Repair Method

A. General

(1) This is a temporary repair method approved for 6061 and 5052 aluminum fuel system tubing, and is applicable only to tubes with wear-through damage, cracks, or punctures.

(2) Repair is accomplished with tubing removed from airplane.

B. Consumable Materials

(1) B01000 Solvent, Series 80

(2) B01008 Solvent, Series 88

C. Aluminum Fuel Tube Repair

S 018-289

CAUTION: REPLACE THE TUBE WITH A TEMPORARY REPAIR WITH A NEW SECTION OF TUBE WITHIN A MAXIMUM OF 250 FLIGHT HOURS. IF YOU DO NOT REPLACE THE TUBE, DAMAGE COULD OCCUR.

(1) Remove aluminum fuel tube to be repaired by referring to applicable maintenance manual removal and installation procedure.

S 118-189

CAUTION: FULLY CLEAN THE TUBING. IF YOU DO NOT CLEAN THE TUBING, THE WELD CAN GET CONTAMINATED AND THE WELD QUALITY DECREASES.

(2) Completely clean the inner and outer surfaces of all the tube section with solvent, Series 80 (AMM 20-30-80/201).

S 358-190

(3) If tubing is cracked, drill 3/32-inch stop holes at each end of crack.

S 128-191

(4) Clean tubing use wire brush to descale and remove all protective coatings and oxides from area to be welded.

NOTE: Wire brushes used for descaling must have bristles of austenitic corrosion-resistant steel or nickel-silver.

S 118-192

(5) Rub or rinse the tubing with solvent, Series 88 (AMM 20-30-88/201) to remove all the residue.

S 318-193

CAUTION: MAKE SURE THERE IS NOT TOO MUCH PRESSURE IN THE TUBING DURING THE WELDING. A HIGH PRESSURE CAN CAUSE A BAD WELD BEAD CONFIGURATION.

(6) Fusion weld the damaged area by a gas tungsten arc process per BAC 5975, Class A, using 4043 filler rod.

S 238-275

(7) Penetrant check welded area (SOPM 20-20-02).

S 118-276

(8) Rinse with solvent, Series 88 (AMM 20-30-88/201).

S 798-207

(9) Hydrostatically test repaired tube to 240 psig per BAC5001-2. There shall be no leakage.

S 378-194

(10) Finish repaired area with appropriate protective coatings as required to meet original tube finish requirements.

S 438-195

(11) Install the repaired fuel tube per applicable maintenance manual procedure.

TASK 20-10-09-938-281

14. Part Marking of Flareless Tubing Assemblies

A. General

(1) Do this task to identify field manufactured replacements for hydraulic tubes or originally installed hydraulic tubes that have lost identification.

(a) For originally installed hydraulic tubes that have lost identification, reapply the original tube part number using one of the methods listed below.

(b) For a field manufactured replacement tube, select a NEW tube part number that will include information to allow easy identification and location for future use (in case the tube must be repaired or replaced again), for example, 65C26841-1002REPL. Apply the NEW tube part number using one of the methods given below.

B. Consumable Materials

(1) G50393 Tape - Adhesive, Label (BAC 5307 Type III, Polyester (Mylar))
(2) C50066 Coating - Exterior Protective Enamel, Clear (BMS10-60, Type 1, Class A)
(3) G02061 Maker - Permanent, Felt Tip Pen (Sanford Sharpie, 13601, 13801)
(4) G50395 Ink - Laundry Marking (TT-I-542)
(5) G00251 Abrasive - Non-Woven, Non-Metallic, Mats - Scotchbrite A-A-58054 (3M Company).
(6) G50396 Ink - Marking, Silk Screen (Standard Overhaul Practices Manual (SOPM) 20-50-10)
(7) B50095 Solvent - BAC5750x
(8) G50410 Stamp Pad (Commercially available)

C. Procedure

S 938-282

(1) Do one of these steps to identify hydraulic tubes:
(a) Rubber Stamp
1) Clean the tube surface with solvent, B50095. Use fine Scotch-Brite, G00251 to remove oxide from the tubing surface to be marked.
2) Select an ink, G50396 (SOPM 20-50-10) that is suitable for the tube material and is visible on the tube surface.
3) Hand stamp the new part number on the tube. Apply liquid ink, G50396to a stamp pad, G50410 and apply the part number to the tube surface with the stamp.

NOTE: For tubes longer than 24 inches, mark new part number within 6 inches of each end or on the straight area that is not in the clamp area.

4) Apply a clear overcoat, C00033.
5) Clean the tube surface with solvent, G50410. Use fine scotch, G00251 to remove the oxide from the tubing surface to be marked.
6) Hand mark the new part number on the tube using a permanent marking ink G50395, or Sanford marker G02061.

NOTE: For tubes longer than 24 inches, mark new part number within 6 inches of each end or on the newest straight area that is not in a clamp area.

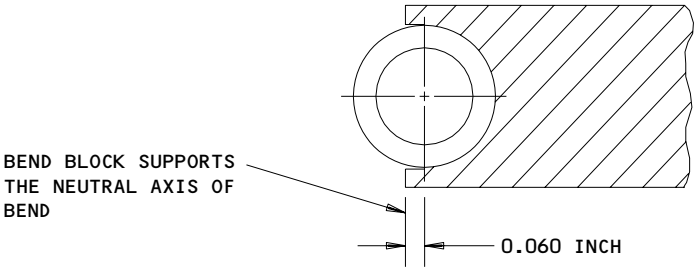
7) Apply a clear overcoat, C00033.

(b) Tape or Adhesive Label

CAUTION: DO NOT USE TAPES OR ADHESIVE LABELS INSIDE FUEL TANK ASSEMBLIES. FUEL CAN WASH AWAY TAPE AND ADHESIVE LABELS.

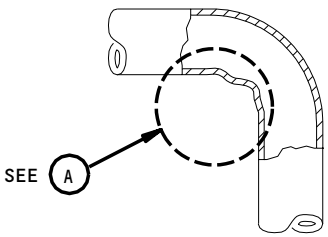
1) Attach a tape or adhesive label, G50393 containing the new tube part number.
2) Cut the tape, G50393 length to encircle the tube at least two times on a 0.250 inch to 0.500 inch diameter tube. On 0.625 inch diameter tubes and larger, encircle the tube with the tape, G50393 one and one-half to two times as necessary.
3) Apply a clear overcoat, C50066.

NOTE: The original identification tapes, P/N BACT11Y-( )( ) can be used for marking replacement tubes, although BACT11Y tapes require special handling equipment.

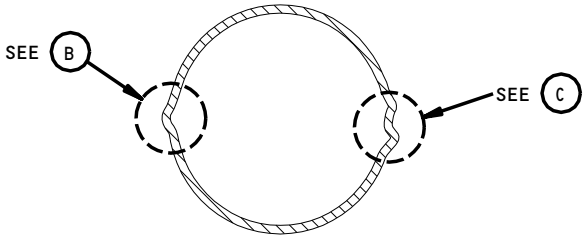


NOTE: IF THE OVALITY OF ANY PART OF THE BEND IS MORE THAN THE MAXIMUM PERMITTED OVALITY, DISCARD THE TUBE.

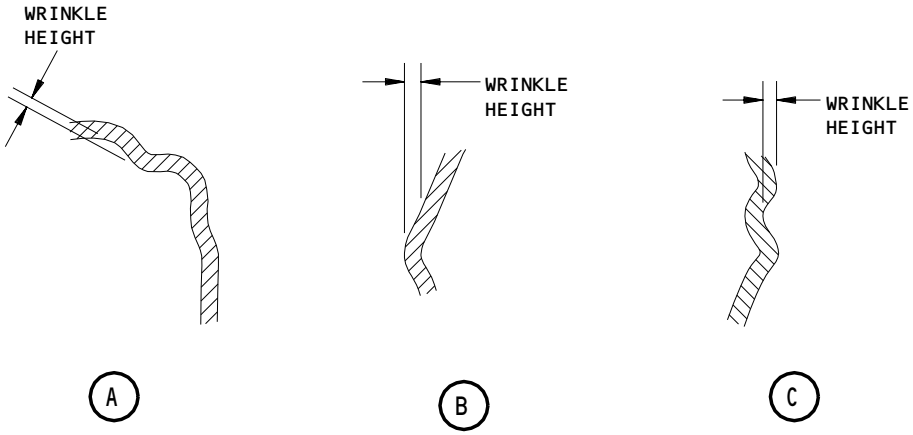
TUBE BEND BLOCK



RADIAL WRINKLE



LONGITUDINAL WRINKLE



WRINKLE MEASUREMENTS

Permitted Ovality and Wrinkle of Hydraulic and Fire Extinguishing Tube Bends
Figure 801 (Sheet 1)

SYSTEM OPERATING PRESSURE	TUBE OD	TUBE MATERIAL	ALLOWABLE WRINKLE HEIGHT (Inches)	ALLOWABLE OVALITY (Percent of Specified OD)* 1
Liquid: 1000 PSI To 3000 PSI (Including Return Lines)	All Sizes	Stainless Steel	0.010	5
		Aluminum	0.010	5
		3AL-2.5V Titanium	None Visible	3
Pneumatic And Oxygen: Pressure Above 1500 PSI or Temperature Above 160F	All Sizes	Stainless Steel	0.010	5
Other Liquid Systems: Pressure Less Than 1000 PSI Pneumatic and Oxygen Systems: Pressure Less Than 1500 PSI or Temperature Less Than 160F	Less Than 1.0	Stainless Steel	0.040	10
		Aluminum Alloy & Copper	0.020	10
	1.0 Or Over, Less Than 2.0	Stainless Steel	0.060	10
		Aluminum Alloy & Copper	0.030	10
	2.0 Or Over, Less Than 3.0	Stainless Steel	0.080	5
		Aluminum Alloy & Copper	0.040	5
	3.0 Or Over	Stainless Steel	0.100	5
		Aluminum Alloy & Copper	0.050	5

* Specified Diameter = Drawing Specified Tube Diameter

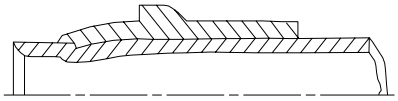
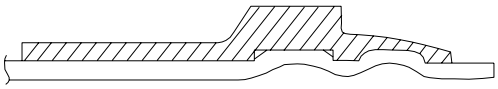
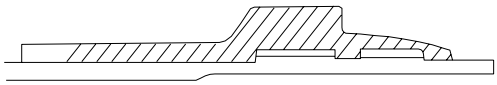
1 PERCENT (OVALITY) = $\frac{\text{OD MAX} - \text{OD MIN}}{\text{OD SPECIFIED*}}$ X 100

(NOTE: OD MEASURED IN SAME PLANE).

NOTE: FOR ADDITIONAL INFORMATION ON TUBE BENDING, SEE SAE AIR 5378 "AIRCRAFT TYBE BENDING METHODS, TECHNIQUES AND TOOLING."

Permitted Ovality and Wrinkle of Hydraulic and Fire Extinguishing Tube Bends
Figure 801 (Sheet 2)

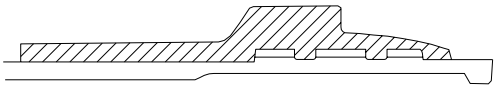
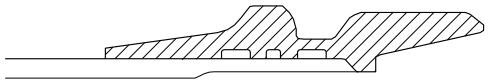
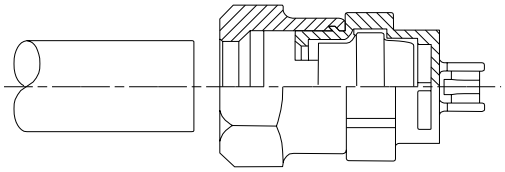
CAUTION: DO NOT USE CADMIUM PARTS ON TITANIUM TUBES. CORROSION WILL OCCUR IF YOU USE CADMIUM PARTS ON TITANIUM TUBES.

TUBE JOINING		TUBE MATERIAL 7	REF TABLE C FOR TOOLS REQUIRED	APPROVED SIZES
ILLUSTRATION	PART NUMBER*			
	BACS13AP (BITE-Type) 1	6061T6	B,C	04, 06, 08, 10, 12
		304 ANN.	B,C	04, 06, 08, 10, 12
		304 1/8 Hard	B,C	04, 06, 08, 10, 12
	BACS13BX (Elastomer Swage) 2	6061T6	A	06, 08, 10, 12, 16, 20 3, 24 3
		304 ANN.	A	16, 20
		304 1/8 Hard	A	06, 08, 10, 12, 16, 20 3, 24 3
		21-6-9	A	04, 06, 08, 10, 12, 16
	BACS13BX (Roller Swage)	21-6-9	D	04, 06, 08, 10, 12, 16
		Ti-3Al-2.5V	D	04, 06, 08, 10, 12, 16

REPAIR METHOD – RECONNECTABLE WITH FLARELESS FITTING SLEEVES
TABLE A

Tube Material and Fitting Selection Tables
Figure 802 (Sheet 1)

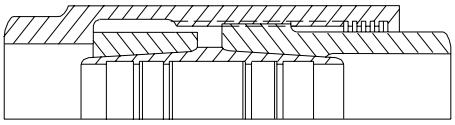
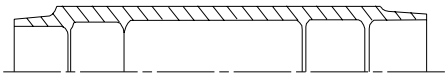
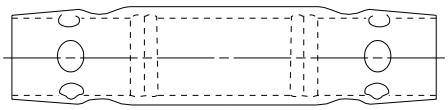
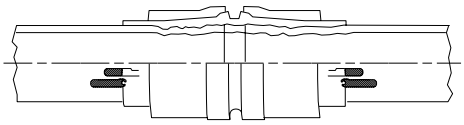
CAUTION: DO NOT USE CADMIUM PARTS ON TITANIUM TUBES. CORROSION WILL OCCUR IF YOU USE CADMIUM PARTS ON TITANIUM TUBES.

TUBE JOINING		TUBE MATERIAL 7	REF TABLE C FOR TOOLS REQUIRED	APPROVED SIZES
ILLUSTRATION	PART NUMBER*			
	35211 SLEEVE (Roller Swage)	Ti-3Al-2.5V	D(1)	04, 06, 08, 10, 12, 16
	35212 UNION (Roller Swage)	Ti-3Al-2.5V	D(1)	04, 06, 08, 10, 12, 16
	CRYOLIVE Assembly 921721	6061T6	G	04, 06, 08, 10, 12, 16
		21-6-9	G	04, 06, 08, 10, 12, 16
		Ti-3Al-2.5V	G	04, 06, 08, 10, 12, 16
		304 1/8 Hard	G	04, 06, 08, 10, 12, 16

* SEE TABLE D FOR ASSOCIATED APPROVED FITTINGS.

REPAIR METHOD - RECONNECTABLE WITH FLARELESS FITTING SLEEVES
TABLE A

Tube Material and Fitting Selection Tables
Figure 802 (Sheet 2)

TUBE JOINING		TUBE MATERIAL 7	REF TABLE C FOR TOOLS REQUIRED	APPROVED SIZES
ILLUSTRATION	PART NUMBER			
	BACC42W Repair H-Coupling BACC42W-T	6061T6	G	04, 06, 08, 10
		304 ANN.	G	04, 06, 08, 10 12, 16
		304 1/8 Hard	G	04, 06, 08, 10, 12, 16
		21-6-9	G	04, 06, 08, 10, 12, 16
		Ti-3Al-2.5V	G	04, 06, 08, 10
	3P02111 or 3PHS111 Cryofit	Ti-3Al-2.5V	F	04, 06, 08, 10, 12, 16
	Permaswage D10282-D (Al)	6061T6	E	04, 06, 08, 10, 12, 16
	Permaswage D10282 - (Cres)	Ti-3Al-2.5V	E	04, 06, 08, 10, 12, 16
		304 1/8 Hard	E	04, 06, 08, 10, 12, 16
		21-6-9	E	04, 06, 08, 10, 12, 16
	Rynglok 80101T - (TITANIUM)	6061T6	H	04, 06, 08, 10, 12, 16
		Ti-3Al-2.5V	H	04, 06, 08, 10, 12, 16
		304 1/8 Hard	H	04, 06, 08, 10, 12, 16
		21-6-9	H	04, 06, 08, 10, 12, 16

REPAIR METHOD - PERMANENT UNIONS, TUBE-TO-TUBE
TABLE B

Tube Material and Fitting Selection Tables
Figure 802 (Sheet 3)

REF LETTER FOR TABLES A AND B	TOOL REQUIRED
A	Harrison Portable Swagers No. 5175 and 5720 or equivalent stationary Swager No. 5570
B	Pressure Presetting Tools ST878D
C	Hand Presetting Tools ST879A
D	Harrison Roller Swage Tool Kit 6633K01
D (1)	Harrison Roller Swaging Machine 6777
E	DMC Permaswage Kits: • D12000 Series - No. D12102C03-01A00 for sizes 04 and 06 (1/4 and 3/8 inch) - No. D12102C06-26A00 for sizes 08,10, and 12 (1/2, 5/8 and 3/4 inch - No. D12102C11-04 for size 16 (1 inch) - One pump unit, Part No. D12025-001, is necessary for swaging with the tool kits shown. • DLT Series - Refer to Fig. 825 for individual tool numbers - Consult DMC for tool kit numbers - One pump unit, DLT02MAPP1000 (pneumatic, 10,000 psi) or - DLT05MAPM1000 (manual, 10,000 psi) is necessary for swaging with the tool kits shown.
F	AMCI: • FRK3P02111-001
G	None necessary - hand tools only.
H	Aeroquip Rynglok Kit RTSK8-02-006 for sizes 04, 06, 08, 10, 12, 16, 20.

TOOL REQUIRED FOR REPAIR METHOD
TABLE C

Tube Material and Fitting Selection Tables
Figure 802 (Sheet 4)

PART NUMBER	ASSOCIATED APPROVED FITTINGS	
	FITTING NUTS 4 6	UNIONS 5
BACS13AP (BITE-Type) BACS13BX (Elastomer Swage) BACS13BX (Roller Swage)	For Aluminum tubes less than size 20, use: • BACN10YL-Alum • MS21921-Alum or Steel • BACN10CS-Alum or Steel For size 20 and 24 Aluminum tubes used with short flareless fittings, use: • AS4660-Alum	For Aluminum tubes less than size 20, use: • MS21902-Alum or Steel • M21924-Alum or Steel For size 20 and 24 Aluminum tubes used with short flareless fittings, use: • AS4663-Alum
	For Cres tubes, use: • BACN10YE-Cres • MS21921-Cres, Steel or Ti • BACN10CS-Cres, Steel • BACN10YA-Ti	For Cres tubes, use: • MS21902-Cres, Steel or Ti • MS21924-Cres, Steel or Ti
	For Ti tubes, use: • BACN10YA-Ti • BACN10YE-Cres • MS21921-Ti, Cres • AS4660-Ti (sizes 20 and 24 only)	For Ti tubes, use: • MS21902-Cres or Ti • MS21924-Cres or Ti • AS4660-Ti (sizes 20 and 24 only) • 35212 swaged union
35211 Sleeve (Roller Swage)	For Ti tubes, use: • BACN10YA-Ti • BACN10YE-Cres • MS21921-Ti, Cres • AS4660-Ti (sizes 20 and 24 only)	For Ti tubes, use: • MS21902-Cres or Ti • MS21924-Cres or Ti • AS4660-Ti (sizes 20 and 24 only) • 35212 swaged union
35212 Union (Roller Swage)	N/A	N/A
CRYOLIVE Assembly 921721	For Aluminum tubes, use: • 921721W- (sizes 04 thru 12 only For Cres tubes, use: • 921721J- For Ti tubes, use: • 921721T-	For Ti tubes, use: • MS21902-Cres or Ti • MS21924-Cres or Ti

ASSOCIATED APPROVED FITTINGS
TABLE D

Tube Material and Fitting Selection Tables
Figure 802 (Sheet 5)

MATERIAL	TUBE SIZES								
	04	05	06	08	10	12	16	20	24
	0.250	0.312	0.375	0.500	0.625	0.750	1.000	1.250	1.500
21-6-9	0.016	0.020	0.020	0.026	0.033	0.039	0.052		
3A1-2.5V	0.016		0.019	0.026	0.032	0.039	0.052	0.070	
6061-T6	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.049	0.049
304 1/8 H	0.020	0.020	0.028	0.035	0.049	0.058	0.065*	0.035*	0.049*

* NOT QUALIFIED FOR 3000 PSI SYSTEMS, LOWER PRESSURES ONLY.

NOTE: ALTERNATIVE WALL THICKNESSES FOR TUBE REPAIRS OF 3000 PSI AND LOWER SYSTEM PRESSURE APPLICATIONS PER FLAGNOTE 7.

CRES 321 TUBING PER MIL-T-8808 MAY BE USED AS A SUBSTITUTE FOR 304 TUBING PER MIL-T-8504, 6061-T6 ALUMINUM TUBING PER AMS-T-7081 OR AMS 4083. 6061-T6 ALUMINUM PER AMS-T-7081 OR AMS 4083 MAY BE USED AS A SUBSTITUTE FOR 6061-T6 ALUMINUM TUBING PER 22-T-700/6. CONTACT THE BOEING COMPANY WHEN CONSIDERING USE OF TUBE MATERIALS OTHER THAN THOSE SPECIFIED.

TABLE E

Tube Material and Fitting Selection Tables
Figure 802 (Sheet 6)

TUBING MATERIAL	LOCATION ON AIRPLANE	TUBING SURFACE	FINISH RECOMMENDATION AND OPTIONS	FINISH CODE FOR COMMERCIAL AIRPLANES
Titanium	All	Inside	None	F-25.01
		Outside	None	F-25.01
CRES	All	Inside	None	F-25.01
		Outside	None Optional: Passivate + Primer (Green) Passivate + Primer + Paint (White)	F-25.01 F-17.09 + F-20.02 F-17.09 + F-20.02 + F-21.03
Aluminum	Fuel Tanks	Inside	None	F-25.01
		Outside	Alodine (Transparent Gold)	F-17.08
	All Other	Inside	None	F-25.01
		Outside	Anodize plus Primer (Green) Optional: Anodize + Primer + Paint (White)	F-17.19 and F-20.02 F-17.19 + F-20.02 + F-21.03

TYPICAL FINISHES FOR HYDRAULIC TUBING
TABLE F

Tube Material and Fitting Selection Tables
Figure 802 (Sheet 7)

NOTE: REFER TO FIG. 824 TO MAKE AN ORDER FOR PARTS.

1 STANDARD CADMIUM-PLATED SLEEVE BACS13AP (SIZE)

2 STANDARD CADMIUM-PLATED SLEEVE:
- BACS13BX (SIZE) HP

3 THE BACS13BX SLEEVE CAN BE USED TO REPAIR SIZE 20 AND 24 ALUMINUM TUBES WITH SHORT FLARELESS FITTINGS. IT CAN ALSO BE USED TO REPAIR SIZE 20 ALUMINUM TUBES AND SIZE 20 AND 24 CRES TUBES WITH STANDARD FLARELESS FITTINGS. MAKE SURE YOU DETERMINE THE APPLICATION BEFORE SWAGGING. SHORT FLARELESS FITTINGS REQUIRE A SHORTER "Z_1" DIMENSION (FIG. 811).

4 DO NOT USE ALUMINUM NUTS OR UNIONS ON TUBE MATERIALS OTHER THAN ALUMINUM.

5 ASSOCIATED APPROVED FITTINGS FOR OTHER UNIONS, REDUCERS, ELBOWS, AND TEES WITH MS33514 OR MS33515 FITTING ENDS; AND FOR SHORT FLARELESS FITTING APPLICATIONS, OTHER UNIONS, REDUCERS, ELBOWS AND TEES WITH AS4658 OR AS4659 FITTING ENDS.

6 USE ONLY THE CRYOLIVE FLARELESS SLEEVE ASSEMBLY, CONSISTING OF THE CRYOLIVE SLEEVE, COUPLING NUT AND PLASTIC CAP. THE CRYOLIVE FLARELESS SLEEVE ASSEMBLY, IN SIZES 10, 12 AND 16, REQUIRES USE OF A LONGER LENGTH AMCI P/N 9211699 (MATERIAL CODE)(SIZE) N COUPLING NUT. THE LONGER LENGTH COUPLING NUTS ARE NOT INTERCHANGEABLE WITH STANDARD BACN10- AND MS21921 COUPLING NUTS.

7 WHEN PERFORMING A HYDRAULIC TUBE REPAIR WITH THE SAME TUBE MATERIAL, THE ALTERNATE TUBE WALL THICKNESSES LISTED IN FIG. 802 (SHEET 6) MAY BE USED IN PLACE OF WALL THICKNESSES DELIVERED WITH THE AIRPLANE WHEN PERFORMING A REPAIR ON TUBES IN SYSTEMS WITH 3000 PSI OR LESS OPERATING PRESSURE.

Tube Material and Fitting Selection Tables
Figure 802 (Sheet 8)

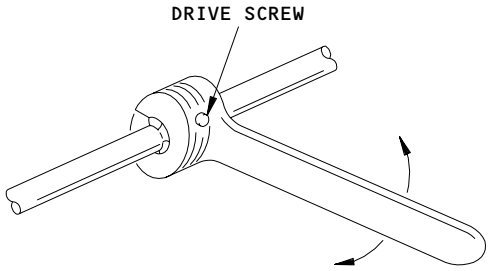
TUBE MATERIAL (PRESSURE)	PROBLEM TYPE	TUBE OUTER DIAMETER						
		1/4	3/8	1/2	5/8	3/4	1	1-1/4
Ti-3Al-2.5V 21-6-9 (3000 psi)	chafed	0.006	0.007	0.008	0.010	0.011	0.012	0.030 (Ti)
	dent	0.005	0.007	0.010	0.015	0.018	0.020	0.030 (Ti)
304 1/8 Hard (3000 psi)	chafed	0.006	0.007	0.008	0.010	0.011	0.012	N/A
	dent	0.005	0.010	0.020	0.030	0.040	0.040	N/A
6061T6 (1500 psi except*)	chafed	0.015	0.015	0.010	0.005	0.004 0.015*	0.003 0.015*	0.003 0.015*
	dent	0.015	0.015	0.010	0.005	0.005	0.005	0.005

*Suction Line, 150 psi

ALL DIMENSIONS ARE IN INCHES.

NOTE: THE ABOVE LIMITS WERE VERIFIED BY HYDRAULIC IMPULSE FATIGUE AND BURST TESTING (FOR ADDITIONAL INFORMATION SEE SAE-AIR 1388).

Permitted Tube Problem Depth -
Hydraulic Pressure (3000 PSI), Return Lines (1500 PSI),
and Fire Extinguishing Pressure (1000 PSI)
Figure 803

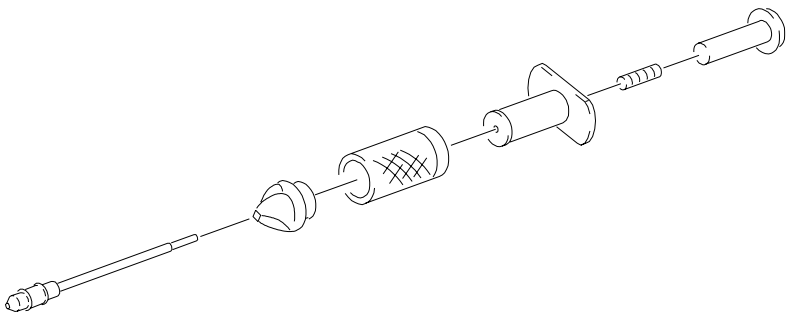


CUTTER TOOL

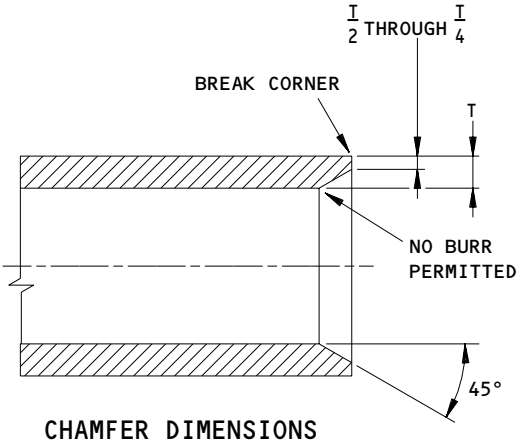
TUBE SIZE	CHIPLESS CUTTER PART NUMBER	CUTTER WHEEL PART NUMBER
04	D12530-001	D12530-109
06	D12530-001	D12530-109
08	D12531-001	D12531-109
10	D12531-001	D12531-109
12	D12531-001	D12531-109

DMC CHIPLESS CUTTERS AND CUTTER WHEELS
TABLE A

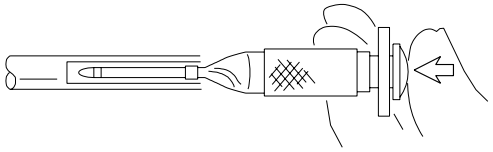
DMC Tools
Figure 804 (Sheet 1)



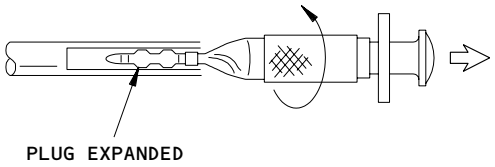
DEBURRING TOOL ASSEMBLY



CHAMFER DIMENSIONS



DEBURRING TOOL INSERTION

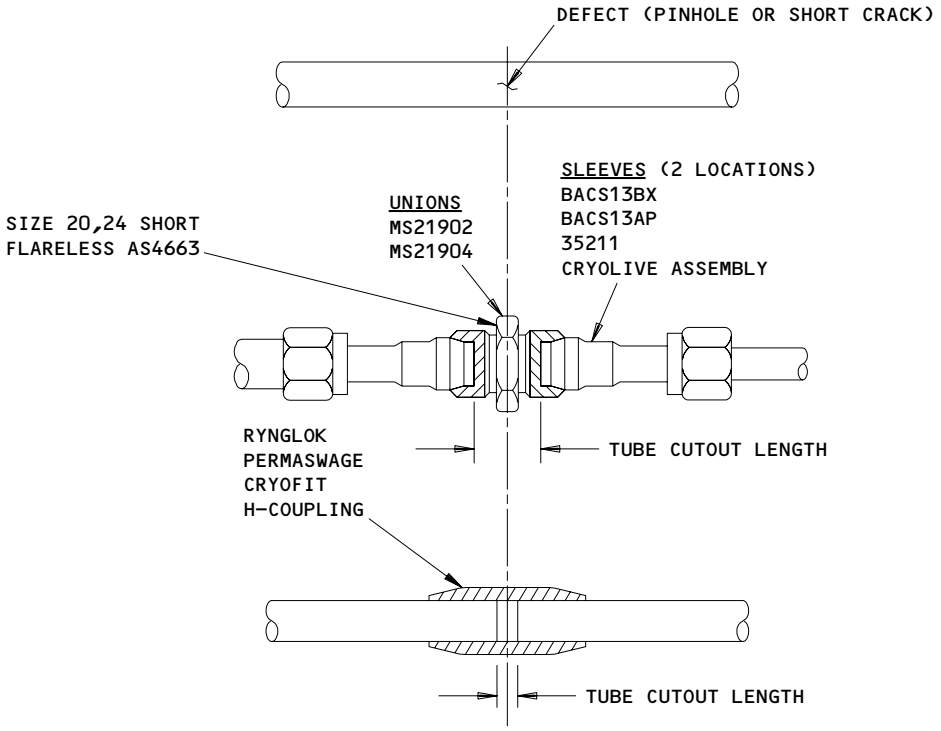


DEBURRING TOOL EXTRACTION

TUBE SIZE	TUBE WALL THICKESS (INCHES)	STEM SUBASSEMBLY PART NUMBER	DEBURRING TOOL PART NUMBER
04	0.016–0.028	D9851–13–04	D9851
04	0.028–0.050	D9851–13–03	D9851
06	0.016–0.035	D9851–13–06	D9851
06	0.035–0.058	D9851–13–07	D9851
08	0.016–0.042	D9850–13–08	D9850
10	0.016–0.058	D9850–13–10	D9850
12	0.016–0.058	D9850–13–12	D9850
16	0.016–0.058	D9849–13–16	D9849
20	0.016–0.058	D9849–13–20	D9849

DMC STEM SUBASSEMBLIES, DEBURRING TOOLS, AND
REQUIRED CHAMFER DIMENSIONS
TABLE B

DMC Tools
Figure 804 (Sheet 2)



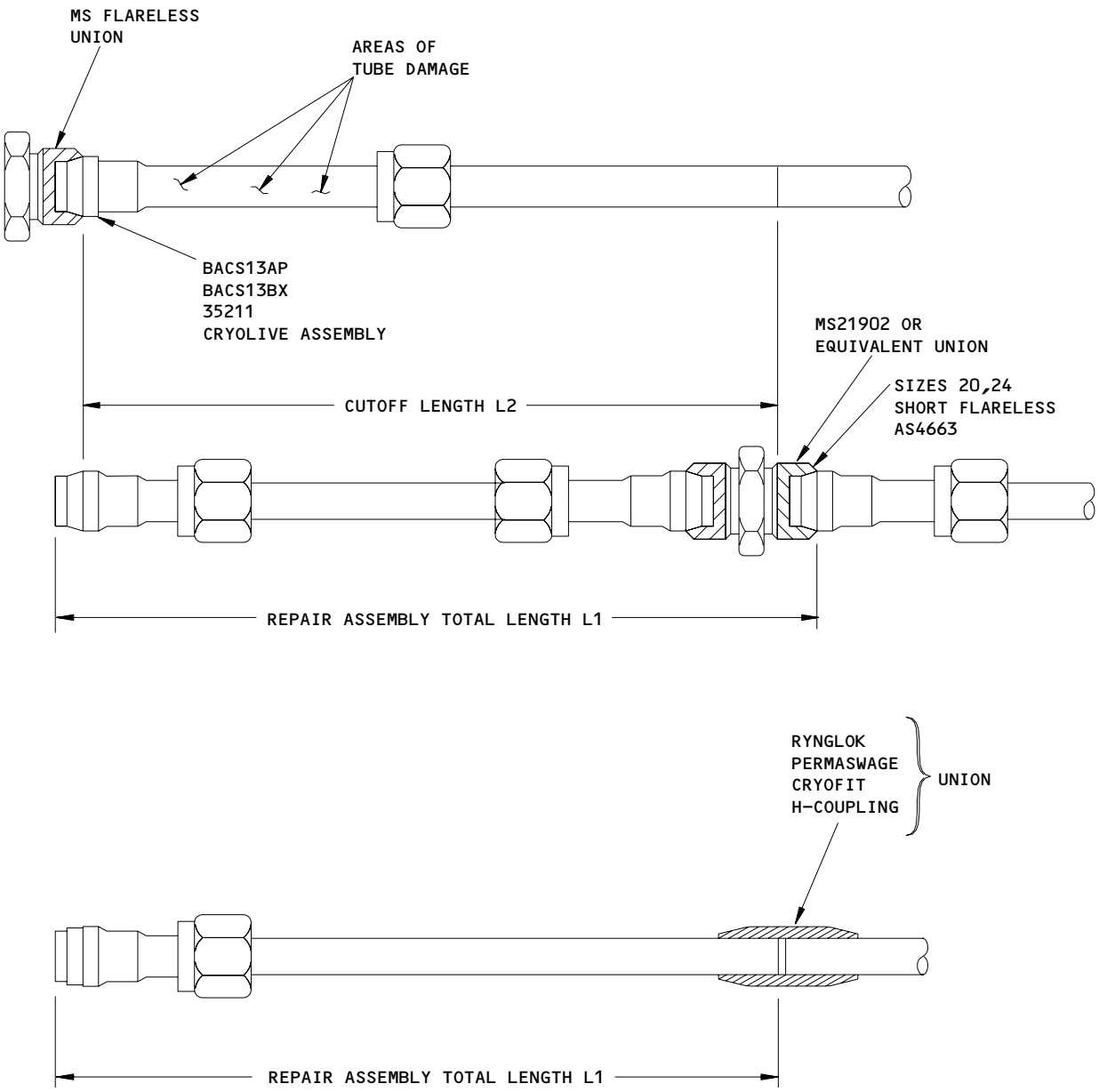
NOTE: FITTING NUTS NOT SHOWN.

Tubing Repair with Unions - Short Damage
Figure 805 (Sheet 1)

UNION PART NO.	SLEEVE PART NO.	TUBE SIZE								
		04	05	06	08	10	12	16	20	24
MS21902	BACS13AP	0.59	0.56	0.68	0.76	0.86	1.05	N/A	N/A	N/A
	BACS13BX (Harrison Elastomer Swager) CRYOLIVE Assembly	0.63	0.60	0.72	0.80	0.90	1.09	0.96	0.96	0.96
	BACS13BX (Harrison Roller Swager) 35211 (Harrison Roller Swager 6777)	0.82	N/A	0.95	1.03	1.21	1.40	1.40	N/A	N/A
MS21924	BACS13AP	1.18	1.18	1.29	1.42	1.55	1.78	N/A	N/A	N/A
	BACS13BX (Harrison Elastomer Swager) CRYOLIVE Assembly	1.22	1.22	1.33	1.46	1.59	1.82	1.68	1.67	1.67
	BACS13BX (Harrison Roller Swager) 35211 (Harrison Roller Swager 6777)	1.41	N/A	1.56	1.69	1.90	2.13	2.13	N/A	N/A
Rynglok	None Necessary	0.300	N/A	0.300	0.350	0.350	0.350	0.400	0.400	N/A
Permaswage Cryofit H-Coupling		← 0.150 INCH MAXIMUM →								

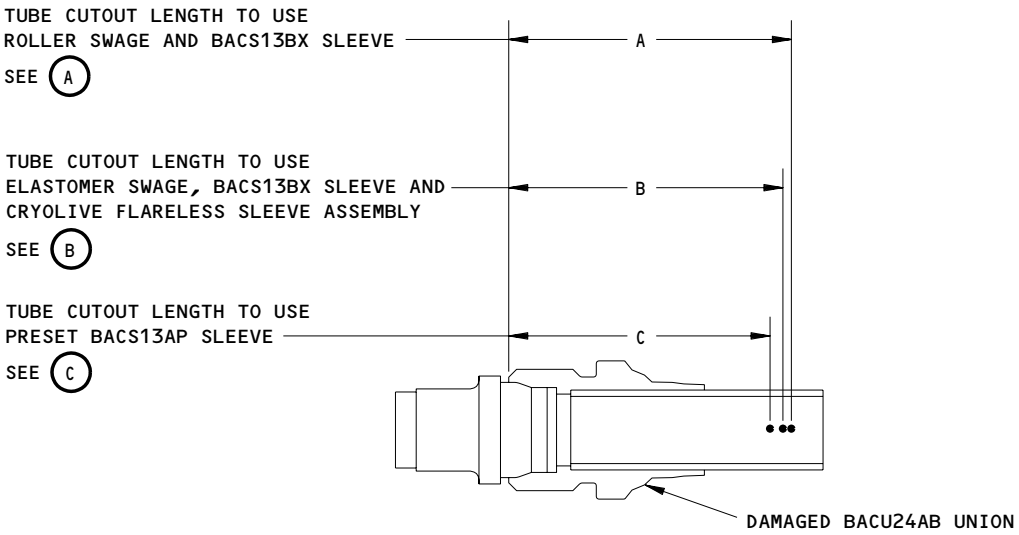
TUBE CUTOUT LENGTHS IN INCHES

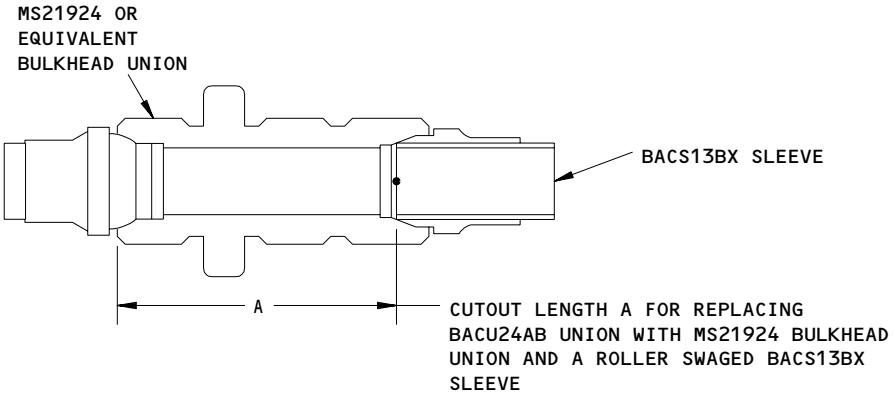
Tubing Repair with Unions - Short Damage
Figure 805 (Sheet 2)



NOTE: REFER TO FIG. 810 (SHEET 1) FOR THE LENGTHS L1 AND L2.

Tubing Repair by End Replacement
Figure 806

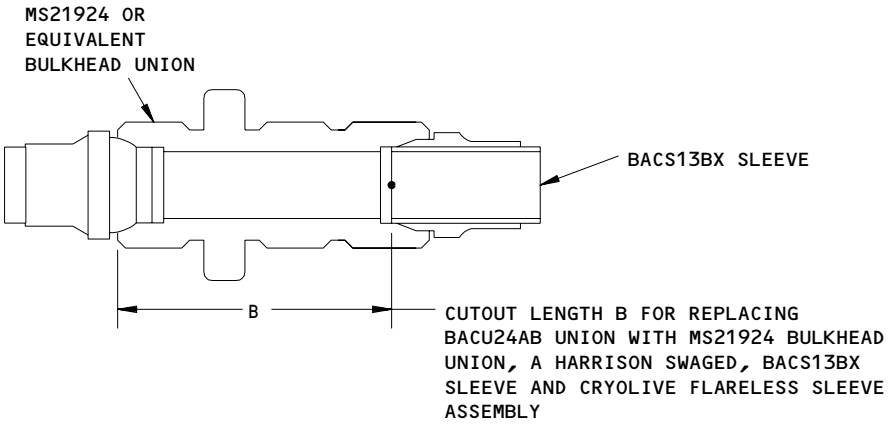


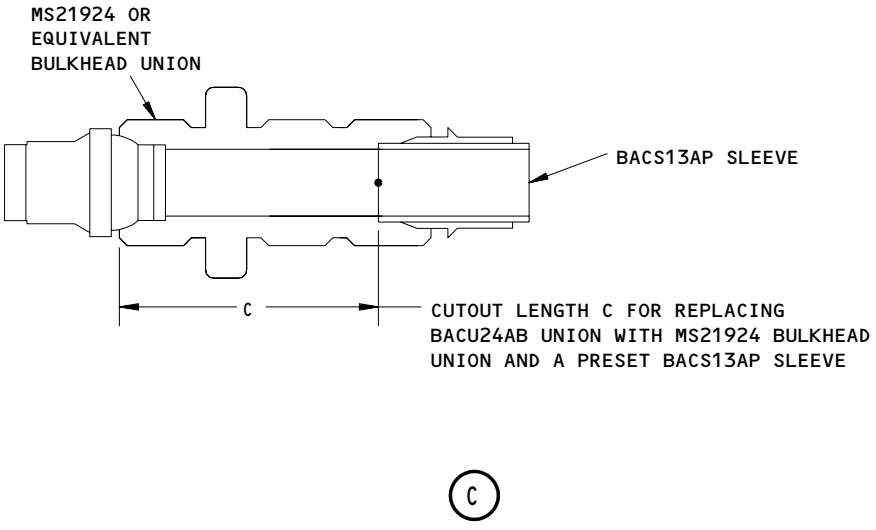


A

NOTE: REFER TO FIG. 808 FOR THE LENGTHS A,B AND C.
COUPLING NUTS NOT SHOWN.

Tube Cutout Lengths for
Replacement of Damaged BACU24AB Swage Unions
Figure 807 (Sheet 1)





Tube Cutout Lengths for
Replacement of Damaged BACU24AB Swage Unions
Figure 807 (Sheet 2)

FITTINGS REPLACING BACU24AB UNIONS				TUBE CUTOUT LENGTHS REQUIRED							
SLEEVE PART NO.	SWAGE METHOD	UNION PART NO.	DIM.	04	06	08	10	12	16	20	24
BACS13BX	HARRISON ROLLER SWGE KIT 6633K01	MS21924	A (Fig. 807)	1.562	1.705	1.886	2.100	2.334	2.319	N/A	N/A
35211	HARRISON ROLLER SWAGE MACHINE 6777										
BACS13BX	HARRISON PORTABLE SWAGERS 5175, 5720 OR EQUIV. STATNRY. 5570	MS21924	B (Fig. 807)	1.487	1.612	1.791	1.965	2.199	2.122	2.119	2.049
BACS13AP	HAND OR MACHINE PRESET	MS21924	C (Fig. 807)	1.422	1.547	1.726	1.900	2.134	N/A	N/A	N/A
CRYOLIVE Assembly	N/A	MS21924	B (Fig. 807)	1.487	1.612	1.791	1.965	2.199	2.122	N/A	N/A

REPAIR METHOD: YOU NEED TO REPLACE A DAMQGED BACU24AB SWAGE UNION. YOU WILL CUT OUT THE FITTING AND REPLACE IT WITH A BACS13BX OR BACS13AP SLEEVE, A COUPLING NUT AND MS21924 FLARELESS BULKHEAD UNION OF THE SAME OR EQUIVALENT MATERIAL AS THE UNION YOU ARE REPLACING. CHECK FIG. 802 FOR SLEEVE/TUBE MATERIAL LIMITATIONS.

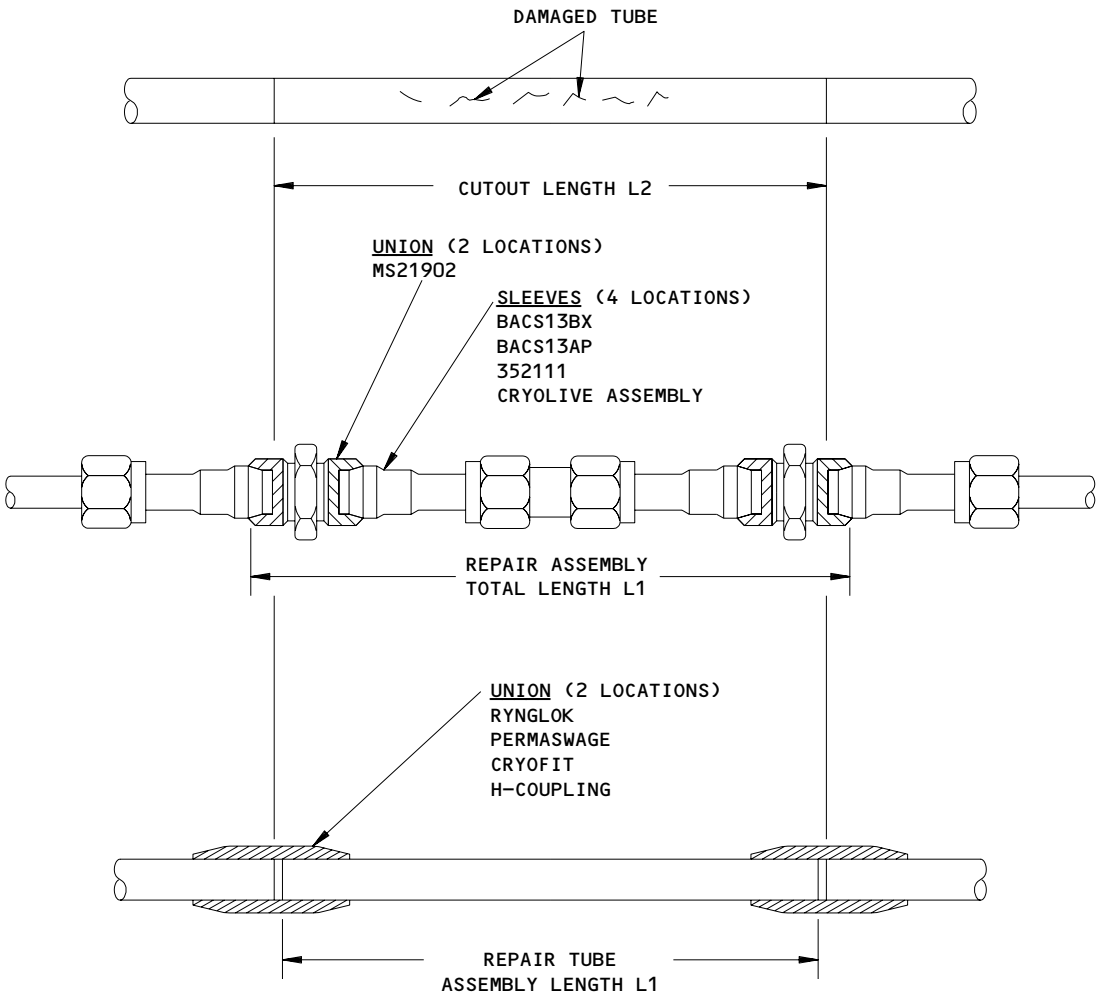
TO MAKE THE REPAIR (REFER TO FIG. 807):

STEP 1. CUT THE TUBE ADJACENT TO THE DAMAGED UNION – TO DIMENSION A, B, OR C DEPENDING ON THE SLEEVE AND SLEEVE INSTALLATION METHOD YOU PLANE TO USE.

STEP 2. SLIDE A FLARELESS COUPLING NUT ON THE TUBE. FOLLOW THE PROCEDURES FOR PRESETTING A BACS13AP SLEEVE OR SWAGING A BSCS13BX SLEEVE TO THE TUBE END.

STEP 3. INSTALL THE MS21924 FLARELESS BULKHEAD UNION BETWEEN THE TWO TUBE ENDS AND TIGHTEN THE NUTS.

Procedure to Replace BACU24AB Union
Figure 808



NOTE: REFER TO FIG. 810 FOR THE LENGTHS L1 AND L2.

Tubing Repair by Section Replacement
Straight or Bend - Extensive Damage
Figure 809

FITTINGS USED FOR REPAIR TUBE ASSEMBLY			L2 CUTOUT LENGTH FORMULA 1	
FLARELESS SLEEVE		UNION PART NO.	FOR TUBE END SECTION	FOR TUBE CENTER SECTION
PART NO.	SWAGE METHOD			
BACS13BX	Harrison Portable Swagers 5175 and 5720 or Equivalent Stationary Swager 5570	MS21902 or Equivalent	L1 Minus 2P	L1 Minus 2P
BACS13BX	Harrison Roller Swage Kit 6633K01		L1 Minus $2Z_1$	L1 Minus $2Z_1$
BACS13AP	Hand or Machine Preset		L1 Minus 2H	L1 Minus 2H
CRYOLIVE Assembly 921721	N/A		L1 Minus 2P	L1 Minus 2P
35211	Harrison Roller Swage Machine 6777		L1 Minus $2Z_2$	L1 Minus $2Z_2$
BACS13BX	Harrison Portable Swagers 5175 and 5720 or Equivalent Stationary Swager 5570	Permaswage Cryofit H-Fitting	L1 Minus (P+0.10)	N/A
BACS13BX	Harrison Roller Swage Kit 6633K01		L1 Minus (Z_1+0.10)	
BACS13AP	Hand or Machine Preset		L1 Minus (H+0.10)	
CRYOLIVE Assembly 921721	N/A		L1 Minus (P+0.10)	
35211	Harrison Roller Swage Machine 6777		L1 Minus $2Z_2$	L1 Minus $2Z_2$
N/A	N/A	Rynglok Permaswage Cryofit H-Coupling		L1 Plus 0.20

Procedure to Find the Tube Cutout Length L2
Figure 810 (Sheet 1)

EXAMPLE: YOU HAVE MADE A DECISION THAT TO REPAIR TUBE DAMAGE: YOU WILL REMOVE A TUBE END SECTION AND REPLACE IT WITH A PREFABRICATED TUBE ASSEMBLY AS SHOWN ON FIG. 806.

TO MAKE THE REPAIR TUBE END SECTION, YOU INSTALL ROLLER SWAGED BACS13BX FLARELESS SLEEVES TO THE TUBE ENDS AND TIGHTENED THEN TO ONE END OF A MS21902 FLARELESS UNION.

STEP 1: MEASURE THE REPAIR TUBE ASSEMBLY TOTAL LENGTH L1 (FIG. 806).

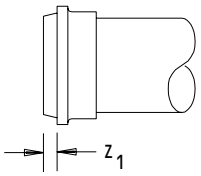
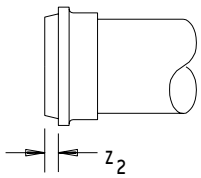
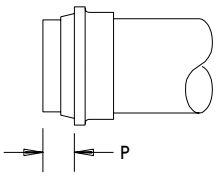
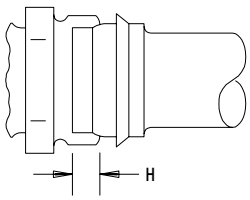
STEP 2: OBSERVE THE CUTOUT LENGTH L2 FORMULA (L1 MINUS $2Z_1$) IN ABOVE TABLE.

STEP 3: FIND THE Z_1 VALUE FOR TUBE SIZE IN FIG. 811.

STEP 4: SUBTRACT (Z_1 TIMES 2) FROM THE MEASURED L1 FOR CUTOUT LENGTH L2.

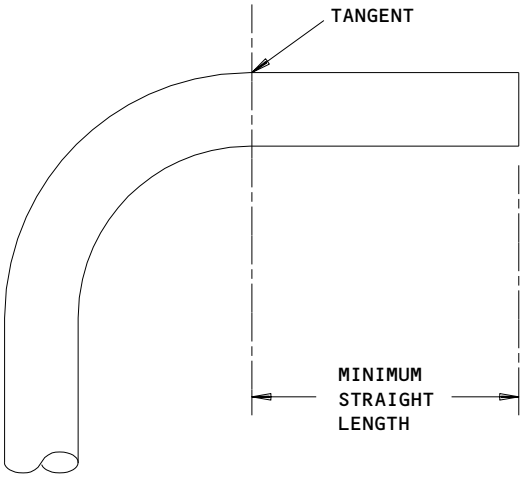
1 REFER TO FIG. 811 FOR VALUES FOR H, P, Z_1 AND Z_2.

Procedure to Find the Tube Cutout Length L2
Figure 810 (Sheet 2)

FLARELESS SLEEVE JOINT TYPE	TUBE SIZES								
	04	05	06	08	10	12	16	20	24
BACS13BX (Roller Swaged) 	0.140	N/A	0.137	0.190	0.195	0.195	0.195	N/A	N/A
35211 (Harrison Roller Swaged) 	0.210	N/A	0.207	0.250	0.255	0.255	0.255	N/A	N/A
BACS13BX (Elastomer Swaged) 	0.214	0.230	0.230	0.285	0.330	0.330	0.392	0.395 (1) 0.355 (2)	0.465 (1) 0.350 (2)
BACS13AP (Preset) 	0.234	0.250	0.250	0.305	0.350	0.350	N/A	N/A	N/A

(1) ALL EXCEPT SHORT FLARELESS
(2) SHORT FLARELESS

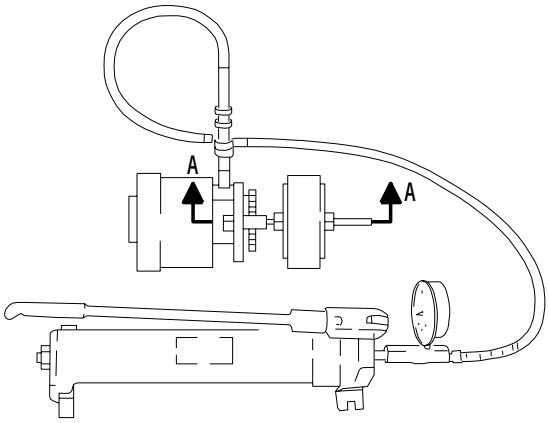
Flareless Sleeve Tube End Values
Figure 811



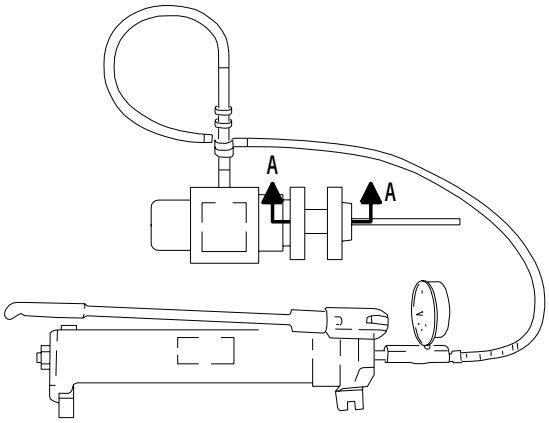
FITTING TYPE	TUBE END MINIMUM STRAIGHT LENGTH – INCHES								
	04	05	06	08	10	12	16	20	24
BACS13BX (Harrison Elastomer Swager) and CRYOLIVE Flareless Sleeve Assembly	1.23	1.25	1.28	1.39	1.48	1.51	1.47	1.46	1.46
BACS13BX (Harrison Roller Swager)	2.25	2.25	2.25	2.25	2.25	2.25	2.25	N/A	N/A
BACS13AP (BITE Type)	0.80	0.90	1.00	1.10	1.15	1.15	N/A	N/A	N/A
D10282 * (Permaswage)	1.07	N/A	1.15	1.65	1.70	1.80	1.90	2.15	N/A
BACC42W * (H-Coupling)	2.80	2.80	2.80	2.80	2.80	2.80	2.80	N/A	N/A
3p02111 * (Cryofit)	0.71	0.81	0.90	0.98	1.17	1.35	1.76	N/A	N/A
35211 Sleeve (Harrison Roller Swager)	1.30	N/A	1.30	1.38	1.42	1.40	1.40	N/A	N/A
35212 Union (Harrison Roller Swager)	1.22	N/A	1.30	1.48	1.46	1.50	1.50	N/A	N/A
80101T (Rynglok)	1.236	N/A	1.362	1.480	1.628	1.777	2.109	2.143	N/A

* Based on 1/2 fitting length

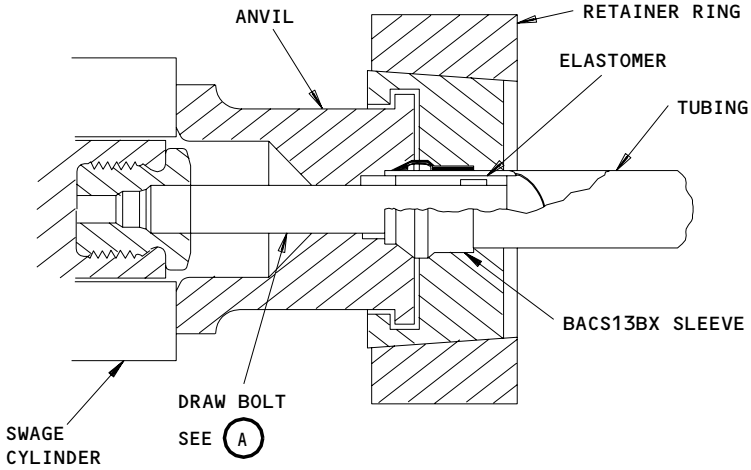
Minimum Straight Length Specifications for Repair Fitting Installations Adjacent to Tube Bends
Figure 812



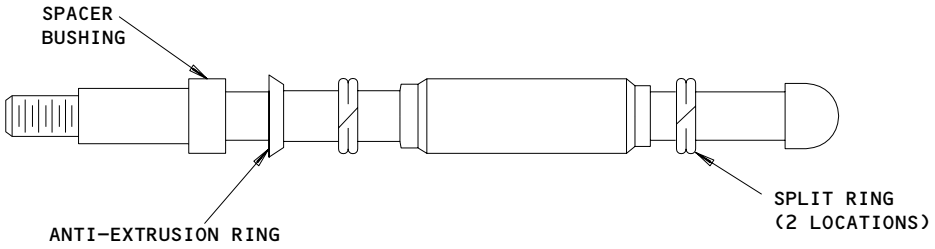
HARRISON MODEL 5720



HARRISON MODEL 5175



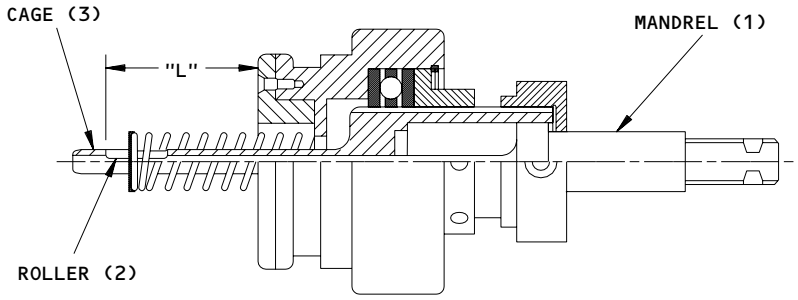
A–A



DRAW BOLT ASSEMBLY
(SHOWN EXTENDED)

A

Harrison Portable Swagers for BACS13BX Sleeves
Figure 813 (Sheet 1)



SIZE	EXPANDER ASSEMBLY	MANDREL (1)	ROLLERS (2)	CAGE (3)
-04	7320-04016	7321-04016	7322-04016	7323-04016
-06	7320-06019	7321-06019	7322-06019	7323-06019
-08	7320-08026	7321-08026	7322-08026	7323-08026
-10	7320-10032	7321-10032	7322-10032	7323-10032
-12	7320-12039	7321-12039	7322-12039	7323-12039
-16	7320-16051	7321-16051	7322-16051	7323-16051

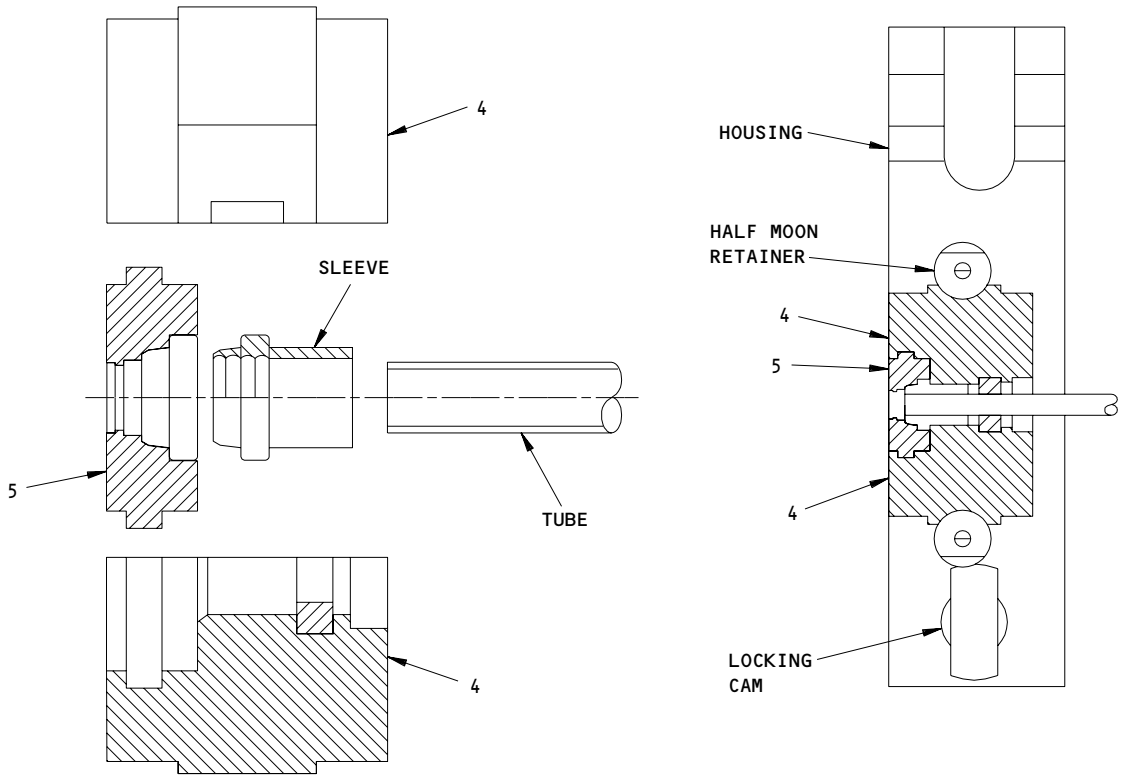
EXPANDERS P/N AND SPARE PARTS P/N REQUIRED
TO ROLLER SWAGE 35211 AND 35212 TO 3AI-2.5V TITANIUM TUBING

TUBE O.D.	SET LENGTH "L" (INCHES) ±0.005
-04	1.010
-06	1.205
-08	1.310
-10	1.382
-12	1.474
-16	1.600

TOOL ADJUSTMENT

HARRISON 6777 MACHINE

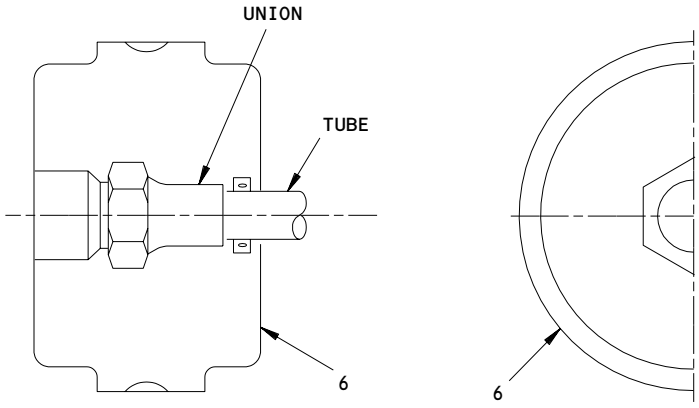
Harrison Portable Swagers for BACS13BX Sleeves
Figure 813 (Sheet 2)



TUBE AND SLEEVE DIA. INCHES	TWO HALF JAWS (4)	RETAINER (5)
1/4	6884-04	6885-104
3/8	6884-06	6885-106
1/2	6884-08	6885-108
5/8	6884-10	6885-110
3/4	6884-12	6885-112
1	6884-16	6885-116

HARRISON 6777 MACHINE

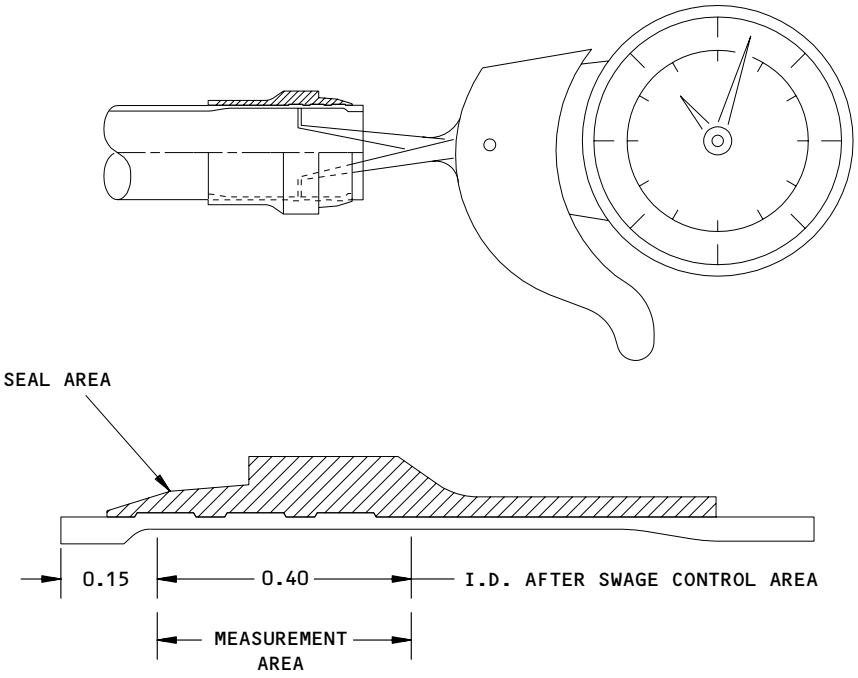
Harrison Portable Swagers for BACS13BX Sleeves
Figure 813 (Sheet 3)



TUBE AND UNION DIA. INCHES	TWO HALF JAWS (6)
1/4	6886-04
3/8	6886-06
1/2	6886-08
5/8	6886-10
3/4	6886-12
1	6886-16

EXTERNAL ROLLER SWAGE TOOLS FOR UNIONS

Harrison Portable Swagers for BACS13BX Sleeves
Figure 813 (Sheet 4)



NOTE: I.D. AFTER SWAGE REQUIREMENTS–MEASURING METHOD FOR 35211 SLEEVE AND 35212 UNION.

TUBE O.D./DASH NO.	TUBE WALL	TORQUE	I.D. AFTER SWAGE
TUBE MATERIAL: 3AI–2.5V TITANIUM PER AMS4945			
0.250/–04	0.016	6–7	0.225–0.232
0.375/–06	0.019	11–12	0.347–0.354
0.500/–08	0.026	20–22	0.458–0.465
0.625/–10	0.032	40–43	0.575–0.587
0.750/–12	0.039	40–43	0.684–0.695
1.000/–16	0.051	65–68	0.913–0.919

SWAGING TORQUE AND I.D. AFTER SWAGE REQUIREMENTS
FOR 35211 SLEEVE AND 35212 UNIONS

Harrison Portable Swagers for BACS13BX Sleeves
Figure 813 (Sheet 5)

Swage Pressures for Elastomer Swaging Flareless Sleeves
Figure 814 (Sheet 1)

TUBE SIZE	SWAGER MODEL NO.	21-6-9 CRES AS SHOWN IN BMS 7-185		6061-T6 AL PER WW-T-700/6 OR AMS-T-7081 OR AMS 4083		6061-T4AL PER AMS-T-7081 OR AMS 4083		304, 321, AND 347 CRES	
		WALL (IN.)	SWAGE PRESSURE (PSI) ▷3◁ BACS13BX	WALL (IN.)	SWAGE PRESSURE (PSI) ±5% BACS13BX	WALL (IN.)	SWAGE PRESSURE (PSI) ±5% BACS13BX	WALL (IN.)	SWAGE PRESSURE (PSI) ▷3◁ BACS13BX
04	5175	0.016	475	N/A	N/A	N/A	N/A	0.020	475* ▷2◁
05		0.020	1000	0.035	450	N/A	N/A	N/A	N/A
06		0.020	1150	0.028 0.035	500	N/A	N/A	0.035 0.035 ▷2◁	940 ▷1◁ 1150* ▷2◁
08		0.026	2000	0.035	950	N/A	N/A	0.035 ▷2◁	2000* ▷2◁

* SWAGE PRESSURES NECESSARY TO INSTALL BACS13BX FLARELESS SLEEVES ON TUBE MATERIALS WITH THE HARRISON PORTABLE AND STATIONARY SWAGERS

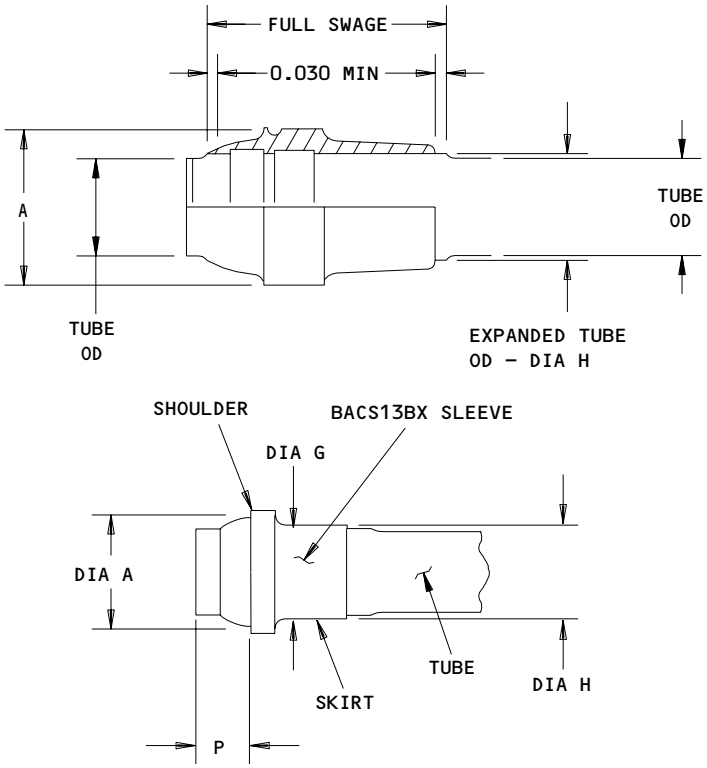
▷1◁ 304 CRES (MIL-T-8504), 321 AND 347 CRES (MIL-T-8808)

▷2◁ 304 1/8 HARD CRES (AMS-T-6845)

▷3◁ MINIMUM SWAGE PRESSURE - IF YOU MUST SWAGE AGAIN, INCREASE IN 5% INCREMENTS.

TUBE SIZE	SWAGER MODEL NO.	21-6-9 CRES AS SHOWN IN BMS 7-185			6061-T6 AL PER WW-T-700/6 OR AMS-T-7081 OR AMS 4083			6061-T4AL PER AMS-T-7081 OR AMS 4083			304, 321, AND 347 CRES		
		WALL (IN.)	SWAGE PRESSURE (PSI) 3		WALL (IN.)	SWAGE PRESSURE (PSI) ±5%		WALL (IN.)	SWAGE PRESSURE (PSI) ±5%		WALL (IN.)	SWAGE PRESSURE (PSI) 3	
			BACS13BX			BACS13BX			BACS13BX			BACS13BX	
10	5570 5720	0.033	850		0.020	250		N/A	N/A		0.035	450	
					0.028	325					0.049	850*	
					0.035	375							
12		0.039	1600		0.035	600		N/A	N/A		0.035 2 0.049 2 0.058 2	1300 2 1350 2 1600* 2	
16		0.052	3050		0.035	950		0.035	750		0.065 2 0.035 2	3050* 2 1650 2	
20		N/A	N/A		0.035	N/A		0.035	750		0.035	N/A	
24	▼	N/A	N/A		N/A	N/A		N/A	N/A		0.035	N/A	

Swage Pressures for Elastomer Swaging Flareless Sleeves
Figure 814 (Sheet 2)



DIMENSION	SIZE								
	04	05	06	08	10	12	16	20	24
P ±0.010	0.214	0.230	0.230	0.285	0.330	0.330	0.392	0.395 ▷1 0.355 ▷2	0.465 ▷1 0.350 ▷2
A max	0.374	0.437	0.493	0.673	0.789	0.964	1.214	1.474	1.723
G max	0.298	0.364	0.423	0.550	0.686	0.822	1.070	1.323	1.573
H max	0.260	0.322	0.385	0.511	0.636	0.761	1.011	1.262	1.517

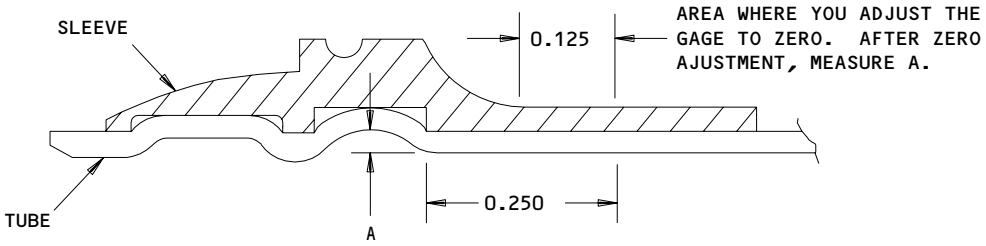
NOTE: ALL DIMENSIONS ARE IN INCHES.

DIMENSIONS OF FLARELESS TUBE ENDS AND
BACS13BX SLEEVES AFTER ELASTOMERIC SWAGING

▷1 ALL EXCEPT SHORT FLARELESS
▷2 SHORT FLARELESS

BACS13BX Flareless Sleeve Dimensions After Elastomeric Swaging
Figure 815

L15936



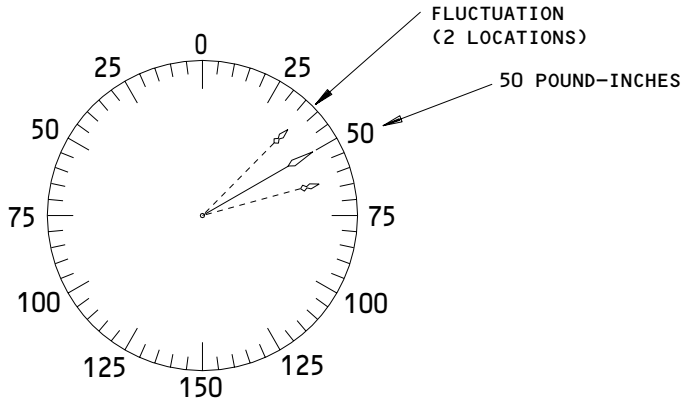
BACS13BX (TWO GROOVES)

TUBE SIZE	DEPTH 2A – INCHES	
	MINIMUM	MAXIMUM
04	0.020	0.032
05	0.020	0.032
06	0.020	0.032
08	0.020	0.032
10	0.022	0.034
12	0.026	0.038
16	0.028	0.040
20	0.026	0.042
24	0.026	0.042

BACS13BX SWAGE
GROOVE DEPTH LIMITS

NOTE: ALL DIMENSIONS ARE IN INCHES.

Groove Depth Measurement for BACS13BX Sleeves
Figure 816



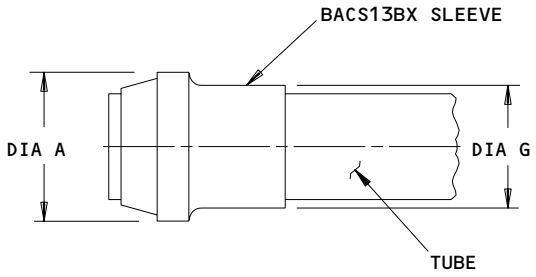
TORQUE WRENCH DIAL - PROCEDURE TO READ TORQUE

TUBE SIZE	MATERIAL WALL THICKNESS - INCHES		SWAGE TORQUE (POUNDS-INCH)	
	3AL-2.5V TITANIUM 1	21Cr-6Ni-9Mn CRES 2	MIN	MAX
04	0.016	0.016	4	5
06	0.019	0.020	12	15
08	0.026	0.026	20	25
10	0.032	0.033	40	45
12	0.039	0.039	40	45
16	0.051	0.052	80	85

SWAGER TORQUES NECESSARY TO ROLLER SWAGE BACS13BX SLEEVES
TO Ti-3AL-2.5V CWSR OR 21-6-9 CRES TUBE USING HARRISON 6633K01
ROLLER SWAGING KIT

1 AS SPECIFIED IN SPECIFICATION AMS 4945/BMS 7-234
2 AS SPECIFIED IN SPECIFICATION BMS 7-185

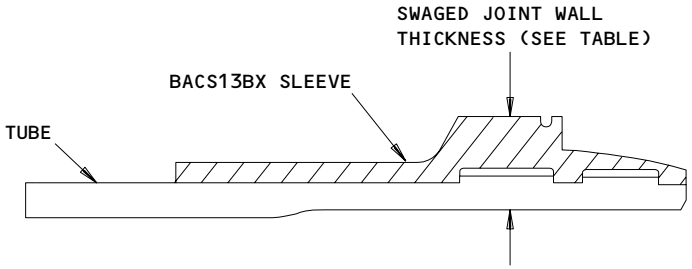
Swage Torques, Sleeve Dimensions, and Wall Thicknesses for Roller Swaging
Figure 817 (Sheet 1)



DIAMETER	TUBE SIZE					
	04	06	08	10	12	16
A MAX	0.374	0.493	0.673	0.789	0.964	1.214
G MAX	0.298	0.423	0.550	0.686	0.822	1.070

MAXIMUM PERMITTED SHOULDER AND SKIRT DIAMETERS (INCH)

Swage Torques, Sleeve Dimensions, and Wall Thicknesses for Roller Swaging
Figure 817 (Sheet 2)



SECTION OF ROLLER SWAGED JOINT

TUBE SIZE	TUBE DIMENSIONS "NOMINAL" WALL THICKNESS - INCHES 4		SWAGED JOINT WALL THICKNESS FOR "NOMINAL" TUBE WALLS - INCHES 3	
	Ti-3AL-2.5V	21-6-9 CRES		
04	0.016	0.016	0.068	TOLERANCE +0.002 -0.003
06	0.019	0.020	0.066	
08	0.026	0.026	0.100	
10	0.032	0.033	0.101	
12	0.039	0.039	0.132	
16	0.051	0.052	0.143	

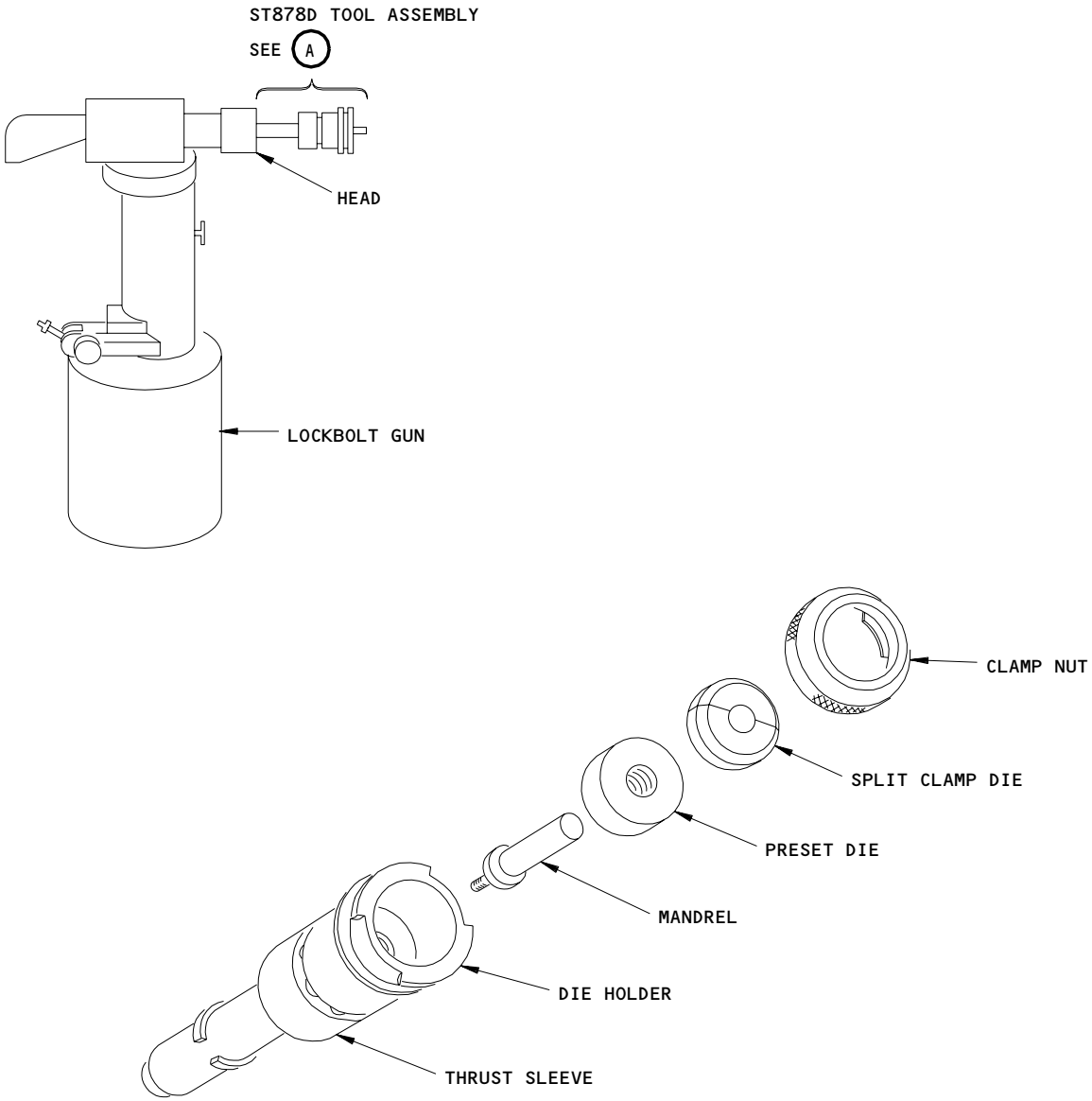
SWAGED JOINT WALL THICKNESS SPECIFICATION 3 4

3 "NOMINAL" WALL THICKNESS DEFINITION: TUBE WALL THICKNESS WITHOUT TOLERANCES AS SPECIFIED BY TUBE SPECIFICATION: AMS 4945 FOR Ti-3AL-2.5V AND BMS 7-185 FOR 21-6-9 CRES.

4 IF THE THICKNESS OF A MEASURED TUBE WALL IS DIFFERENT THAN THE "NOMINAL", ADD OR SUBTRACT THE DIFFERENCE FROM THE NECESSARY SWAGED JOINT WALL THICKNESS FOR "NOMINAL" TUBE WALLS.

EXAMPLE:
1. MEASURED 10 SIZE TITANIUM 3AL-2.5V TUBE WALL = 0.035 INCH
2. WALL DIFFERENCE IS 0.035 INCH, MINUS 0.032 INCH = 0.003 INCH
3. ADD 0.003 INCH TO 0.101 INCH = 0.104 INCH

Swage Torques, Sleeve Dimensions, and Wall Thicknesses for Roller Swaging
Figure 817 (Sheet 3)



ST878D TOOL ASSEMBLY

A

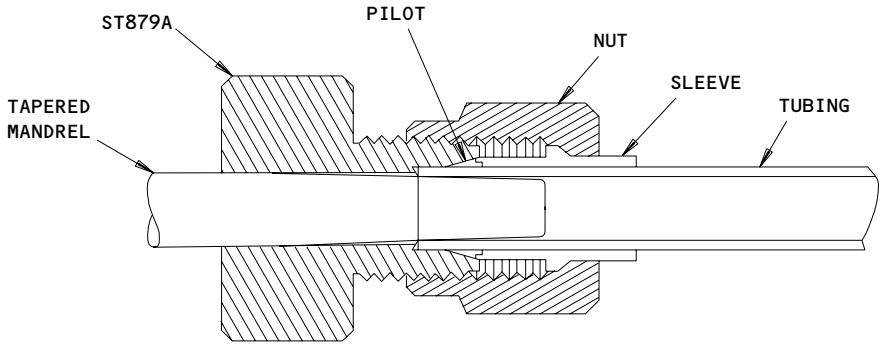
Preset Pressures (PSI) for the Cherry G-85 Lockbolt Gun
with ST878D Presetting Tool Assembly (BACS13AP Sleeves)
Figure 818 (Sheet 1)

L16426

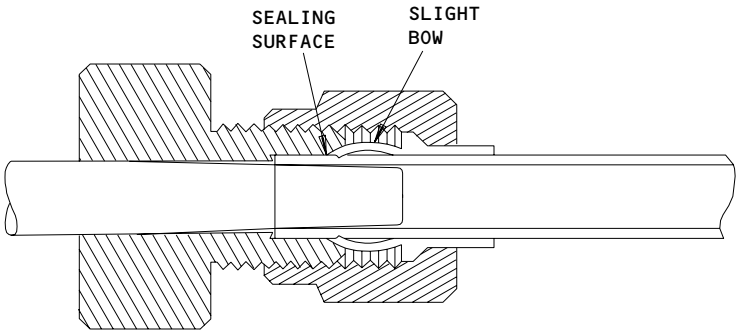
TUBE SIZE	WALL THICKNESS	TOOL NO.	RECOMMENDED AIR PRESSURE (PSI)	
			ALUMINUM	STEEL
			6061-T6	AISI 304-1/8 HARD
3/16	0.020-0.035	ST878D-3-020 ST878D-3-035	22.5	30.0
1/4	0.020-0.035	ST878D-4-020 ST878D-4-035	27.5	40.0
5/16	0.020-0.035	ST878D-5-020 ST878D-5-035	30.0	40.0
3/8	0.020-0.035	ST878D-6-020 ST878D-6-035	30.0	52.5
1/2	0.028-0.035	ST878D-8-028 ST878D-8-035	42.5	75.0
5/8	0.028-0.083	ST878D-10-028 ST878D-10-083	50.0	80.0
3/4	0.020-0.049	ST878D-12-020 ST878D-12-049	52.5	85.0

NOTE: ALL DIMENSIONS ARE IN INCHES.

Preset Pressures (PSI) for the Cherry G-85 Lockbolt Gun
with ST878D Presetting Tool Assembly (BACS13AP Sleeves)
Figure 818 (Sheet 2)

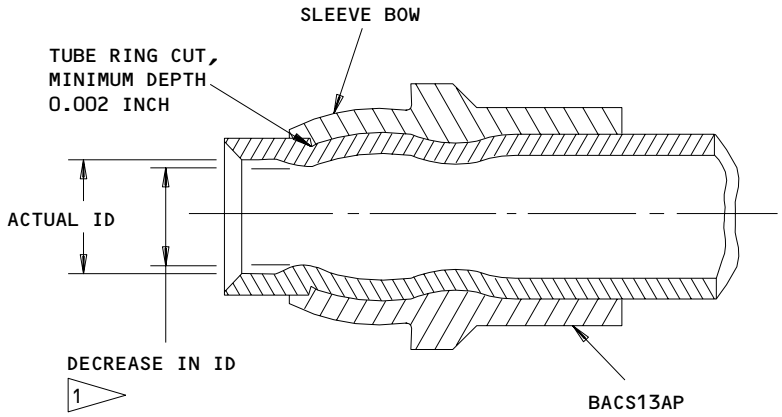


BEFORE PRESET BY HAND

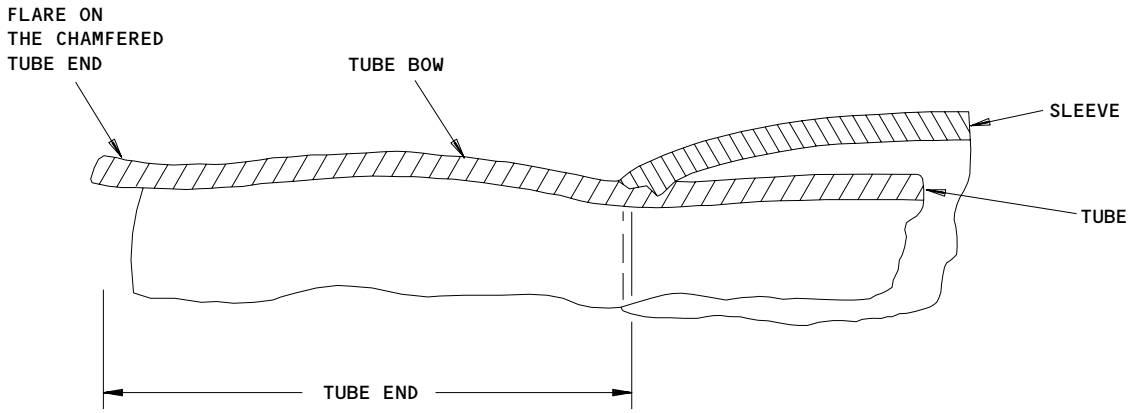


AFTER PRESET BY HAND

Preset by Hand with Preset Tool ST879A
Figure 819



ASSEMBLED AND PRESET SLEEVE



TUBE END DEFORMATION

1 MAKE SURE THE ID DOES NOT DECREASE MORE THAN 0.005 INCH AFTER PRESET OR 0.015 INCH AFTER YOU TIGHTEN MANY TIMES.

Properties of Preset BACS13AP Flareless Sleeve/Tube End
Figure 820

TUBE OD		1/4	5/16	3/8	1/2	5/8	3/4	1	1-1/4
Wall Thickness	304	0.020	0.020	0.028	0.035	0.049	0.058	N/A	N/A
	21-6-9	0.016	0.020	0.020	0.026	0.033	0.039	N/A	N/A
Procedure A 2 (Displacement, Turns)		1-1/6	1-1/6	1-1/6	1-1/6	1-1/6	1-1/6	N/A	N/A
Procedure B (Torque) Pound-Inches 3	304	145	200	290	545	780	900	N/A	N/A
	21-6-9	145	200	290	545	780	1200	N/A	N/A

NOTE: ALL DIMENSIONS ARE IN INCHES.

HAND PRESETTING FLARELESS FITTINGS - NO MANDREL 1
(STEEL TUBING)
TABLE A

TUBE OD		1/4	5/16	3/8	1/2	5/8	3/4	1	1-1/4
Wall Thickness	6061-T6	0.035	0.035	0.035	0.035	0.035	0.035	N/A	N/A
Procedure A 2 (Displacement, Turns)		1-1/6	1-1/6	1-1/6	1	1	1	N/A	N/A
Procedure B (Torque) Pound-Inches 3	6061-T6	110	140	170	280	360	450	N/A	N/A

NOTE: ALL DIMENSIONS ARE IN INCHES.

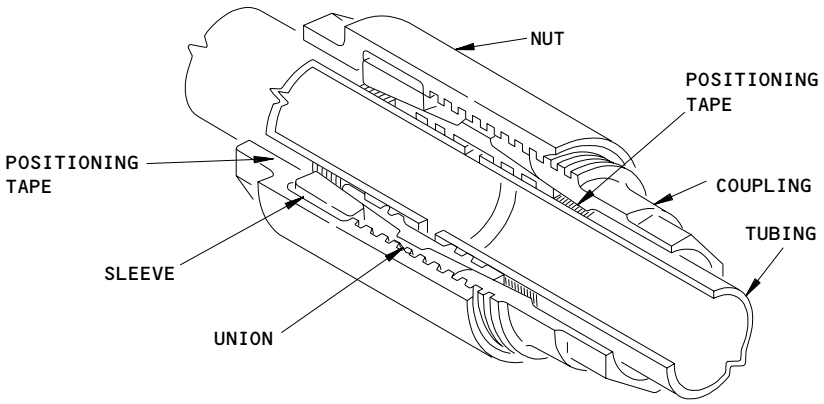
HAND PRESETTING FLARELESS FITTINGS - NO MANDREL 1
(ALUMINUM TUBING)
TABLE B

1 USE AN INTERNAL MANDREL PRESET TOOL ON TUBES WITH THINNER WALLS (REFER TO ST879A). WHEN IN DOUBT, MAKE A TEST PRESET TO MAKE SURE THE RING CUT MINIMUM DEPTH IS 0.002 INCH.

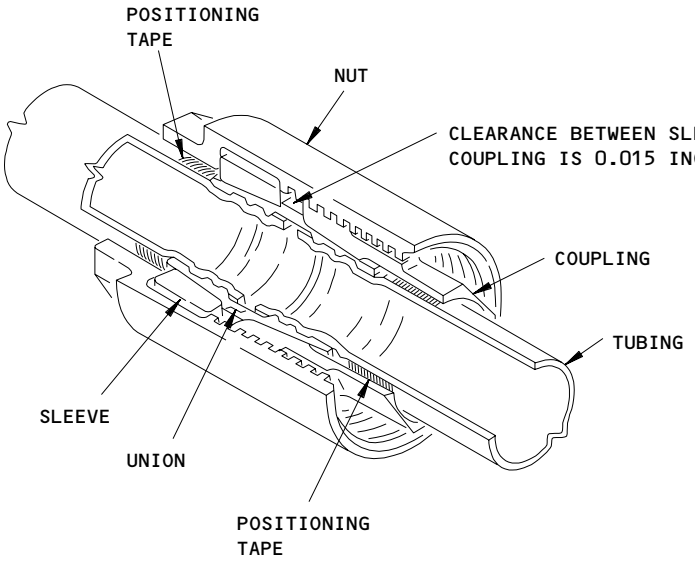
2 MEASURE DISPLACEMENT FROM THE POINT WHERE THE FITTING, SLEEVE, AND NUT ARE FIRMLY HAND-TIGHTENED, AND A WRENCH IS NECESSARY TO FURTHER TIGHTEN.

3 APPLY TORQUE, LOOSEN, AND APPLY INDICATED TORQUE THREE TIMES.

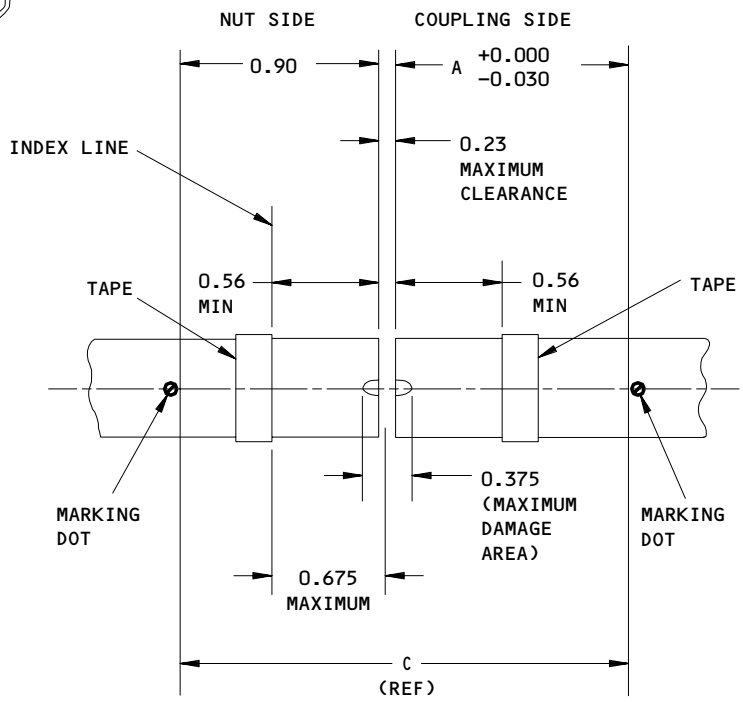
Displacement Turns and Torque Values for Hand Preset of Flareless Sleeves
Figure 821



H-COUPLING
(BEFORE INSTALLATION)



H-COUPLING
(INSTALLED, TIGHTENED)

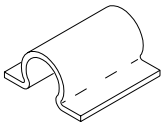


TUBE SIZE	DIMENSION A
04 THRU 10	1.440
12 THRU 16	1.740

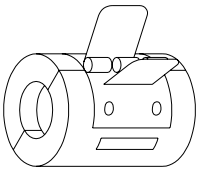
NOTE: USE THESE DIMENSIONS TO FIND DIMENSION C.

ALL DIMENSIONS ARE IN INCHES.

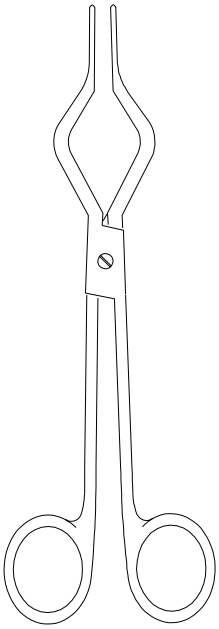
H-Coupling Installation
Figure 822



SNAP-ON
INTALLATION STOP

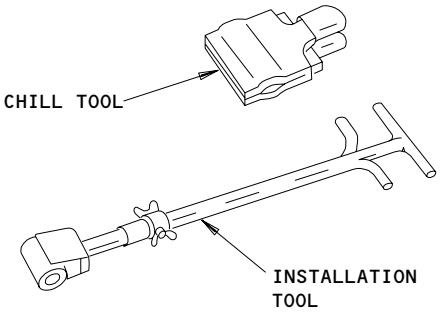


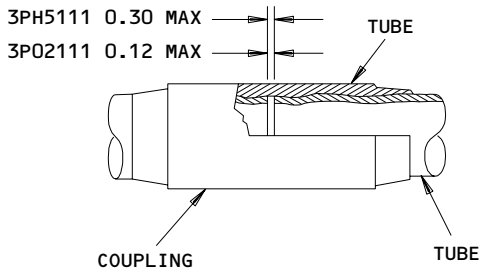
EXTENDED TIME TOOL



TONGS

O-RINGS INSTALLATION STOP

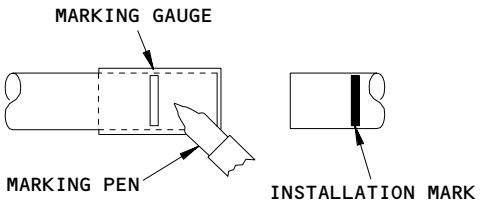




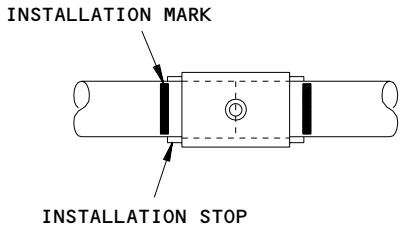
CRYOFIT COUPLING INSTALLATION

NOTE: CRYOFIT KITS INCLUDE ADDITIONAL ITEMS.

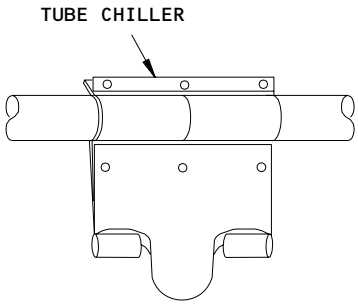
Cryofit Coupling 3PO2111 and 3PH5111 Repair
Figure 823 (Sheet 1)



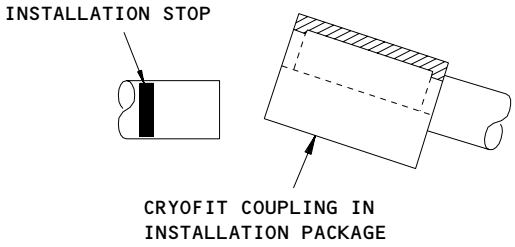
APPLICATION OF INSTALLATION MARK



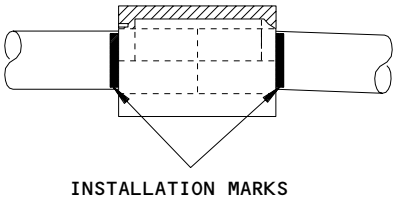
INSTALLATION STOP



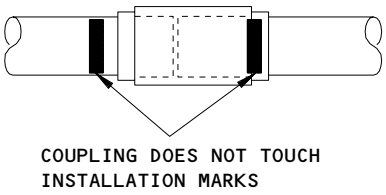
TUBE CHILLER APPLICATION



CORRECT POSITIONING OF
CRYOFIT FITTING ON TUBE



ACCEPTABLE



UNACCEPTABLE

POSITION OF INSTALLED FITTING ON TUBE

NOTE: CRYOFIT KITS INCLUDE ADDITIONAL ITEMS.

Cryofit Coupling 3P02111 and 3PH5111 Repair
Figure 823 (Sheet 2)

DMC PART NO.	FITTING MATERIAL	FOR USE WITH TUBE MATERIAL	APPROVED TUBE SIZES OD/WALL						
			04	06	08	10	12	16	20
D10282-() 1	21-6-9 Cres	21-6-9 Cres	0.016	0.020	0.026	0.033	0.039	0.052	--
		3AL-2.5V Ti	0.016	0.019	0.026	0.032	0.039	0.051	0.070
		304-1/8 Hard Cres (AMS-T-6845)	0.020	0.028	0.035	0.049	0.058	0.065	--
D10282D() 1	6061T6 Al	6061T6 Al (AMS-T-7081)	0.035	0.035	0.035	0.035	0.035	0.035	0.040

TABLE A

BOEING PART NO.	FITTING MATERIAL	FOR USE WITH TUBE MATERIAL	APPROVED TUBE SIZES OD/WALL						
			04	06	08	10	12	16	20
BACU24BS (SIZE) (SIZE) J 1	21-6-9 Cres	21-6-9 Cres	0.016	0.020	0.026	0.033	0.039	0.052	--
		3AL-2.5V Ti	0.016	0.019	0.026	0.032	0.039	0.051	0.070
		304-1/8 Hard Cres (AMS-T-6845)	0.020	0.028	0.035	0.049	0.058	0.065	--
BACU24BS (SIZE) (SIZE) D 1	6061T6 Al	6061T6 Al (AMS-T-7081)	0.035	0.035	0.035	0.035	0.035	0.035	0.040

TABLE B

Approved Fitting/Tube Material Combinations for Repair with Permaswage Unions
Figure 824 (Sheet 1)

NOTE: Material code (J) with the Boeing part number or no material code (–) with the DMC part number indicates 21-6-9 cres fitting with two internal grooves on each end, one each filled with silicone. Material code D on either the Boeing or DMC part number indicates 6061T6 aluminum fitting with two internal groves on each end, all filled with silicone.

Aluminum unions without all grooves filled with the silicone sealant are not approved for Boeing airplanes.

1 A BOEING STANDARD FOR AN EXTERNALLY SWAGED UNION – BACU24BS (SIZE)(SIZE) MATERIAL) – BASED ON THE DMC PERMASWAGE D10282 UNION HAS BEEN DEVELOPED BY BOEING FOR USE ON THE 777 AIRPLANE. THE BACU24BS (SIZE)(SIZE) J UNION (BOTH SIZES THE SAME) AND THE D10282–(SIZE) UNION ARE INTERCHANGEABLE. IN ADDITION, THE BACU24BS (SIZE)(SIZE) D UNION (BOTH SIZES THE SAME) AND D10282D (SIZE) D UNION ARE INTERCHANGEABLE.

THE CORROSION RESISTANT STEEL D10282–(SIZE) AND ALUMINUM D10282D(SIZE) PER-MASWAGE UNIONS ARE IMPROVED REPLACEMENTS FOR THE STANDARD CORROSION RESISTANT STEEL D10036D (SIZE) AND ALUMINUM D10036D (SIZE) UNIONS, RESPECTIVELY. THE D10036 UNIONS ARE FUNCTIONALLY INTERCHANGEABLE WITH THE D10282 UNIONS.

BACU24BS (SIZE)(SIZE) J – (BOTH SIZES THE SAME), BACU24BS (SIZE)(SIZE) D – (BOTH SIZES THE SAME), D10282–(SIZE) AND D10282D (SIZE) UNIONS ARE NOT SHOWN IN DMC CATALOGS, BUT YOU CAN MAKE AN ORDER DIRECTLY TO DESIGNED METAL CONNECTIONS, 14800 SOUTH FIGUEROA ST., LOS ANGELES, CA 90248.

Approved Fitting/Tube Material Combinations for Repair with Permaswage Unions
Figure 824 (Sheet 2)

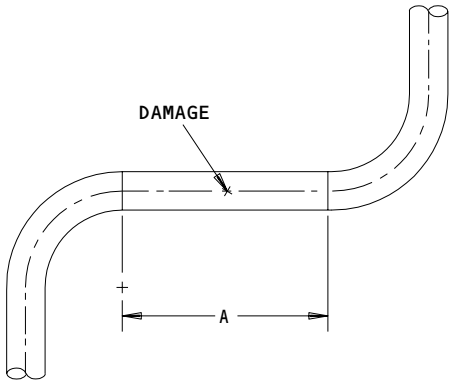
TUBE SIZE	SWAGE TOOL ASSEMBLY	SWAGE HEAD ASSEMBLY	POWER UNIT	INSPECTION GAGE
04	DLT05PSKT3000	DLT05PSHA3004	DLT05MAPW0000	D12-9892-04
06	DLT10PSKT3000	DLT10PSHA3006	DLT10MAPW0000	D12-9892-06
08	DLT20PSKT3000	DLT20PSHA3008	DLT20MAPW0000	D12-9892-08
10		DLT20PSHA3010		D12-9892-10
12	DLT30PSKT3000	DLT30PSHA3012	DLT30MAPW0000	D12-9892-12
16	DLT40PSKT3302	DLT40PSHA4016	DLT40MAPW0000	DNR9892-016
20	DLT40PSKT3003	DLT40PSHA3020	DLT40MAPW0000	D12-9892-20

NOTE: One of the following pumps is necessary to actuate the power units:

- DTL02MAPP1000 pneumatic pump 10,000 psi
- DLT05MAPM1000 manual pump 10,000 psi

DMC LIGHTWEIGHT TOOLS
TABLE A

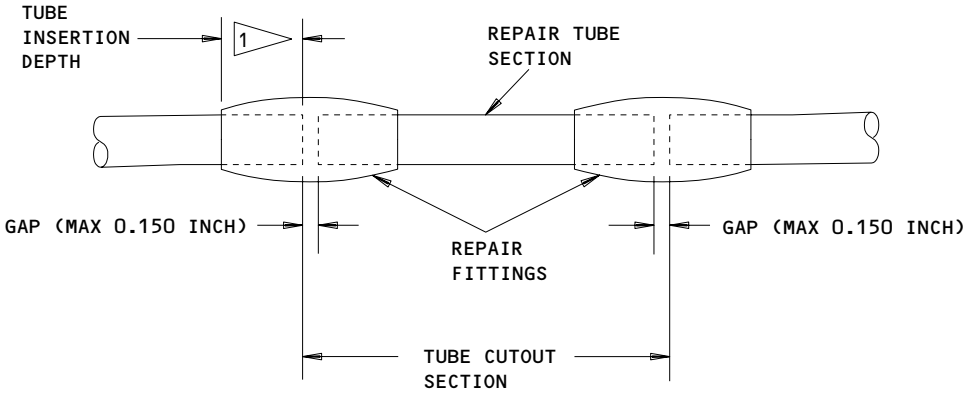
Swage and Inspection Tool Part Numbers
Figure 825



SIZE	TUBE SIZE						
	04	06	08	10	12	16	20
Fitting length	1.540/ 1.530	1.690/ 1.680	2.700/ 2.686	2.780/ 2.766	2.920/ 3.906	3.209/ 3.195	3.664/ 3.650
A tube length (min)	2.15	2.30	3.30	3.40	3.55	3.80	4.30

NOTE: ALL DIMENSIONS ARE IN INCHES.

Minimum Straight Length for Permaswage Fitting Installation
Figure 826



MATERIAL	TUBE SIZE						
	04	06	08	10	12	16	20
Cres/Ti	0.02	0.02	0.03	0.04	0.057	0.049	0.05
Al	None	0.04	0.06	0.06	0.061	0.048	0.06

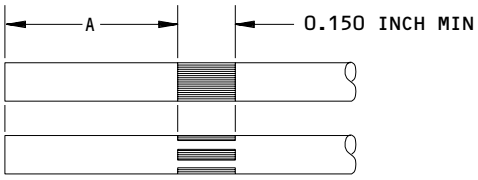
SWAGE GROWTH VALUES (INCH)

1 THE A DIMENSION IS SHOWN IN FIG. 829.

Tube Splice Repair
Figure 827

MATERIAL SURFACE	PROCEDURE TO CLEAN TUBE
Bare or alodine	Solvent clean
Anodize	Hand apply abrasive material, 180-grit or finer: • Fed Spec P-P-121 • Fed Spec P-C-451 • Abrasive Scotch Brite, Type A
Primer/paint	1. Hand apply abrasive material, 240-grit or finer 2. Lacquer thinner (refer to TT-T-266) (flammable) MEK (refer to TT-T-261) (flammable) for primed surfaces (MIL-P-6889) and lacquer base paint/enamel

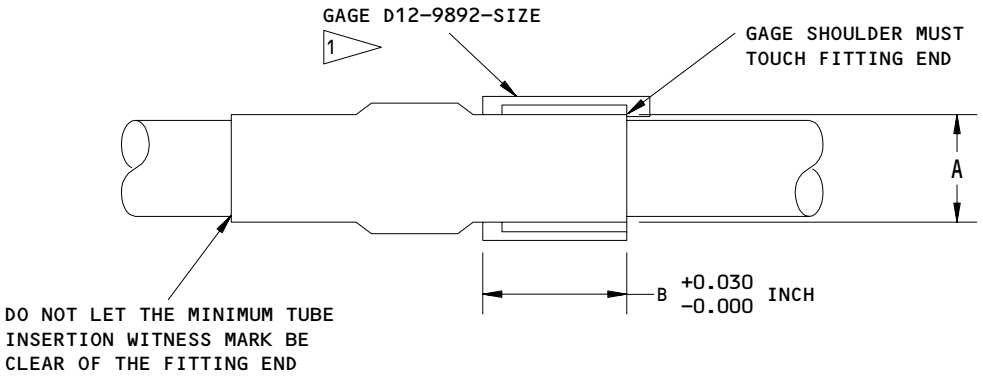
Cleaning and Paint Removal Procedures for Aluminum Tubes
FIgure 828



DIMENSION (FIG. 827)	TUBE SIZE AND INSERTION DEPTH – INCHES						
	04	06	08	10	12	16	20
A	0.69	0.77	1.27	1.31	1.38	1.52	1.62

MARK FOR THE MINIMUM TUBE INSERTION DEPTHS

Witness Mark Location and Usual Marking Procedures
Figure 829

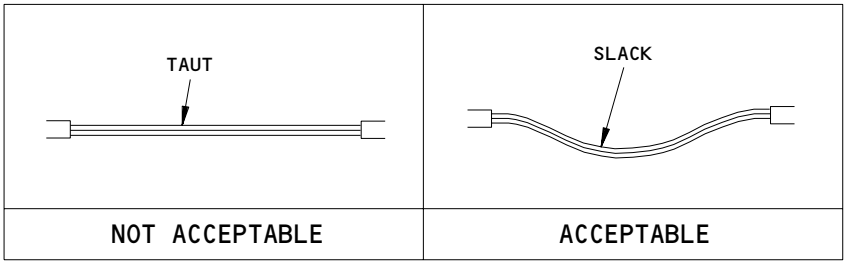


TUBE DIAMETER (INCHES)	SWAGED DIAMETER MAX A DIMENSIONS (INCHES)	SWAGED LENGTH MIN B DIMENSIONS (INCHES)
1/4 (04)	0.315	0.46
3/8 (06)	0.447	0.53
1/2 (08)	0.606	1.02
5/8 (10)	0.735	1.02
3/4 (12)	0.863	1.02
1 (16)	1.181	1.412
1-1/4 (20)	1.390	1.406

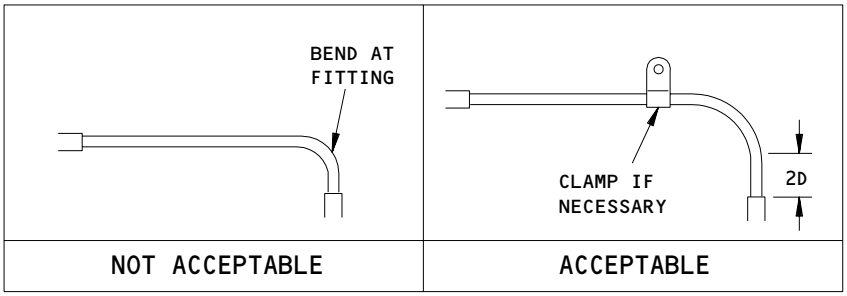
AFTER SWAGE DIMENSIONS (INCH)

1 USE DNR9892-016 FOR SIZE 16

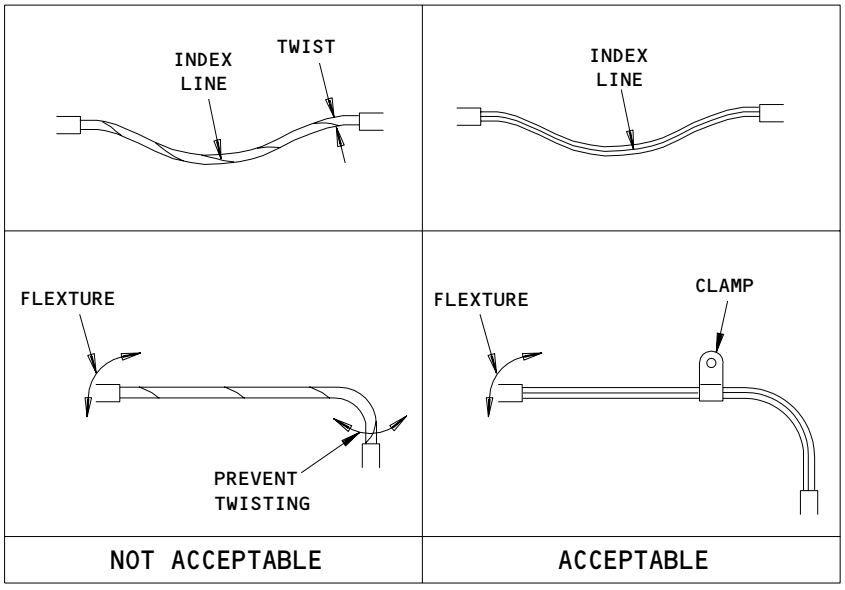
Final Swage Dimensions
Figure 830



SLACK

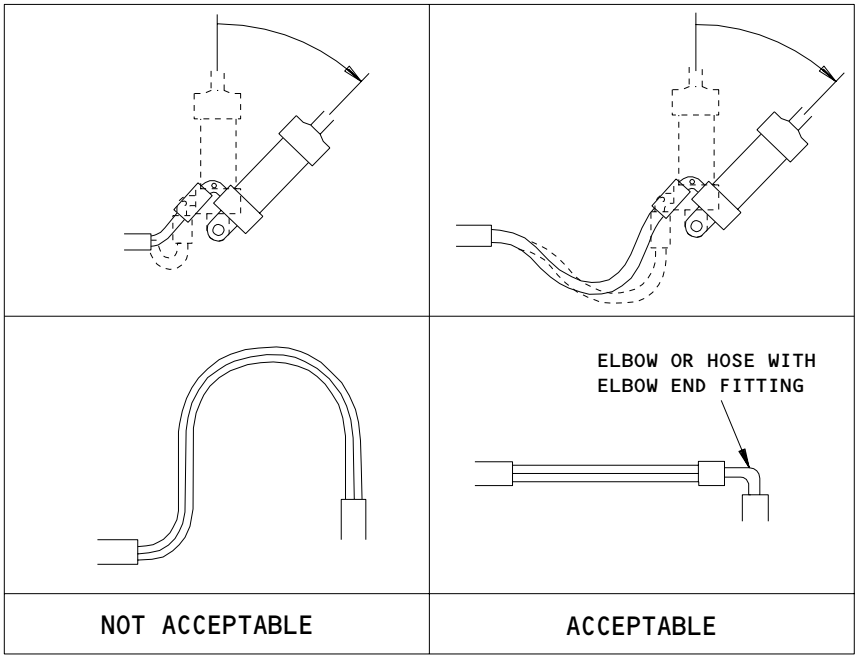


FLEX

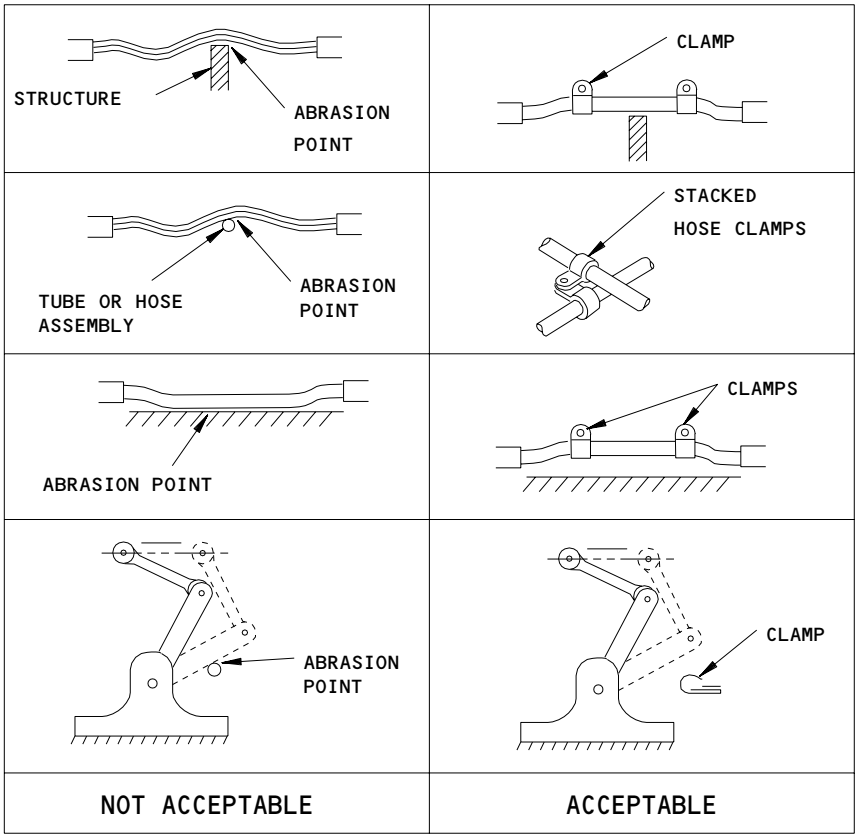


TWISTING

Hydraulic Tubing Repair with Flexible Hose
Figure 831 (Sheet 1)

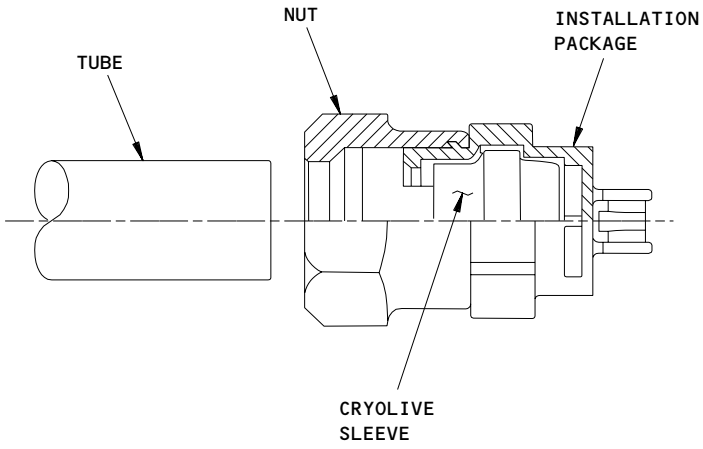


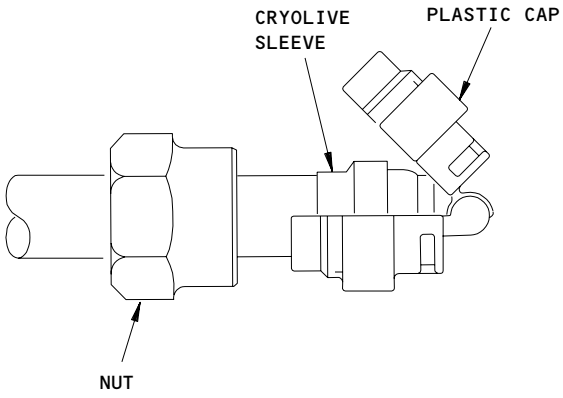
BENDING



CLEARANCE

Hydraulic Tubing Repair with Flexible Hose
Figure 831 (Sheet 2)





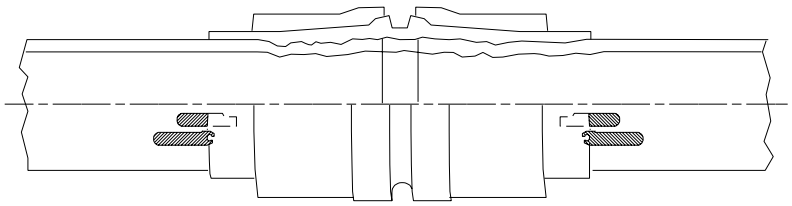
NOTE: REMOVAL OF PLASTIC CAP AFTER INSTALLATION.

CRYOLIVE Flareless Sleeve Assembly
Figure 832

TUBE SIZE	COUPLING NUT MATERIAL	COMBINATION - SLEEVE/COUPLING NUT/PLASTIC CAP PART NO. *
04	304 Cres 7075-T73 Al 6Al-4V Ti	921721J04 921721W04 921721T04
06	304 Cres 7075-T73 Al 6Al-4V Ti	921721J06 921721W06 921721T06
08	304 Cres 7075-T73 Al 6Al-4V Ti	921721J08 921721W08 921721T08
10	304 Cres 7075-T73 Al 6Al-4V Ti	921721J10 921721W10 921721T10
12	304 Cres 7075-T73 Al 6Al-4V Ti	921721J12 921721W12 921721T12
16	304 Cres 7075-T73 Al 6Al-4V Ti	921721J16 (Combination Not Approved) 921721T16

* DO NOT REPLACE COUPLING NUTS INCLUDED WITH THE CRYOLIVE FLARELESS SLEEVE/COUPLING NUT/PLASTIC CAP COMBINATIONS. USE ONLY THE COUPLING NUT PROVIDED WITH THE ASSEMBLY.

Approved CRYOLIVE Flareless Sleeve/Coupling Nut/Plastic Cap Combinations
Figure 833



Rynglok Tube to Tube Union
Figure 834

L16364

AEROQUIP PART NUMBER	FOR USE WITH TUBE MATERIALS	APPROVED TUBE SIZES OD/WALL						
		04	06	08	10	12	16	20
R80101T(–) (TITANIUM MATERIAL)	21–6–9 CRES	0.016	0.020	0.026	0.033	0.039	0.052	N/A
	304 1/8 HARD CRESS (AMS–T–6845)	0.020	0.028	0.035	0.049	0.058	0.065	N/A
	6061–T6 AL (AMS–T–7081) or AMS 4083	0.035	0.035	0.035	0.035	0.035	0.035	0.035
	3AL–2.5V TITANIUM	0.016	0.019	0.026	0.032	0.039	0.051	N/A

Approved Fitting/Tube Material Combinations for Repair with Rynglok Unions
Figure 835

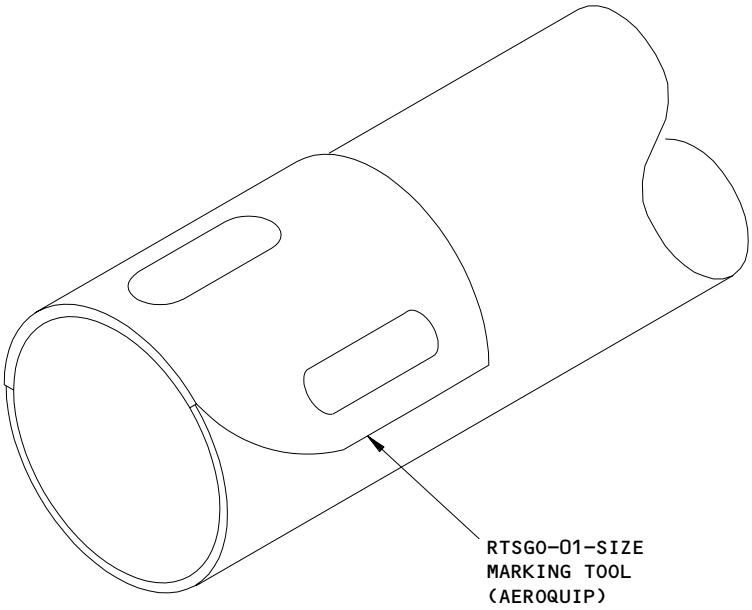
TUBE DASH NUMBER	TUBE OUTER DIAMETER (IN)	MINIMUM REMOVED TUBE SECTION (IN)
04	0.250	2.38
06	0.375	2.64
08	0.500	2.92
10	0.625	3.18
12	0.750	3.56
16	1.000	4.15
20	1.250	4.81

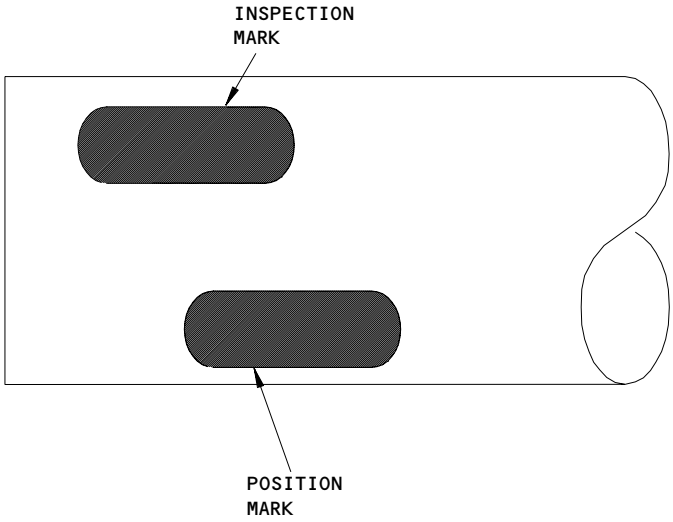
Splice Repair with More Than One Rynglok Tube to Tube Union–
Minimum Removed Tube Section
Figure 836

TUBE SIZE	TOOL NUMBER FOR EACH TUBE SIZE	INSP. GAGE P/N
04	RTST8-02-04	RTSG-051-04
06	RTST8-02-06	RTSG-051-06
08	RTST8-02-08	RTSG-051-08
10	RTST8-02-10	RTSG-051-10
12	RTST8-02-12	RTSG-051-12
16	RTST8-02-16	RTSG-051-16
20	RTST8-02-20	RTSG-051-20

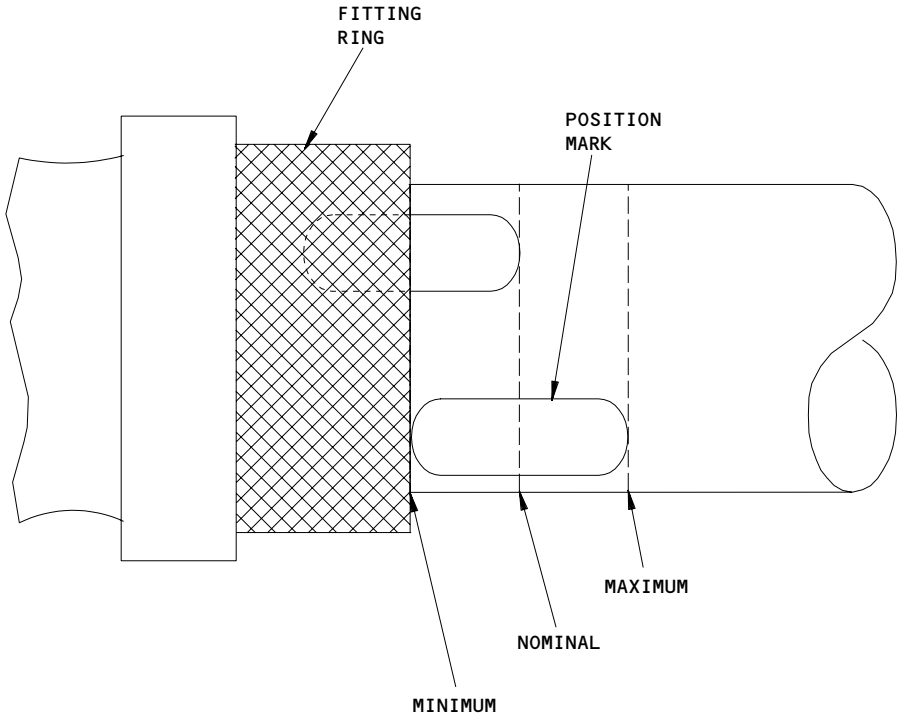
AEROQUIP TOOL KIT NUMBER
RTSK8-02-006 (COVERS TUBE SIZES 04 THROUGH 20)

Rynglok Repair Fittings Swage and Inspection Tool Part Numbers
Figure 837

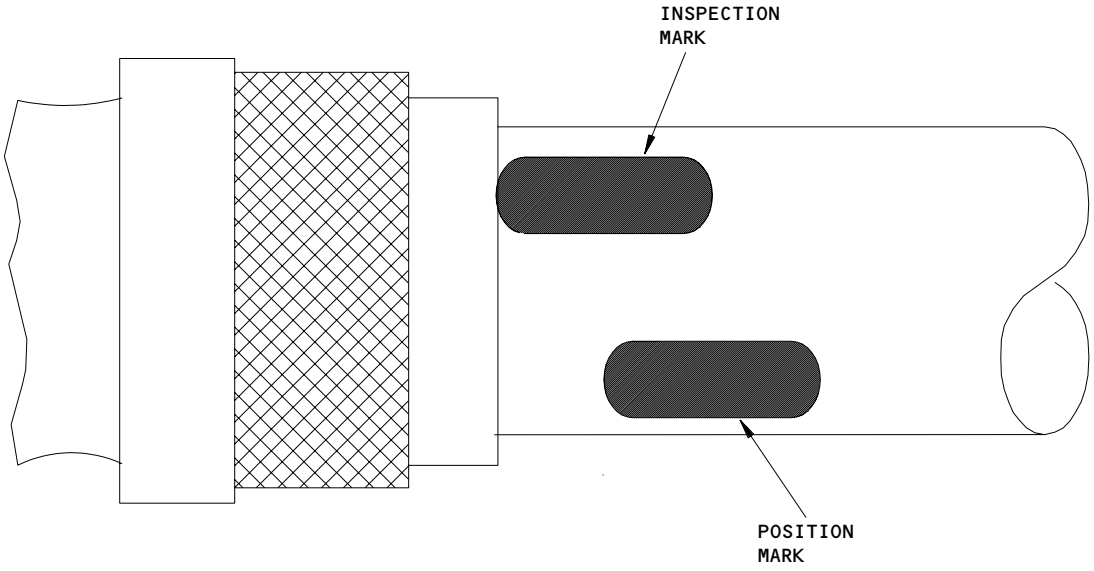




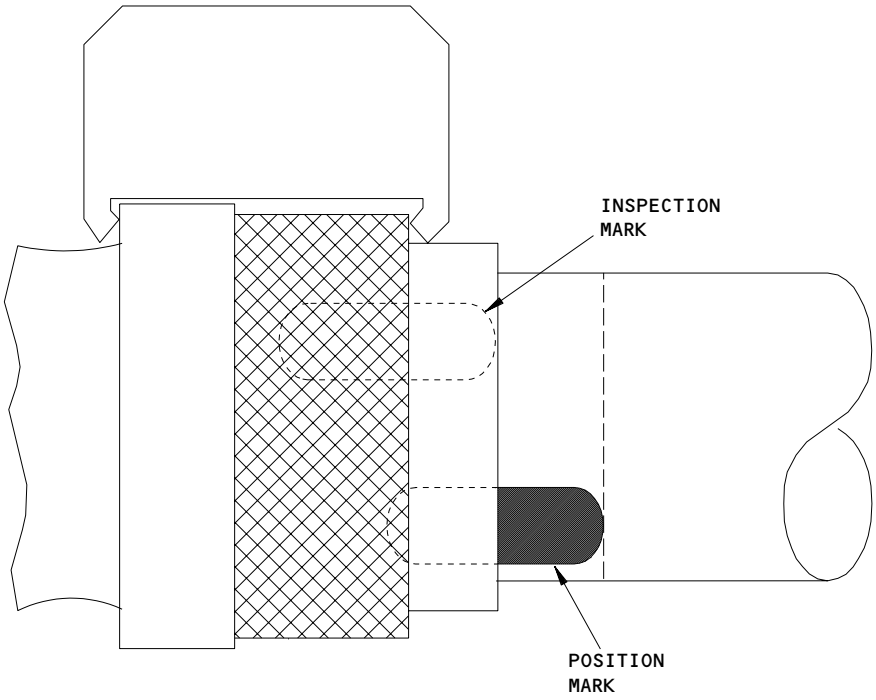
Mark Location During Rynglok Fitting Installation
Figure 838



Fitting Position for Tube Insertion
Figure 839



MINIMUM INSPECTION MARK AFTER SWAGING

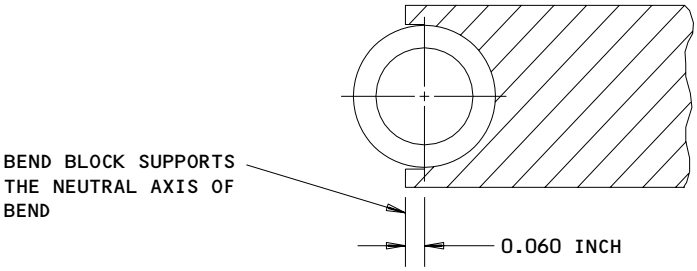


MAXIMUM INSPECTION MARK AFTER SWAGING

Use of Inspection Gage After Swage of Rynglok Fittings
Figure 840

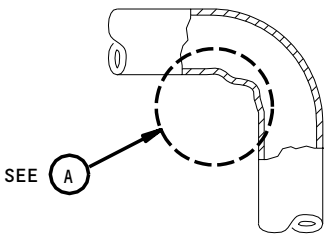
CONDUIT SIZE (OD)	MAXIMUM DENT DEPTH	CONDUIT SIZE (OD)	MAXIMUM DENT DEPTH
0.25	0.050	0.88	0.175
0.31	0.063	1.00	0.200
0.38	0.075	1.25	0.250
0.50	0.100	1.50	0.300
0.63	0.125	1.75	0.350
0.75	0.150	2.00	0.400

Smooth Dent Damage Limits for Electrical Rigid Conduit
Figure 841

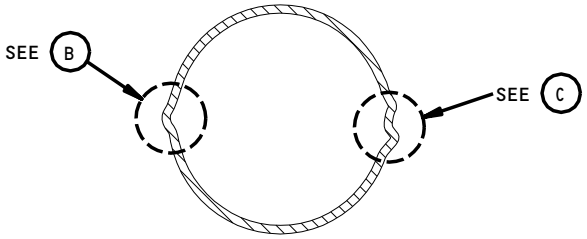


NOTE: IF THE OVALITY OF ANY PART OF THE BEND IS MORE THAN THE MAXIMUM PERMITTED OVALITY, DISCARD THE TUBE.

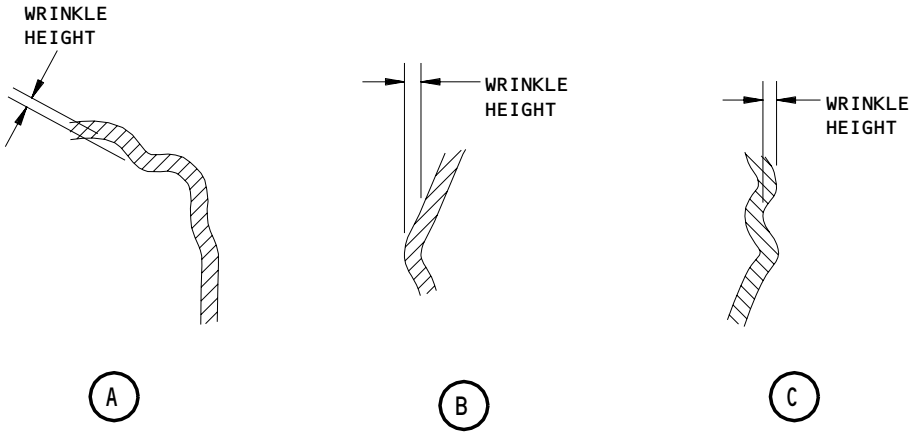
TUBE BEND BLOCK



RADIAL WRINKLE



LONGITUDINAL WRINKLE



WRINKLE MEASUREMENTS

Permitted Forming Limits for Electrical Rigid Conduit
Figure 842 (Sheet 1)

CONDUIT SIZE (OD)	CONDUIT MATERIAL	ALLOWABLE WRINKLE HEIGHT (Inches)	ALLOWABLE OVALITY (Percent of Specified OD)
1.0 OR LESS	STAINLESS STEEL	0.040	10
	ALUMINUM ALLOY	0.020	10
OVER 1.0	STAINLESS STEEL	0.060	10
	ALUMINUM ALLOY	0.030	10

Permitted Forming Limits for Electrical Rigid Conduit
Figure 842 (Sheet 2)

FLEXIBLE HOSE - INSTALLATION

1. General
   A. This procedure contains one task. The task is the installation of flexible hoses.
   B. This procedure gives general instructions for the installation of flexible hoses. If there is a special procedure for a specified system, use the special procedure. For example, there is a special procedure for AMM 71-00-02/401, Power Plant - Removal/Installation.
   C. Flexible hoses do not have a specified life limit. Inspect flexible hoses to the applicable operators standard.
   D. Before you do maintenance on oxygen system flexible hoses, refer to safety precautions and general maintenance instructions in AMM 35-00-00/201, Oxygen - Maintenance Practices.

TASK 20-10-10-404-002

2. Install the Flexible Hose
   A. Procedure

S 214-010

(1) Prior to hose installation do a visual check of the hose assembly to determine its condition.
   (a) Look at the hose, fittings, sealing surfaces and outer covering for damage.
   (b) Do the following if you find broken wires in the outer covering:
      1) Put a tag on the hoses that have random or isolated broken wires.

         NOTE: This is to identify the hose for future inspections.

      2) Do not use the hose if two or more wires in one plait are broken, or if several wires are broken in a concentrated area.

S 434-008

CAUTION: PUT CAPS ON THE HOSES AND FITTINGS. UNWANTED MATERIAL CAN CAUSE CONTAMINATION OF HOSES, DAMAGE TO SYSTEM COMPONENTS, AND LEAKAGE OF HYDRAULIC FLUID.

REMOVE ALL HYDRAULIC FLUID LEAKAGE. HYDRAULIC FLUID CAN CAUSE CORROSION OR OTHER DAMAGE.

(2) Use caps on the hose assemblies and mating connections.

NOTE: Caps keep out moisture and unwanted material until the hose is again connected to its system.

S 214-003
(3) Make sure all fittings are clean and free of defects.

S 644-004
(4) Lubricate external threads as necessary. Refer to AMM 20-10-09/401 for approved thread lubricants.

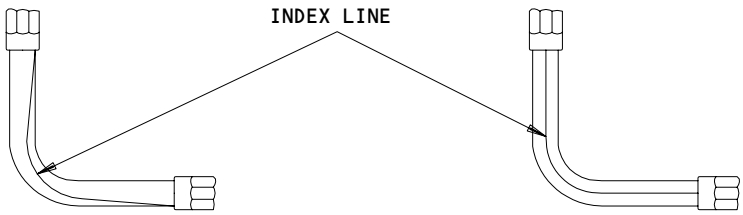
S 424-005
(5) Put the hose in position and tighten the fitting by hand.

S 214-009
(6) Examine the installation for correct alignment and length.

S 434-006

CAUTION: USE THE INDEX LINE ON THE SIDE OF THE HOSE TO MAKE SURE THE HOSE IS NOT TWISTED. IF THE HOSE IS TWISTED, HOSE FAILURE OR HOSE COUPLING LEAKAGE CAN OCCUR BEFORE THE USUAL TIME.

(7) Tighten the pipe fitting ends. Refer to (AMM 20-11-00/201) for the correct torque values.



Flexible Hose Installation
Figure 401

S 434-001

(8) Tighten the coupling-type ends. Refer to (AMM 20-11-00/201) for correct torque valves. Use two wrenches to prevent twisted flexible tubing.

S 434-007

(9) Clamp hose as necessary.

FLUID LINE TUBING CLAMPS - REMOVAL/INSTALLATION

1. General
   A. This procedure contains one task. The task is the replacement of block clamp assemblies.
   B. Different types of clamps hold the fluid system tubing.
   C. Block clamps are used to hold a number of fluid lines at a specific location.
   D. Loop-type cushioned tube clamps are used in fluid line installations to prevent vibration and chafing of lines.
      (1) Before you install nylon loop clamps, make the clamps larger to approximately 1-1/2 times the tube diameter, three or four times, to do a test for flexibility. If the clamp feels flexible and does not crack, you can install it.
   E. For information on removal/installation of vee-band clamps, refer to (AMM 20-11-00/201) Maintenance Practices.

TASK 20-10-11-964-001

2. Replacement of the Block Clamp Assembly
   A. Consumable Materials
      (1) G00145 Tape - Permacel P421
   B. Remove the Block Clamp Assembly

      S 034-002
      (1) Remove the nuts, bolts and washers that hold the block clamp assembly together.

      S 024-009
      (2) Remove the block clamp assembly.
   C. Install the Block Clamp Assembly

      S 024-010
      (1) Remove and discard used tape from the tube.

      NOTE: The condition of used tape on the tube does not always occur.

      S 214-003
      (2) At the location of the block clamps and tube overlap, apply three layers of P421 tape to the tube.

S 424-011
(3) Apply the tape ±0.25 inch from each edge of the block.

S 434-004
(4) Put the tubes in the applicable notches in one-half of the block clamp assembly.

S 424-005
(5) Put the other half of the block clamp assembly in position.

S 434-006
(6) Put the channel over the half of the block clamp assembly that the bolthead will touch.

S 434-007
(7) Put the washers on the bolts and put the bolts through the holes in the block clamp assembly.

S 434-008
(8) Put the washer and nut on the threaded end of the bolt and tighten the nut.

NOTE: Make sure the washers are under the bolthead and the nut so the bolthead does not wear into the block clamp channel.

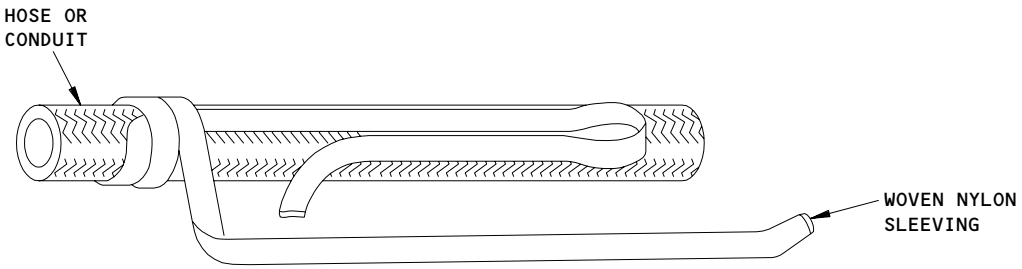
TASK 20-10-11-404-013

3. Protective Lacing - Installation

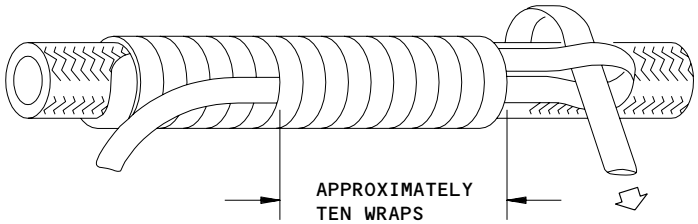
A. Consumables
(1) A00027 Adhesive - RTV 108 (used on nose landing gear only)
(2) G00057 Tape - Scotch, 3M #63 (used on nose landing gear only)
(3) G02503 Lace - Black Nylon Untreated Sleaving (1/8 inch)

B. Procedure - Install the Protective Lacing

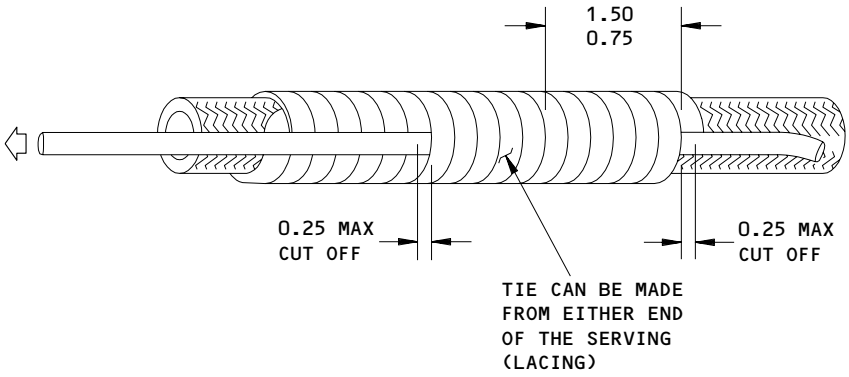
S 404-014
(1) Install the lacing per Figure 401, steps 1 through 3, except nose landing gear.



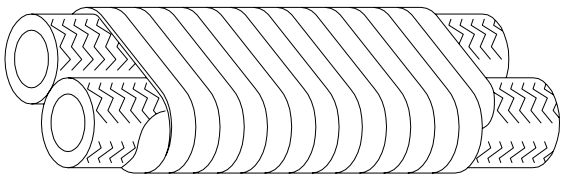
STEP 1



STEP 2



STEP 3



FOR TWO OR MORE HOSES

NOTE: ALL DIMENSIONS ARE IN INCHES.

Protective Lacing Installation
Figure 401

S 404-015

(2) Install the protective lacing on nose landing gear per Figure 401, steps 1 through 3.
   (a) Prior to pulling lock lace through, (before step 3), apply adhesive to laces.
   (b) Pull the laces into place, (Step 3), this will bond the laces in place.
   (c) Apply two layers of tape over the lacing.
      1) Spirally wrap each layer with a 50% overlap and reverse the direction of the spiral with each layer.
      2) Extend the tape 1.0 inch to 1.5 inch beyond each end of the lacing.

PRESSURE-SENSITIVE DECALS - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks:
      (1) Remove Pressure-Sensitive Decals
      (2) Install Pressure-Sensitive Decals.
   B. Apply external decal sections in a sequence where the ends make an overlap downstream from the line of flight.
   C. All exterior decals require edge sealing using paint or an edge sealer unless specified differently.
   D. Clean plastic film decals with naphtha. Do not use adhesive activator.
   E. You can remove air bubbles in the eight hours after you apply the decal. Make a small hole in the decal film with a sharp pointed instrument, at the edge of bubble, and push air out through the hole.
   F. You can also install interior decals with the same procedure you use for pressure-sensitive placards (AMM 20-10-13/401).

TASK 20-10-12-004-001

2. Remove Pressure-Sensitive Decals
   A. Equipment
      (1) Plastic Scraper (See AMM 51-31-01/201 for approved scrapers)
      (2) Source of heat - 120°F, for example, hot air blast or light bulb
   B. Consumable Materials
      (1) B00083 Aliphatic Naptha - TT-N-95
      (2) B00130 Isopropyl Alcohol - TT-I-735
      (3) G00033 Cheesecloth - BMS 15-5
   C. References
      (1) AMM 51-21-01/701, Paint Stripping
      (2) AMM 51-31-01/201, Seals and Sealing
   D. Procedure

      S 024-002
      (1) To remove external decals, paint strip (AMM 51-21-01/701).

      S 024-003
      (2) To remove internal decals, use heat or use solvent.

CAUTION: THE TEMPERATURE OF THE SURFACE TO WHICH THE DECAL IS APPLIED MUST NOT BE MORE THAN 130°F.

(a) To remove decals with heat, do these steps:
1) Heat the decal to approximately 120°F until the adhesive becomes soft.

NOTE: If you use too much heat, the decal will melt. If the decal melts, remove it with solvent.

CAUTION: MAKE SURE THAT YOU ONLY USE APPROVED SCRAPERS ON THE AIRPLANE SKIN. SCRAPERS THAT ARE NOT APPROVED CAN MAKE SCRATCHES ON THE SKIN AND CAUSE FATIGUE CRACKS.

CAUTION: DO NOT USE ABRASIVE PADS (SCOTCH-BRITE) OR ABRASIVE PAPER ON THE ALUMINUM SURFACE UNLESS THE SCRIBE LINE INSPECTIONS WERE MADE. ABRASIVE PADS CAN SMOOTH THE ALUMINUM SURFACE AND HIDE SCRIBE LINE MARKS. IF YOU USE ABRASIVE PADS TO REMOVE PAINT OR PRIMER BEFORE YOU DO THE SCRIBE LINE INSPECTIONS, YOU CAN BE REQUIRED TO DO REPEAT INSPECTIONS BASED ON THE SCRIBE LINE INSPECTION SERVICE BULLETIN.

2) Lift the corner of the decal with an approved scraper and remove the decal from the surface.
3) If necessary, clean the surface with a cheesecloth pad that is moist with isopropyl alcohol or aliphatic naphtha.

(b) To remove decals with solvent, do these steps:
1) Apply solvent, Series 89 (AMM 20-30-89/201) to the decal with a brush or cloth.
2) When the decal has wrinkles (after approximately two minutes), apply solvent again.
3) After approximately two minutes, move the soft decal off of the surface or remove with a spatula.
4) If necessary, clean the surface with a cheesecloth pad that is moist with solvent, Series 89 (AMM 20-30-89/201).

TASK 20-10-12-404-004

3. Install Pressure-Sensitive Decals

A. Equipment
(1) Scotchcal Cutter - ST732
(2) Plastic Scraper (See AMM 51-31-01/201 for approved scrapers)
(3) Felt Squeegee

B. Consumable Materials
(1) B00083 Aliphatic Naptha - TT-N-95
(2) B00130 Isopropyl Alcohol - TT-I-735
(3) B00151 Methyl Isobutyl Ketone - TT-M-268
(4) C00260 Enamel, BMS 10-11, Type 2

(5) C50020 Kit, Desothane Edge Sealer CA8000/B900B Dethosthane HS Activator
(6) C00034 683-3-2 Base with X-310A Catalyst (Edge Sealer) - BAC5710, Type 41
(7) G00270 Masking Tape
(8) G00033 Cheesecloth - BMS 15-5
(9) B00137 Abrasive Paper - 150-Grit

C. References
(1) AMM 12-25-01/301, Airplane Servicing (Exterior Cleaning)
(2) AMM 51-21-03/701, Corrosion Removal and Control
(3) AMM 51-24-01/701, Hydraulic Fluid Resistant Finish
(4) AMM 51-31-01/201, Seals and Sealing

D. Prepare the Surfaces for Installation

S 114-005
(1) Clean corroded aluminum surfaces (AMM 51-21-03/701).

S 114-006
(2) Clean wax-coated aluminum surfaces until area shows a water-break-free surface (AMM 12-25-01/301).

S 114-007
(3) Use methyl isobutyl ketone cleaner and a clean cloth to clean polyester plastic that is not painted.
(a) Dry surface with a clean cloth. Do not let air dry.

S 114-019
(4) Use naphtha cleaner and a clean cloth to clean phenolic plastic that is not painted.
(a) Dry surface with a clean cloth. Do not let air dry.

S 114-008
(5) Lightly sand cork surfaces with 150-grit abrasive paper until you get a clean cork surface.
(a) Remove sanding dust with a clean, dry cloth.

S 114-021

WARNING: DO NOT GET SOLVENTS IN YOUR MOUTH, OR YOUR EYES, OR ON YOUR SKIN. DO NOT BREATHE THE FUMES FROM SOLVENTS. SOLVENTS ARE HAZARDOUS MATERIALS. SOLVENTS MAY BE FLAMMABLE OR HARMFUL TO THE ENVIRONMENT. REFER TO PRODUCT MATERIAL SAFETY SHEETS (MSDS) AND LOCAL REQUIREMENTS FOR PROPER HANDLING PROCEDURES.

(6) Clean all other surfaces thoroughly with naphtha cleaner and a clean dry cloth, except in preparation for application of the Refuel Panel Placard which requires the use of solvent, Series 89 (AMM 20-30-89/201) and a clean dry cloth in place of naphtha.

NOTE: Verify that no grease is present on the surface prior to the application of the Refuel Panel Placard.

(a) Dry the surface with a clean cloth. Do not let air dry.

E. Prepare the Decal for Installation

S 804-010

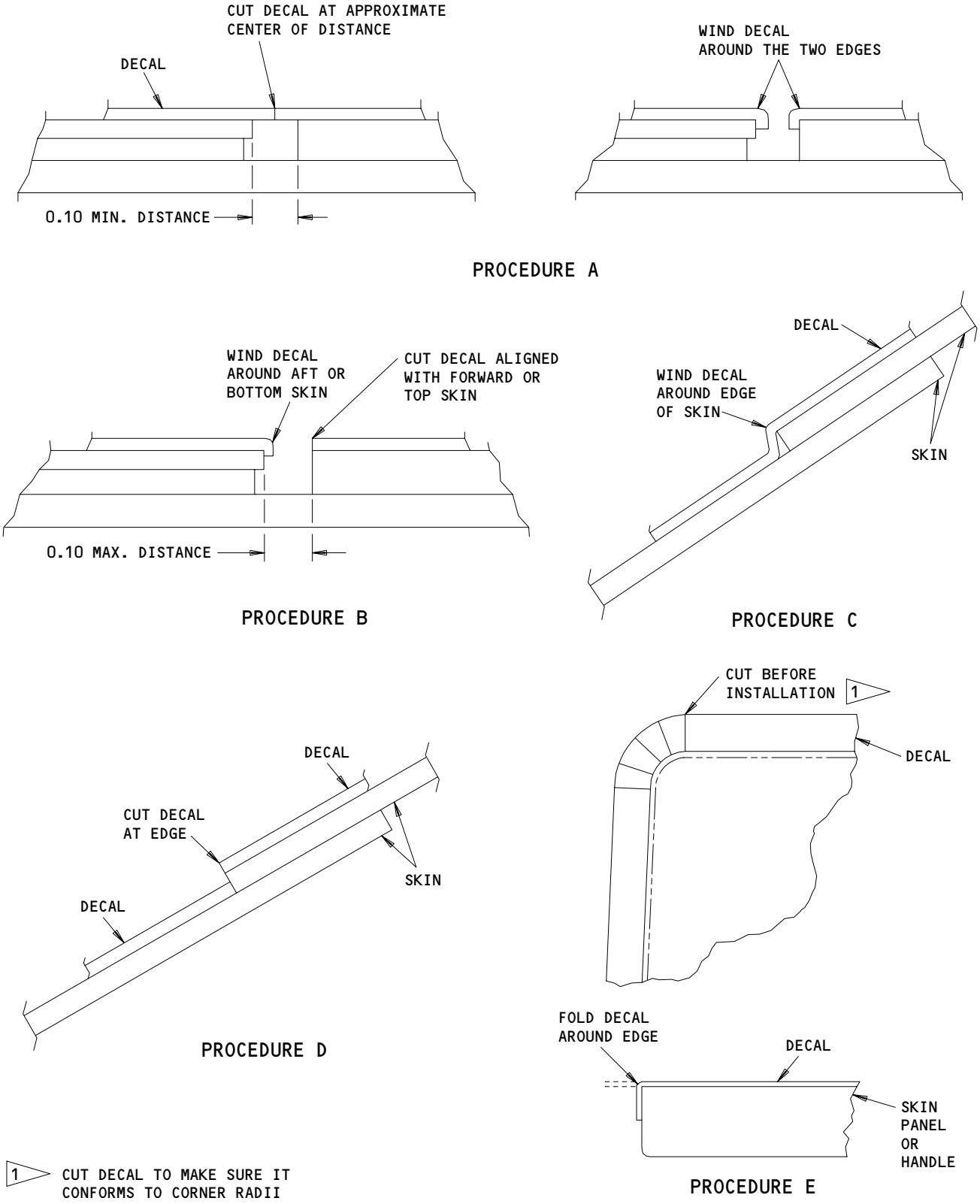
(1) On decals with an area less than one square foot, remove the backing and put the decal face down on a smooth surface.

S 424-011

(2) On decals with an area more than one square foot, use masking tape to put the decal on the receiving surface.
   (a) Cut a sheet of carrier tape approximately four inches longer than the decal and approximately the same width. When you use premasked decals, you can use the premask as a carrier.
   (b) Put the carrier over the decal, with the edge you will hang two to three inches beyond the decal edge.
   (c) Hang the carrier on the receiving surface with masking tape.
   (d) Rub the carrier on with a plastic scraper. Use short strokes and work from the middle of the joint to the edges. Be sure to remove all wrinkles and air bubbles.
   (e) Fold the carrier and decal back at the joint, along the surface with the backing up. Use masking tape to hold in this position.
   (f) Remove the decal backing.

S 804-012

(3) On strip decals, remove about one foot of backing and put the decal face down on a smooth surface.



Decal Application Over Irregular Surfaces
Figure 401

F. Procedure

S 424-014

(1) To apply decal to a regular surface, do these steps:

(a) Put the decals with areas less than one square foot in position and bond one edge to the surface. Hold the remainder of decal taut and a small distance from the receiving surface with a piece of backing on the adhesive side.

(b) For decals with an area greater than one square foot, move the carrier into position. Hold the free end taut and a small distance from the receiving surface with a piece of backing on the adhesive.

(c) Align and bond approximately three inches of strip decals to the receiving surface.

1) Use the applied section as a joint and strip up to three feet of the backing.

2) Align the stripping and hold it taut and a small distance away from the receiving surface.

CAUTION: MAKE SURE THAT YOU ONLY USE APPROVED SCRAPERS ON THE AIRPLANE SKIN. SCRAPERS THAT ARE NOT APPROVED CAN MAKE SCRATCHES ON THE SKIN AND CAUSE FATIGUE CRACKS.

CAUTION: DO NOT USE ABRASIVE PADS (SCOTCH-BRITE) OR ABRASIVE PAPER ON THE ALUMINUM SURFACE UNLESS THE SCRIBE LINE INSPECTIONS WERE MADE. ABRASIVE PADS CAN SMOOTH THE ALUMINUM SURFACE AND HIDE SCRIBE LINE MARKS. IF YOU USE ABRASIVE PADS TO REMOVE PAINT OR PRIMER BEFORE YOU DO THE SCRIBE LINE INSPECTIONS, YOU CAN BE REQUIRED TO DO REPEAT INSPECTIONS BASED ON THE SCRIBE LINE INSPECTION SERVICE BULLETIN.

(d) Start at the joint and rub the decal on the surface with the approved plastic scraper with short fan-like strokes. Do not let the adhesive touch the receiving surface until the plastic scraper pushes it down.

(e) Continue to strip, apply activator, and apply strip decals until you apply all of the decal.

(f) When you apply strip decals around a corner and a splice occurs, overlap decal a minimum of 0.5 and a maximum of 2.0 inches.

S 424-023

CAUTION: DO NOT DAMAGE THE AIRPLANE SKIN WHEN YOU CUT THE DECAL. DAMAGE TO THE SKIN SUCH AS NICKS, CUTS, SCRATCHES, OR SCRIBE LINES WILL REDUCE THE FATIGUE STRENGTH AND DURABILITY OF THE STRUCTURE.

(2) To apply decals to irregular surfaces, do these steps:
  (a) To apply decals on a joint between two surfaces which move with respect to each other, do one of these steps:
    1) For distances of 0.100 inch and more, cut the decal at the approximate center of the distance. Wind the decal around the two edges. See Procedure A (Fig. 401).
      a) If you damage the skin or sealant, obey all the specified steps, cautions and references to inspect and repair the sealant and skin in AMM 51-31-01/201 and the applicable structural repair manual.
    2) For distances of less than 0.100 inch, cut the decal aligned with the forward or top skin edge. Wind the decal around the aft or bottom skin edge. See Procedure B.
      a) If you damage the skin or sealant, obey all the specified steps, cautions and references to inspect and repair the sealant and skin in AMM 51-31-01/201 and the applicable structural repair manual.
  (b) To apply decals across lap joints, do one of these steps:
    1) Wind the decal smoothly and continuously around the edge of the lap joint. See procedure C (recommended procedure).
    2) You can use this alternative where the decal extends along the lap joint for a long distance. Cut the decal aligned with the overlap edge and touch the remainder of the decal to the overlap edge. See Procedure D.
  (c) To apply decals to external emergency exit handles, see Procedure E.
    1) Before you remove the backing paper, put the decal on the handle and cut the decal overlap around each rounded corner.
    2) Remove the backing paper and apply the decal. Push the overlap around the edges of the handle.
  (d) Use tool ST732 to cut decals, except pressure-sensitive Polyester, around the heads of fasteners on removable panels. Push the decal into the recessed slot.
    1) If you damage the skin or sealant, obey all the specified steps, cautions and references to inspect and repair the sealant and skin in AMM 51-31-01/201 and the applicable structural repair manual.
  (e) Cut and remove an area of film, of pressure-sensitive polyester decals, and approximate size of a nonflush rivet or fastener, with a Scotchcal cutter. Push the decal film firmly in position around the rivet or fastener.
  (f) Let the adhesive cure for 1/2 hour before you seal the edges.

(g) Make a small hole in the decal film, with a sharp pointed instrument, at each rivet on decals applied over pressurized areas.

S 804-016

(3) To remove carrier, or premask and masking tape, pull back parallel to the decal surface. If you will paint the adjacent area, leave the premask in position.

S 394-024

CAUTION: DO NOT APPLY PAINT OR NON-TRANSPARENT MATERIALS OR OTHER UNAPPROVED MATERIALS TO THE ACRYLIC WINDOWS. PAINT OR NON-TRANSPARENT MATERIALS OR OTHER UNAPPROVED MATERIALS WILL CAUSE STRUCTURAL DAMAGE TO THE ACRYLIC AND WILL PREVENT DAMAGE DETECTION. DAMAGE TO THE WINDOW CAN CAUSE A WINDOW BLOWOUT.

(4) Seal the edges.
   (a) If you painted up to the edges of decals, seal the edges of the decal with paint.
      1) If the decal has a premask, remove the premask only after you apply the last layer of paint up to the decal and overlaps the decal edge by 0.2 inches. The paint will flow sufficiently well to seal the edges. If this condition does not occur, seal the edges by the recommended procedure.
   (b) Use a brush to apply clear base 683-3-2 with X-310A catalyst (edge sealer)or Desothane edge sealer to the edges of the decals that follow. Make sure you have a dry film thickness of 0.0015 to 0.0020 inch (AMM 51-24-01/701).
   (c) Extend the edge seal to a minimum of 0.2 inches around the decal and 0.2 inches on the decal.
      1) Solvent-activated vinyl decals
      2) BMS 10-26, Type 1 and 3 pressure-sensitive elastomeric vinyl decals
      3) Solvent-activated reflective decals
      4) Pressure-sensitive reflective decals
      5) Pressure-sensitive aluminized, mylar decals
   (d) Let adhesive cure for a minimum of 1/2 hour, then seal the edges of pressure-sensitive polyester decals with clear base 683-3-2 and X-310A catalyst (edge sealer) (AMM 51-24-02/701).
   (e) Use a brush to apply the applicable color of BMS 10-11, Type 2 enamel on all open exposed rivet or fastener heads on pressure-sensitive polyester decals. Make an overlap on the edge of the decal by 0.25 inch.

PRESSURE-SENSITIVE DECALS - APPROVED REPAIRS

1. General
   A. This procedure contains one task. The task is to repair external decals.
   B. To repair damaged external decals, apply patches of equivalent decals. Replace damaged internal decals.

TASK 20-10-12-358-001

2. Repair External Decals
   A. References
      (1) AMM 20-10-12/401, Pressure-Sensitive Decals
      (2) AMM 51-31-01/201, Seals and Sealing
   B. Procedure

S 028-007

CAUTION: DO NOT DAMAGE THE AIRPLANE SKIN WHEN YOU CUT THE DECAL. DAMAGE TO THE SKIN SUCH AS NICKS, CUTS, SCRATCHES, OR SCRIBE LINES WILL REDUCE THE FATIGUE STRENGTH AND DURABILITY OF THE STRUCTURE.

(1) Cut away all loose decal film but be careful not to cut the airplane skin.
   (a) If you damage the skin or sealant, obey all the specified steps, cautions and references to inspect and repair the sealant and skin in AMM 51-31-01/201 and the applicable structural repair manual.

S 808-003

(2) Cut a patch of decal film of the same type and color as the initial decal. Make sure it is of sufficient size to make an overlap of 1/4 inch on the part of the decal that is not damaged.

S 438-004

(3) Apply the patch (AMM 20-10-12/401).

S 398-005

(4) Edge seal all around the repair with the applicable edge sealer specified in AMM 20-10-12/401.

PRESSURE SENSITIVE PLACARDS - REMOVAL/INSTALLATION

1. General
   A. This procedure contains one task. The task is the replacement of internal vinyl placards.

      NOTE: Vinyl placards are prepared on a material that will not easily follow the contour of rough or textured surfaces. The placard will touch only the high spots and have a poor bond. Use an adhesive with vinyl placards to get a smooth surface and a firm bond for the placard. Foil markers are made on a soft metal that, when applied, will have the contour of the surface and make a good bond. If the surface is textured, you can apply adhesive to get a smoother surface and more satisfactory installation of foil markers.

TASK 20-10-13-964-001

2. Replace the Placard
   A. Consumable Materials
      (1) B00048 Detergent Cleaner - Spraywhite E
      (2) B00036 Freon TF
      (3) B00083 Aliphatic Naphtha - TT-N-95
      (4) A00119 Adhesive - BMS 5-55
      (5) A00016 Adhesive Film - BMS 5-91
      (6) B00137 Sandpaper, medium grit
      (7) G00270 Masking tape
   B. Remove the Placard

      NOTE: If the placard is bonded firmly and the new placard is the same size, you can install the new placard on the used placard.

      S 024-002
      (1) Put a sharp knife or similar object under the edge of the placard and remove the placard from the adhesive area.

      S 114-003
      (2) Remove remaining adhesive film with Freon TF, naphtha , CDG-110, CDG-211, isopropyl alcohol, or ethyl alcohol cleaner.
   C. Prepare the Placard for Installation

      S 804-004
      (1) If the placard has an indication that BMS 5-91 adhesive is used, no special placard preparation is necessary. Continue to the installation.

      S 844-005
      (2) If the placard has no backing adhesive, prepare placard as follows:
         (a) Make the rear surface of the placard rough with sandpaper.
         (b) Clean the placard with naphtha cleaner.

(c) Remove release paper from one side of the BMS 5-91 adhesive film and apply to rear of placard. Remove unwanted film.
(d) Laminate adhesive film to the placard with one of these steps:
1) Roll placard on hot roll laminator heated to 140°F.
2) Heat the placard to not more than 140°F with a dry air blast or other applicable source and rub release paper with a cheesecloth.

NOTE: Heat makes the adhesive to release paper bond soft. Be careful not to move the release paper.

S 844-006
(3) If the placard has an adhesive backing other than BMS 5-91, prepare placard as follows:

NOTE: This step is not necessary but it does make sure the adhesive film is firmly bonded to the placard.

(a) Remove the release paper from the rear of the placard.
(b) Remove the release paper from one side of the BMS 5-91 adhesive film and apply adhesive film to the rear of the placard. Remove unwanted film.
(c) Laminate adhesive film to the placard with one of these steps:
1) Roll placard on hot roll laminater heated to 140°F.
2) Heat placard to not more than 140°F with a dry air blast or other applicable source and rub release paper with a cheesecloth.

NOTE: Be careful not to move the release paper.

D. Install the Placard

NOTE: If you install the new placard over a placard or on cured adhesive, do not do steps 2-4 and 7.

S 114-007
(1) Clean the surface with Freon , CDG-110, CDG-211, isopropyl alcohol, or ethyl alcohol cleaner or detergent. Dry fully.

S 954-008

CAUTION: MAKE SURE THE MASKED AREA IS IN THE CORRECT POSITION. YOU CAN REMOVE DRY ADHESIVE WITH NAPHTHA CLEANER. IF YOU TRY TO REMOVE CURED ADHESIVE, YOU WILL CAUSE DAMAGE TO THE SURFACE.

(2) Mask an area approximately 1/16 inch smaller than placard with masking tape or attach a mask of necessary size.

S 804-009
(3) Use a brush to apply one layer of adhesive to the prime contact area. Let adhesive dry fully (approximately 15 minutes).

S 954-010
(4) Remove masking tape or mask.

S 424-011
(5) Remove release paper from the placard. Put the placard on the center of the primed surface. Apply to the surface but be careful to prevent air pockets.

S 424-012
(6) To attach the placard fully, rub with firm hand pressure and a cheesecloth pad.

S 114-013
(7) If the primed surface shows around the placard, remove unwanted adhesive with naphtha cleaner.

ALUMINUM FOIL MARKERS - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks. The first task is the removal of aluminum foil markers. The second task is the installation of aluminum foil markers.
   B. Replace aluminum foil markers that have creases, damaged edges, or words you cannot read.
   C. Replace aluminum foil markers that are not satisfactorily bonded to external primed or painted surfaces.
   D. Remove and replace aluminum foil markers that are not satisfactorily bonded to internal primed or painted surfaces.
   E. Remove and replace aluminum foil markers that are not satisfactorily bonded to bare metal surfaces.

      NOTE: For aluminum foil markers that you install on textured surfaces or that to not bond satisfactorily, you can use the procedure for internal vinyl pressure sensitive placards. This gives a better installation (AMM 20-10-13/401, Removal/Installation).

   F. Do not install a new aluminum foil marker on a used aluminum foil marker. Remove the used aluminum foil marker and install the new aluminum foil marker.

TASK 20-10-14-004-016

2. Remove Pressure Sensitive Aluminum Foil Placards
   A. Consumable Materials
      (1) B00148 Methyl Ethyl Ketone (MEK) - TT-M-261
      (2) B00084 Xylene - ASTM 845 or 846
      (3) G00033 Cheesecloth - BMS 15-5B
   B. Procedure

      S 024-017
      (1) Put a sharp knife, or equivalent object, under the edge of the placard and remove the placard from the adhesive area.

S 114-018

(2) On primed, painted, or plastic interior surfaces, use xylene to remove all adhesive from surfaces and markers.

S 114-019

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(3) On metal surfaces, use a cheesecloth that is wet with solvent, Series 88 (AMM 20-30-88/201) to remove all adhesive from surfaces and markers.

TASK 20-10-14-404-005

3. Install the Aluminum Foil Marker

A. Equipment

(1) Model C, IBM typewriter with Pica type and with a medium dark opaque, or blueprint black ribbon

B. Consumable Materials

(1) A00134 Adhesive - BMS 5-14
(2) A00119 Adhesive - RUBBER CEMENT BMS 5-55
(3) B00046 Phosphoric Acid Metal Conditioner and Corrosion Remover - MIL-M-10578 Type II
(4) B00316 Solvent - Aliphatic Naphtha, TT-N-95
(5) B00137 Abrasive Paper - 150- and 180- grit aluminum oxide
(6) G00033 Cheesecloth - BMS 15-5B
(7) A00253 Adhesive - BMS 5-109
(8) C00034 Bostik Clear Base - 683-3-2 with Catalyst - X-310A

C. References

(1) 51-24-01/701, Hydraulic Fluid Resistant Finish

D. Prepare for Installation

S 824-020
(1) If it is necessary, use an electric typewriter with pica type set at the highest impression level to add data to the placard.

S 824-026
(2) Make sure all typed data is clear with letters that do not cut through the aluminum foil marker.

S 804-001
(3) If it is necessary, cut the aluminum foil marker to the necessary dimension before you remove the protective backing.

S 104-002
(4) Clean the surface to receive the aluminum foil marker immediately before you apply the aluminum foil marker.
   (a) To clean aluminum surfaces, do these steps:
      1) Clean aluminum surfaces that have corrosion with a wire brush.
      2) Clean surfaces that have grease with BMS 3-2 solvent.
      3) Apply a solution of one-fourth phosphoric acid and three-fourths water, by volume, with a brush, rag, or sponge to the surface.
      4) Let the solution stay on the metal approximately 1/2 minute.
      5) Rub the surface with a damp cheesecloth and then with a dry cheesecloth until the surface is dry and free of corrosion.
   (b) Use xylene to clean polyester, epoxy, phenolic or polyurethane surfaces that are not painted.
   (c) To clean aluminized paint (EC-843) coated surfaces, do these steps:
      1) Sand with 180-grit abrasive paper.
      2) Clean with BMS 3-2 solvent.
   (d) To clean cork surfaces, do these steps:
      1) Lightly sand with 150-grit, aluminum oxide, abrasive paper until you get a clean cork surface.
      2) Rub the surface with a clean cheesecloth to remove any dust.
   (e) Clean all other surfaces with BMS 3-2 solvent.

S 804-003
(5) On cadmium-plated surfaces, laminated not painted polyester materials, laminated not painted phenolic materials, and rough surfaces that are not painted, do these steps:
(a) Apply a light layer of BMS 5-14 adhesive to the cleaned surface.
(b) Let the adhesive dry for 5 to 20 minutes. The adhesive must be tacky but will not bond to a clean finger when lightly touched.

S 804-004
(6) Do these steps on primed or painted rough interior surfaces:

NOTE: Do not use this procedure on external surfaces open to the weather.

(a) Apply a light layer of BMS 5-55 adhesive to the cleaned surface.
(b) Let the adhesive dry for 5 to 20 minutes. The adhesive must be tacky but will not bond to a clean finger when lightly touched.

E. Install the Aluminum Foil Marker

S 494-021
(1) Use supports for surfaces of thin panels during the installation of markers.

S 434-022
(2) Do not use an aluminum foil marker that is not flat or is damaged.

S 844-023
(3) Do not touch or contaminate the adhesive on the aluminum foil marker after you remove the protective backing.

S 844-024
(4) Make sure the aluminum foil marker and the open surface are free of moisture.

S 844-025

(5) During the installation of a large or complicated aluminum foil marker, keep a small section of backing attached.

NOTE: A small section of backing will help you to touch and move the aluminum foil marker.

S 424-006

(6) To install a cellophane-backed aluminum foil marker, do these steps:
   (a) Put the aluminum foil marker in water (50 to 120°F) for approximately 30 to 120 seconds.
   (b) Remove the aluminum foil marker from the water and remove unwanted water with a clean, dry cheesecloth.
   (c) With dry hands, move a finger across the edge of the aluminum foil marker and move back the cellophane.
   (d) Carefully remove the backing from the aluminum foil marker.

S 424-007

(7) To install a paper-backed aluminum foil marker, do these steps:
   (a) Remove the paper backing from the aluminum foil marker, but be careful not to touch the adhesive coating.
      1) Where the paper backing has a cut, bend the paper backing lightly along the cut line. Hold the backing and move it slowly away from the aluminum foil marker to prevent damage to the marker.
      2) Where the paper backing does not have a cut, move a finger across the edge of the aluminum foil marker to move back one edge of the paper backing.

         NOTE: The backing can also have a tab which will help to remove the backing.

S 424-008

(8) To install aluminum foil markers without self-contained adhesive, do these steps:
   (a) On primed, painted, or plastic interior airplane surfaces that are not open to the weather, do these steps:
      1) Apply a light layer of BMS 5-55 adhesive to the rear of the aluminum foil marker.
      2) Let the adhesive dry until it is tacky but will not bond to a clean finger when lightly touched.
   (b) On bare metal surfaces, do these steps:
      1) Apply a light layer of BMS 5-14 adhesive to the rear of the aluminum foil marker.
      2) Let the adhesive dry until it is tacky but will not bond to a clean finger when lightly touched.

S 424-009
(9) Put the aluminum foil marker in the correct position and push down to attach it.

S 424-010
(10) Use a roller and start at one end of the marker and roll the marker into position. Be careful to prevent air bubbles. To prevent roll marks, do not let the edge of the roller touch the aluminum foil marker.

S 804-011
(11) To remove air bubbles, make a small hole with a pin and make a smooth surface with a roller.

S 114-012

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(12) If it is necessary, remove unwanted adhesive. Use solvent, Series 88 (AMM 20-30-88/201) for BMS 5-14 adhesive or BMS 3-2 solvent for BMS 5-55 adhesive.

S 034-013
(13) To remove the protective paper facing, strip it parallel to the surface of the aluminum foil marker.

S 214-014
(14) Make sure there is a good bond on the edge of the aluminum foil marker. Be careful not to lift the edge.

S 394-015
(15) For protection of markers from fuel, hydraulic fluid, or outdoor weather do the following:
(a) Seal the marker edges or put an overcoat on the markers with BMS 5-109 Adhesive or Bostik Clear Base - 683-3-2 with Catalyst - X-310A.

STENCIL MARKINGS - REMOVAL/INSTALLATION

1. General
   A. This procedure contains one task. The task is the installation of stencil markings.
   B. For decorative finishes used on airplane external surfaces, refer to "Decorative Exterior Finishes" (AMM 51-21-10/701).
   C. Paint used for markings is specified by the surface you will paint and the type of finish necessary. Paint must agree with the initial surface finish.
   D. In areas where a skydrol 500 resistant finish is necessary, apply BMS 10-60, Type II enamel.
   E. When letter sizes are less than two inches in height and width, use BMS 10-60 enamel for the letters.

      NOTE: When you use BMS 10-60, Type II on painted or not painted surfaces, use BMS 10-79, Type II primer.

   F. For markings applied directly on Corogard EC 843 or EC 843S, use EC 942 black.

   TASK 20-10-15-404-001
2. Install Stencil Markings
   A. General
      (1) Make sure clean surfaces do not become dirty when you clean adjacent surfaces.
      (2) Use a polyethylene wash bottle to apply solvents. Identify contents.
      (3) Do not cause contamination to adjacent areas when you spray.
      (4) Make sure all coatings or finishes are uniform, homogeneous, and free from gelled particles.
      (5) Apply primer and stencil paint with spray equipment only.
      (6) Make sure all coating or finish materials are correctly mixed and labeled. Discard materials with expired pot life.
      (7) Make sure painted markings are well made and have a solid, homogeneous color.
   B. Equipment
      (1) Bottles, Polyethylene - size as necessary, with nozzle
      (2) Brush, Fiber - soft bristle
      (3) Burnishing Tool - plastic or wood
      (4) Gloves, Knitted Cotton - lightweight, white
      (5) Spray Equipment
   C. Consumable Materials
      (1) Solvents
         (a) B00316 Solvent - Aliphatic Naphtha, TT-N-95, Type I

(b) B00083 Solvent - Aliphatic Naphtha, TT-N-95, Type II
(c) B00148 Methyl Ethyl Ketone (MEK), TT-M-261
(2) G00117 Tape, Masking - Permacel P112
(3) G00033 Wipers, BMS 15-15, Classes A and B
(4) G00251 Abrasive Paper - 280-grit or finer
(5) Finishes
(a) C00319 BMS 10-79, Type II Primer
(b) C00032 BMS 10-60, Type I Enamel (preferred)
(c) C00033 BMS 10-60, Type II Enamel (alternate)
(d) C00035 EC 942 Black (Corogard)
(6) B00151 Methyl Isobutyl Ketone (MIBK)
(7) B00079 Butyl Acetate

D. References
(1) AMM 51-21-01/701, Paint Stripping
(2) AMM 51-21-02/701, Prepaint Cleaning and Treatment
(3) AMM 51-21-10/701, Decorative Exterior Finishes

E. Prepare Surface for Stencil Markings

S 424-010
(1) Mask or put a protective cover on all adjacent surfaces which you will not clean, treat, or coat.

S 424-002
(2) Remove old markings if necessary:
(a) Strip the markings (AMM 51-21-01/701).
(b) Prepare the surface for the coating (AMM 51-21-02/701).
(c) Apply a layer of material that is equivalent to the initial material (AMM 51-21-10/701).

S 114-003
(3) Clean the surface:
(a) Remove loose soil and unwanted grease or oil. Be careful not to get dirt on a larger area than necessary.

WARNING: DO NOT SPRAY SOLVENTS OR KEEP THEM IN OPEN CONTAINERS. DO NOT USE FLAMMABLE SOLVENTS IN THE AIRPLANE. SOLVENTS AND CLEANERS CONTAIN TOXIC INGREDIENTS. WEAR PROTECTIVE GLOVES WHEN YOU USE THEM, AND DO NOT GET SOLVENT OR CLEANER ON SKIN OR EYES. MAKE SURE YOU HAVE SUFFICIENT VENTILATION OR USE RESPIRATOR MASKS. INJURY OR DAMAGE CAN OCCUR.

CAUTION: DO NOT USE SOLVENTS OTHER THAN THOSE SPECIFIED. THEY CAN CAUSE DAMAGE TO THE FINISH.
(b) Use the applicable solvent:

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1) For tedlar, teflon, and solvent resistant finishes, use solvent, Series 98 (AMM 20-30-98/201).
2) For acrylic surfaces, use naphtha, TT-N-95, Type II.
3) For all other surfaces and for hydraulic fluid contamination, use BMS 3-2.

(c) Use a polyethylene bottle to apply solvent to the work surface or to a clean wiper.

NOTE: Do not put the wiper into the solvent container.

(d) Rub the surface with a wiper or a soft brush.
(e) Rinse the surface with clean solvent. Use clean wipers.
(f) Remove unwanted solvent. Let the surface drain, then rub dry.

S 114-004

(4) Clean the surface again:
(a) Put solvent on a clean wiper.

NOTE: Do not put the wiper into the solvent container.

(b) Rub the surface with a solvent-soaked wiper. Immediately rub dry with a clean, dry wiper.

NOTE: Do not let the solvent air dry.

(c) Replace the dirty wipers frequently with clean ones.
(d) Do the last three steps until the wiper shows no dirt.

NOTE: If a clean surface becomes dirty, clean it again.

S 124-005

(5) For plastic laminates and painted surfaces, do these steps:
(a) If necessary, clean the surface.

CAUTION: DO NOT SAND THE PAINTED SURFACE AROUND THE DECAL EDGE IF CLEAR HYDRAULIC FLUID RESISTANT COATING WAS USED AS AN EDGE SEALER FOR THE DECAL. DAMAGE TO THE SEAL CAN OCCUR.

(b) Lightly sand the surface with 280-grit or finer abrasive paper.
(c) Do again the two steps to clean the surface.

F. Install Stencil Markings

S 424-006

(1) Install the stencil.
  (a) Make sure all stencil cuts are sharp and clear of burrs.
  (b) Attach stencil tightly so paint does not go under the edges.

S 374-011

(2) Use a marking enamel or lacquer that agrees with the surface finish.

S 374-007

(3) Prepare the stencil paint.
  (a) To prepare BMS 10-79, Type II and BMS 10-60, Type I, refer to AMM 51-21-10/701.

WARNING: KEEP MATERIAL IN AN OPEN CONTAINER TO PREVENT CONCENTRATION OF HYDROGEN GAS. EC 942 REACTS CHEMICALLY WITH METAL AND RELEASES FLAMMABLE HYDROGEN GAS.

  (b) To prepare EC 942 Black (Corogard 12), do these steps:
    1) Shake base mixture immediately before you make it thin.

CAUTION: DO NOT ADD A VOLUME OF THINNER THAT IS MORE THAN ONE-FIFTH THE VOLUME OF THE BASE MATERIAL.

    2) Make the base material thin with a mixture (by volume) of 5/8 methyl isobutyl ketone and 3/8 butyl acetate.

NOTE: You can use the material for as much as 16 hours after you mix it (pot life is 16 hours). Do not use the material after 16 hours.

S 384-012

WARNING: DO NOT BREATHE THE FUMES OF FINISHES AND SOLVENTS. DO WORK IN A WELL-VENTILATED AREA. USE APPROVED RESPIRATORY PROTECTION AS NECESSARY. DO NOT GET FINISHES AND SOLVENTS IN EYES OR ON SKIN AND CLOTHING. KEEP MATERIALS AWAY FROM SOURCE OF IGNITION. FINISHES AND SOLVENTS ARE TOXIC AND FLAMMABLE. THEY CAN CAUSE INJURY OR DAMAGE.

CAUTION: DO NOT APPLY FINISHES WHEN AMBIENT TEMPERATURE IS LESS THAN 50 DEGREES FAHRENHEIT OR RELATIVE HUMIDITY IS MORE THAN 85 PERCENT.

(4) Apply enamel or lacquer with spray equipment. Make sure there is a sufficiently wet layer to give uniform flowout but not to cause runs and sags.

S 804-009

(5) Remove rough edges from the markings with BMS 3-2 solvent or burnishing tool after the marking cures.

NOTE: An alternative procedure to remove rough edges is to remove masking tape while paint film is still wet. This permits paint to flow out.

RECESSED BOSS SEAL FITTINGS - REMOVAL/INSTALLATION

1. General
   A. This procedure contains three tasks. The first task is the removal of adapter fittings and positioning fittings. The second task is the installation of adapter fittings. The third task is the installation of positioning fittings.

TASK 20-10-16-004-001

2. Remove the Fitting
   A. Procedure

S 034-002
(1) Loosen the jamnut.

S 034-003
(2) Disconnect the fitting from the hose or tube, as applicable.

S 024-004
(3) Remove the fitting from the boss.

TASK 20-10-16-404-005

3. Install the Adapter Fitting (Fig. 401)
   A. Procedure

S 644-006
(1) Lubricate a new O-ring and backup ring and install them in the fitting groove.

S 434-007
(2) Lubricate a new O-ring and put it in the groove under the jamnut.

S 424-008
(3) Install the fitting into the boss and tighten to the correct torque for the size of the fitting (AMM 20-11-00/201).

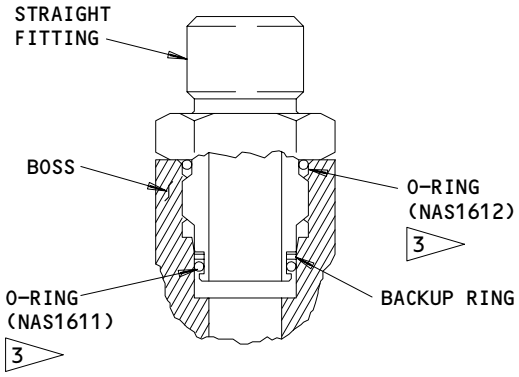
TASK 20-10-16-404-009

4. Install the Positioning Fitting (Fig. 401)
   A. Procedure

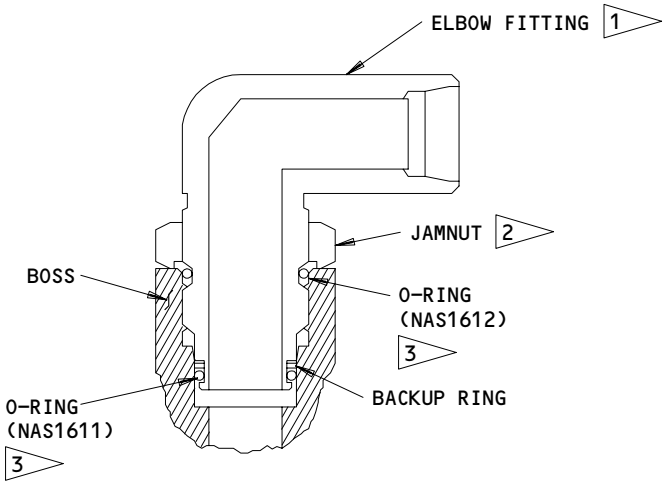
S 434-010
(1) Install the jamnut on the fitting and turn it to the stop.

S 644-011
(2) Lubricate a new O-ring and install it in the groove between the two sets of threads.

S 434-012
(3) Lubricate a new O-ring and backup ring with the applicable system lubricant and install them in the fitting groove.



STRAIGHT (STYLE E) FITTINGS



ELBOW (STYLE S) FITTINGS

1 YOU CAN USE A 45 OR 90° ELBOW
2 JAMNUTS NAS1410DD AND AN6298 WITH BACKUP RING MS28773 ARE OPTIONAL
3 USE ONLY PHOSPHATE ESTER FLUIDS WITH NAS1611 AND NAS1612 O-RINGS

Recessed Boss Seal Fitting Installation
Figure 401

S 424-013
(4) Install the fitting into the boss until it touches bottom, then loosen until the fitting aligns with the hose or tube (one turn maximum).

S 424-014
(5) Hold the fitting stable and tighten the jamnut to the correct torque for the size of the fitting (AMM 20-11-00/201).

S 434-015
(6) Connect the fitting to the hose or tube.

TEFLON BACKUP RINGS - REMOVAL/INSTALLATION

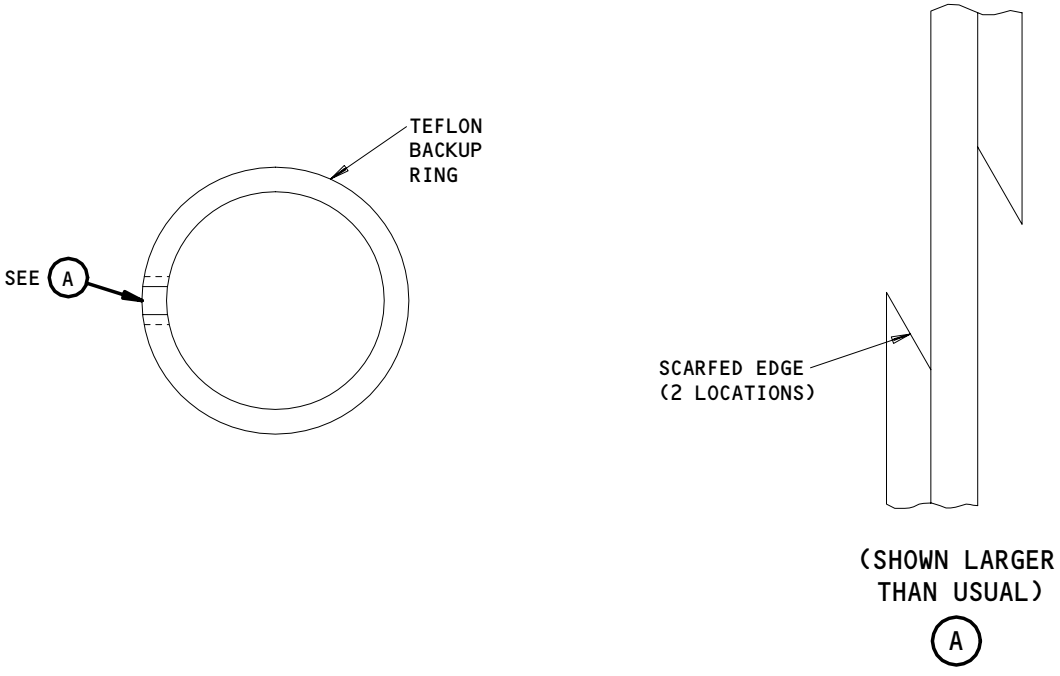
1. General
   A. This procedure contains one task. The task is the installation of the teflon backup ring.

   TASK 20-10-17-404-001

2. Install the Teflon Backup Ring
   A. Procedure

      S 424-002

      (1) Install split-teflon backup rings with the direction of the spiral clockwise. Make sure the scarfed ends face as shown in Fig. 401.



Teflon Backup Ring Installation
Figure 401

RADIOLUMINOUS MATERIAL (DISPOSAL) - MAINTENANCE PRACTICES

1. General
   A. This procedure contains one task. The task is to discard radioluminous material.
   B. Some exit signs use radioluminous material to identify aircraft emergency exits. Overwing escape hatch handles use radioluminous material to identify the handles if a failure of the internal lighting occurs. The radioluminous material is not dangerous unless the capsule for the luminous material breaks and releases radioactive tritium gas. If you breathe the tritium gas, you can have bad lung problems.
   C. Disposal of radioluminious material is controlled by radiation protection persons who must obey government regulations.

TASK 20-10-18-802-001

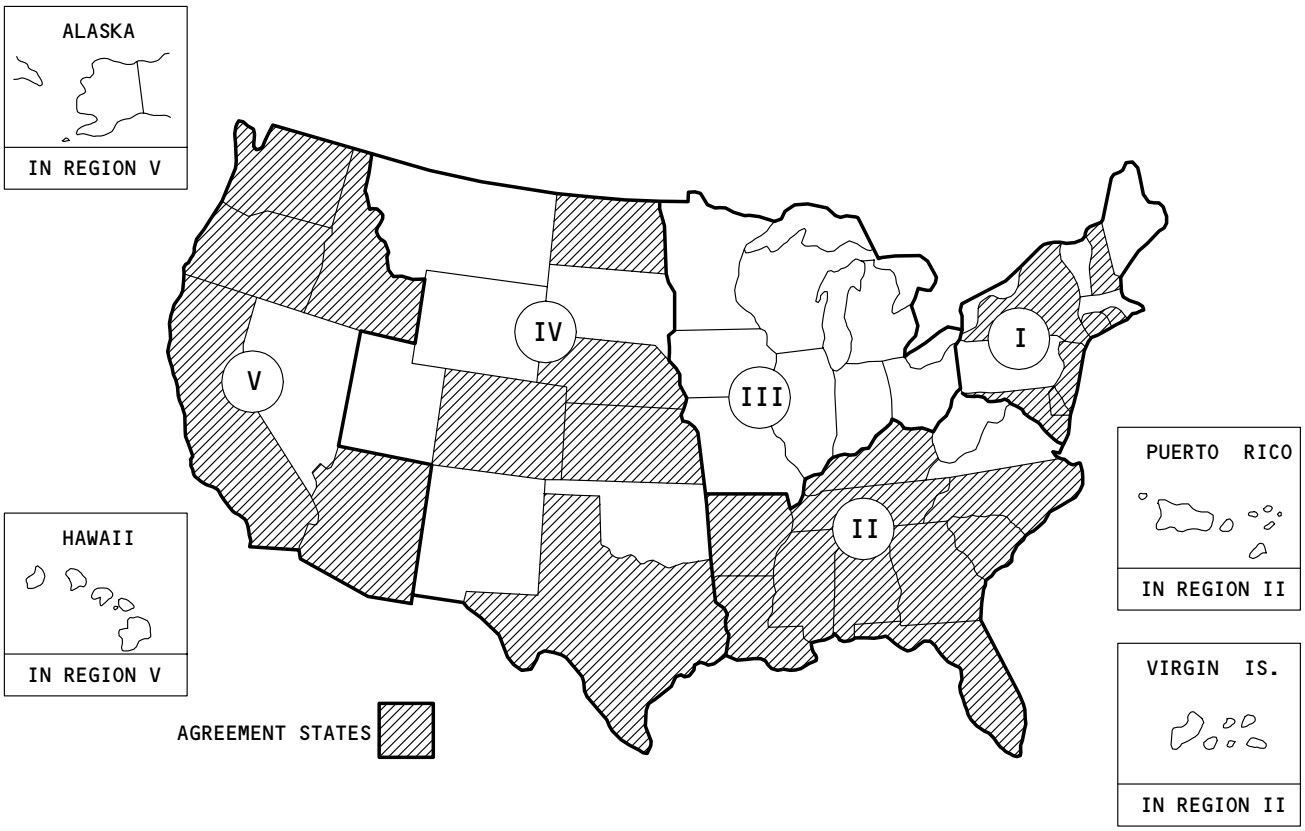
2. Discard Radioluminous Material
   A. General

      WARNING: ALWAYS DO WORK WITH RADIOLUMINOUS MATERALS IN WELL-VENTILATED AREAS. LUNG DAMAGE CAN OCCUR IF YOU BREATHE A CONCENTRATION OF TRITIUM GAS IF THE CONTAINER BREAKS.

      (1) Obey this warning during all of this task.
   B. References
      (1) AMM 33-51-02/201, Self-Illuminated Exit Signs
      (2) AMM 52-21-02/201, Overwing Escape Hatch Lining
   C. Procedure

      S 802-002
      (1) To discard radioluminous material in the United States, refer to the Nuclear Regulatory Commission (NRC) to find if the maintenance location is in an agreement or nonagreement State. Do the applicable step that follows:
         (a) If in an agreement State, refer to the State regulations to discard the material. Get the regulations from your airline medical department or from the State Health Department.
         (b) If in a nonagreement State, refer to the NRC regulations to discard the material. Get the regulations from your airline medical department or the NRC Regional Office (Fig. 201).

      S 802-003
      (2) To discard radioluminous material in a location other than the United States, talk to the responsible Government Agent to get locally approved procedures. As an alternative, you can send parts to the part manufacturer after you get instructions.



REGION	ADDRESS	TELEPHONE	
		DAYTIME	NIGHTS AND HOLIDAYS
I	REGION I, DIVISION OF COMPLIANCE, USAEC 970 BROAD STREET NEWARK, NEW JERSEY 07102	201-645-3960	212-989-1000
II	REGION II, DIVISION OF COMPLIANCE, USAEC SUITE 818, 230 PEACHTREE ST. NW. ATLANTA, GEORGIA 30303	404-526-4537	404-526-4537
III	REGION III, DIVISION OF COMPLIANCE, USAEC 799 ROOSEVELT ROAD GLEN ELLYN, ILLINOIS 60137	312-838-2660	312-739-7711
IV	REGION IV, DIVISION OF COMPLIANCE, USAEC 10395 WEST COLFAX AVENUE DENVER, COLORADO 94704	303-297-4211	303-237-5095
V	REGION V, DIVISION OF COMPLIANCE, USAEC 2111 BANCROFT WAY BERKELEY, CALIFORNIA 94704	415-841-5820 EXT 651	415-841-5620

UNITED STATES NUCLEAR REGULATORY COMMISSION COMPLIANCE OFFICES

Identification of Agreement and Non-Agreement Nuclear Regulatory Commission Compliance States and Offices
Figure 201

S 802-004

(3) If you cannot get instructions about how to discard radioluminous materials from the above sources, contact one of these sources for instructions:

(a) Safety Light Corporation (Formerly United States Radium Corp)
4150-A Old Berwick Road
Bloomsburg, PA 17815, U.S.A.
Telephone 717-784-4344
TWX 510-655-2634

(b) Boeing Commercial Aviation Services
Safety Office
(206) 544-0994

S 802-005

(4) Prepare radioluminous material for shipment as follows:

(a) Remove radioluminous exit sign or overwing escape hatch handle PULL markers and put in a plastic bag.

(b) Put the plastic bag in a tight metal container. For example, you can use a small, empty paint can with sufficient packing material to prevent too much movement. Do not put more than five signs in one container.

O-RINGS - REMOVAL/INSTALLATION

1. General
   A. This procedure contains the following tasks:
      (1) The removal of the O-rings.
      (2) The installation of O-rings over sharp edges. Sharp edges include threaded fasteners, keyways, slots, splines, and ports.
   B. Before installation, examine the O-rings for cuts, abrasions, deformities, and surface defects.

TASK 20-10-19-204-010

2. Removal of O-rings (Fig. 401)
   A. Equipment
      (1) O-Ring Removal Tool - ST848R
   B. Procedure

      S 804-011
      (1) Use the applicable ST848R series O-Ring removal tool.

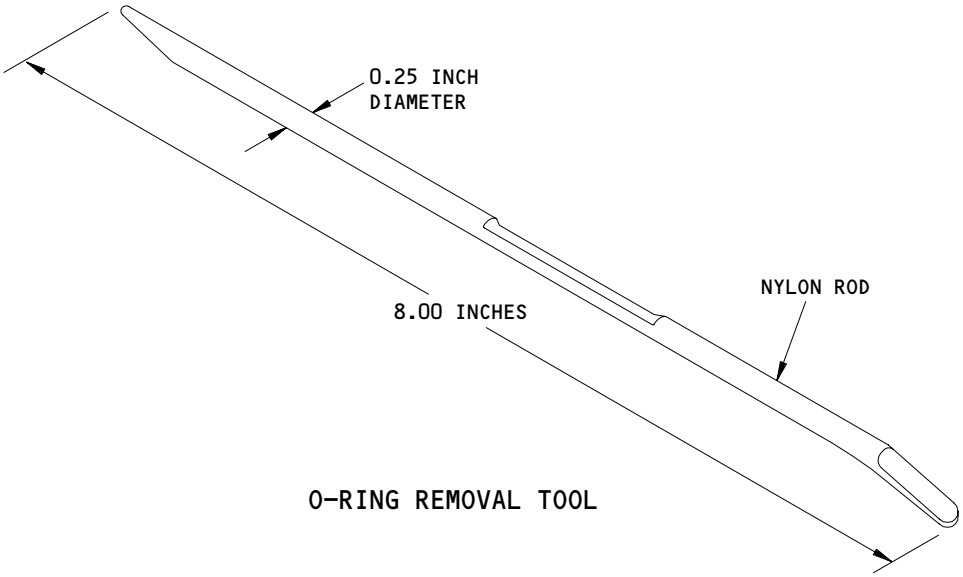
      S 034-012
      (2) Place the tool under the O-ring and slowly pry the O-ring out.

TASK 20-10-19-404-001

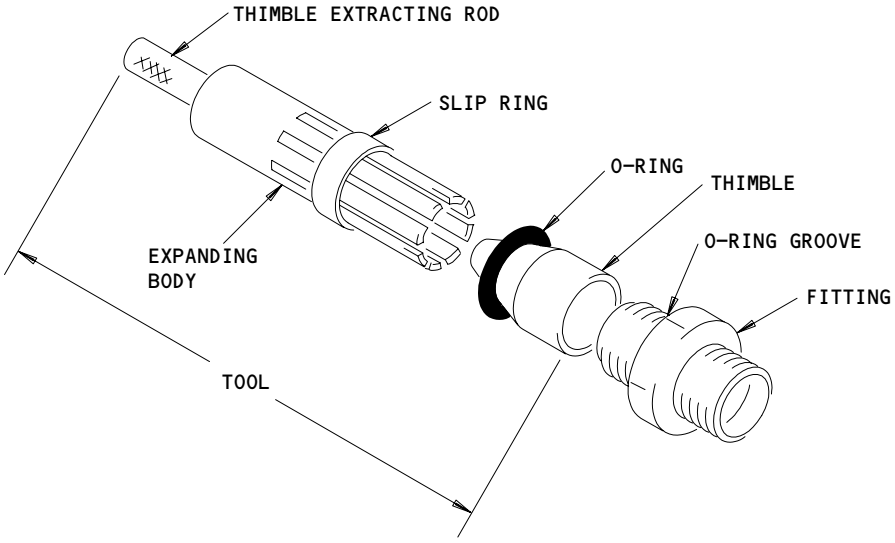
3. Installation of O-rings (Fig. 401)
   A. Equipment
      (1) O-Ring Installation Tool - ST848
   B. Consumable Material
      (1) Fluid used with component or system
   C. Procedure

      S 804-002
      (1) Use the applicable ST848 series O-Ring installation tools.

TOOL NO.	TUBE OR HOSE FITTING SIZE
ST848-187	3/16
-250	1/4
-312	5/16
-375	3/8
-500	1/2
-625	5/8
-750	3/4
-1000	1
-1250	1-1/4
-1500	1-1/2
-1750	1-3/4



O-RING REMOVAL TOOL



O-Ring Installation
Figure 401

S 644-003

CAUTION: REPLACE USED O-RINGS WITH NEW O-RINGS. USED O-RINGS CAN CAUSE LEAKAGE.

(2) Lubricate the O-ring with a thin layer of the fluid used with the component or system.

S 434-004

CAUTION: DO NOT MAKE THE ELASTOMERIC O-RING INNER DIAMETERS LARGER BY MORE THAN 50% DURING INSTALLATION. DO NOT MAKE THE TEFLON AND PLASTIC O-RING INNER DIAMETERS LARGER BY MORE THAN 5% DURING INSTALLATION. FAILURE CAN OCCUR.

(3) Put the thimble over the fitting.

S 424-005
(4) Put the O-ring on the thimble.

S 424-006
(5) Move the expanding body over the thimble and against the O-ring, then push the O-ring into the groove.

S 034-007
(6) Use the extracting rod to remove the expanding body from the thimble.

S 034-008
(7) Remove the thimble.

S 214-009

CAUTION: DO NOT PINCH THE O-RINGS. MAKE SURE ATTACHED BOLTS ARE CORRECTLY TIGHTENED. FAILURE CAN OCCUR.

(8) Examine the O-ring for twists and pinches caused by installation.
(a) Make sure you align the O-ring with no twists before you close the gland.

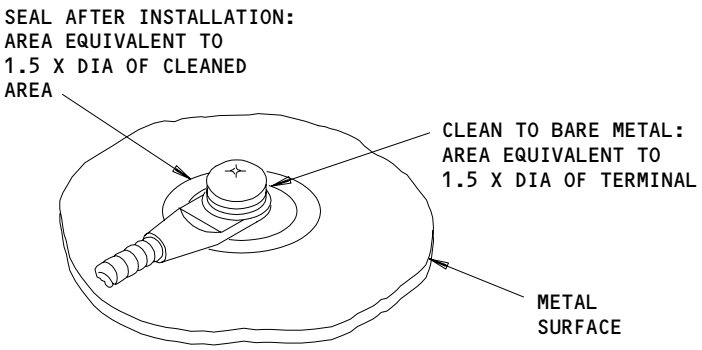
ELECTRICAL BONDING - REMOVAL/INSTALLATION

TASK 20-10-21-964-001

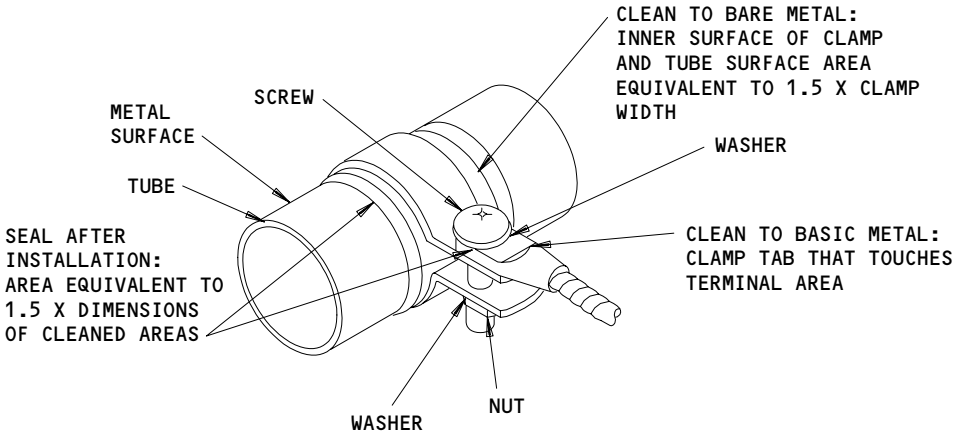
1. Replace the Bonding Jumpers and Ground Leads

A. General

(1) Refer to SWPM 20-20-00/1, Electrical Bonds and Grounds, in the Standard Wiring Practice Manual (SWPM), D6-54446.



SURFACE PREPARATION AREA



TUBE SURFACE PREPARATION

Bonding and Ground Surface Preparation
Figure 401

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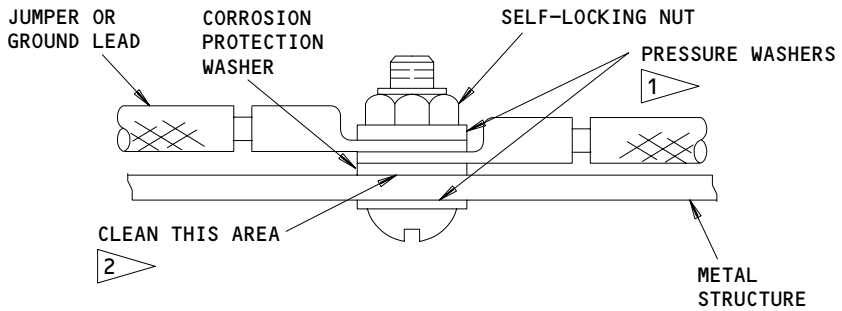
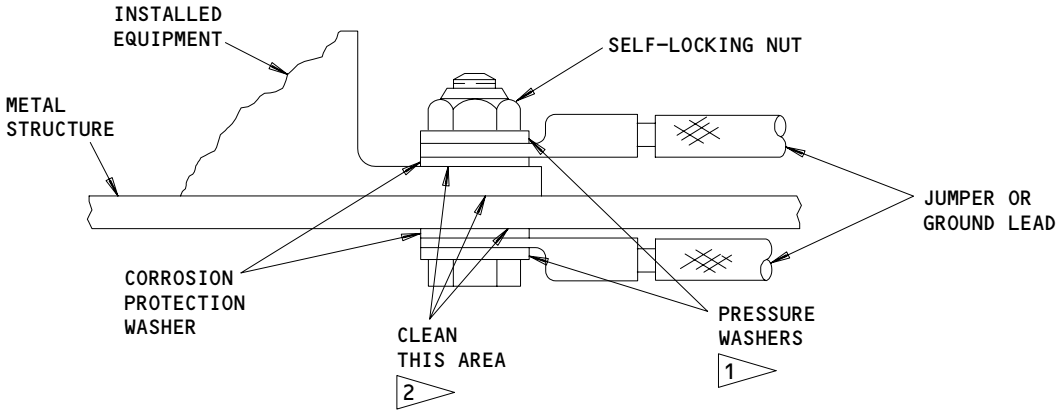
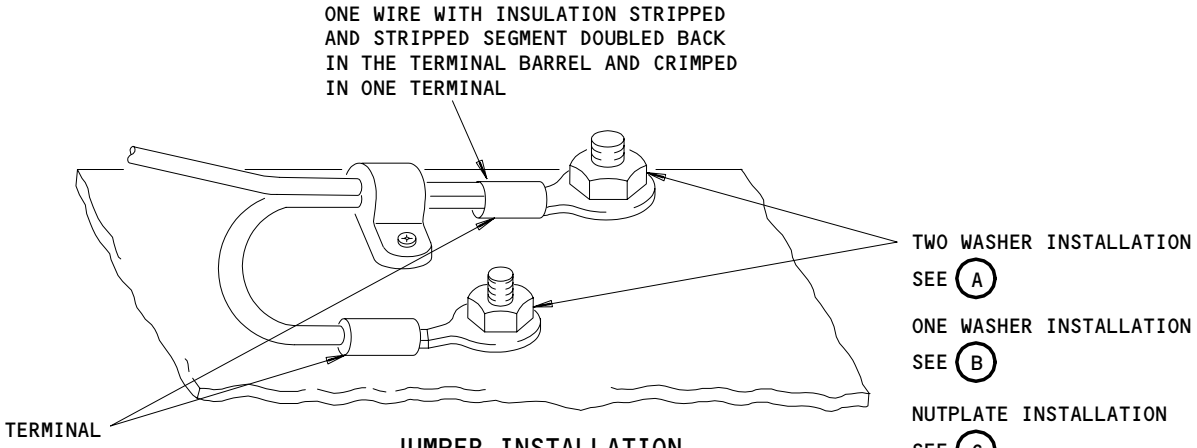


TWO JUMPER INSTALLATION
ONE SIDE OF METAL STRUCTURE



TWO JUMPER INSTALLATION
TWO SIDES OF METAL STRUCTURE

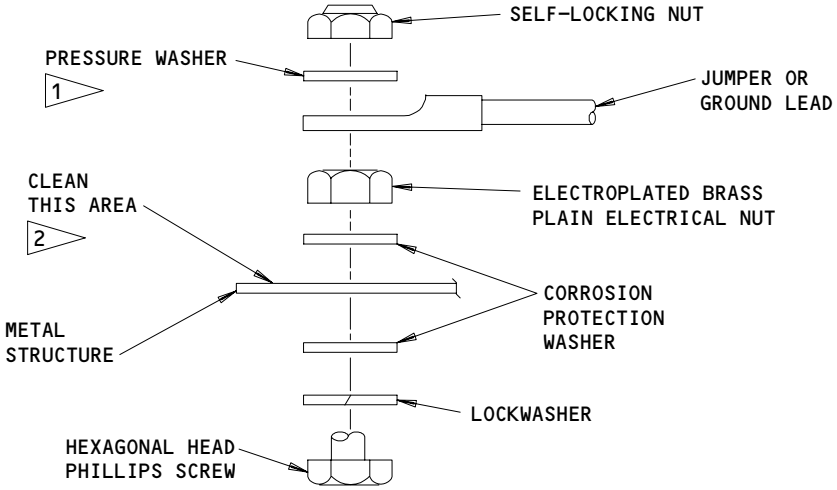


JUMPER INSTALLATION

1 USED ONLY ON 1/4 INCH DIAMETER OR LARGER STUDS AND SCREWS

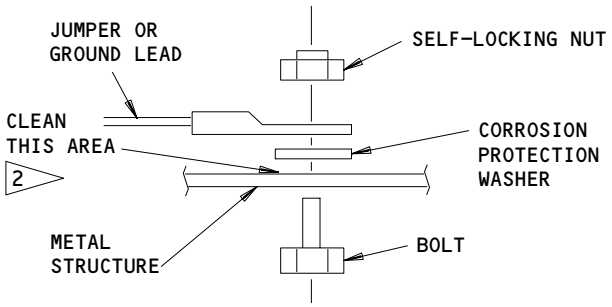
2 SEE FIG. 401: SURFACE PREPARATION

Bonding Jumpers and Ground Leads
Figure 402 (Sheet 1)



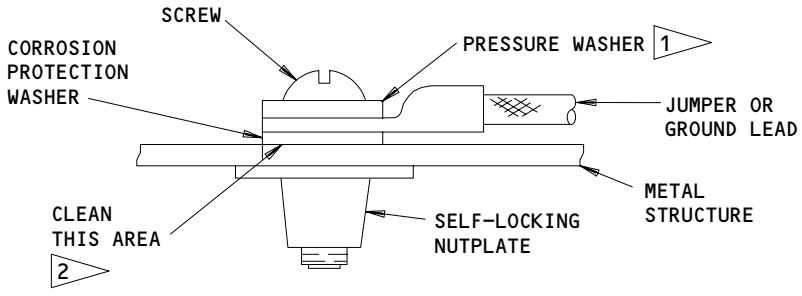
TWO WASHER INSTALLATION

A



ONE WASHER INSTALLATION

B



NUTPLATE INSTALLATION

C

Bonding Jumpers and Ground Leads
Figure 402 (Sheet 2)

ELECTRICAL BONDING - INSPECTION/CHECK

TASK 20-10-21-766-001

1. Do a Check of the Electrical Bonding
   A. General
      (1) Refer to (SWPM 20-20-00), Electrical Bonding and Grounding, in the Standard Wiring Practice Manual, D6-54446.

METAL SURFACES - CLEANING/PAINTING

1. General
   A. This procedure contains five tasks. The first task is to hand clean metal surfaces with abrasives. The second task is to clean metal surfaces with a rotary banding brush. The third task is to clean metal surfaces with a rotary abrasive disk. The fourth task is to remove paint from metal surfaces with solvent, Series 84 (AMM 20-30-84/201) . The fifth task is to clean bare, clad, or plated metal with solvent.
   B. Use this procedure for faying surface bonds and bonding jumper installation. Do not use abrasives or wire brushes on CRES, plated surfaces, or alclad aluminum that is not painted.

TASK 20-10-22-127-001

2. Hand Clean Metal Surfaces with Abrasives
   A. General
      (1) Do not use abrasives on plated surfaces, alclad aluminum, or CRES.
      (2) This is the only procedure you can use to clean titanium.
   B. Consumable Materials
      (1) Abrasive paper or cloth, 180-grit
         (a) B00137 Abrasive Paper - Federal Spec P-P-121
         (b) B00138 Abrasive Cloth Federal Spec P-C-451
   C. Procedure

      S 127-015

      CAUTION: DO NOT LET PARTICLES FROM THE ABRASIVE CAUSE CONTAMINATION OF THE MECHANISMS OR ELECTRICAL EQUIPMENT. DAMAGE CAN OCCUR.

      (1) Use a circular or elliptical movement of the abrasive to get an equally smooth surface.

TASK 20-10-22-147-003

3. Clean Metal Surface with a Rotary Bonding Brush
   A. General
      (1) Use this procedure to remove paint from metal or to remove Alodine, Iridite, or light anodize from aluminum. Do not use a bonding brush on plated surfaces or on metals that are not painted, for example, CRES, titanium, or alclad aluminum. Clean these surfaces with solvent.
   B. Equipment
      (1) Drill motor or other applicable drive
      (2) Bonding brush, stainless steel, of correct size (Fig. 701).

C. Procedure

NOTE: Identify the bonding brush housings with color as shown in the task, Remove Paint from Metal Surfaces with lacquer thinner or solvent, Series 84 (AMM 20-30-84/201). The colors show which bonding brush housings you will use on which metal.

S 147-016

CAUTION: DO NOT USE CARBON STEEL BONDING BRUSHES. STEEL PARTICLES IN METAL SURFACES COULD CAUSE DANGEROUS CORROSION.

DO NOT USE ROTARY WIRE BRUSHES OR ABRASIVE DISKS ON TITANIUM. DAMAGE CAN OCCUR. HAND CLEAN TITANIUM WITH ABRASIVES OR CLEAN WITH A SOLVENT.

(1) Use a drill motor or other applicable drive to apply a stainless steel bonding brush of the correct size to clean the necessary diameter.
   (a) Apply brush intermittently and keep the cutting face parallel with the surface.
   (b) Examine results after each time you apply the brush and continue operation until necessary area is clean.

   NOTE: Keep the decrease in surface metal to a minimum.

   (c) If it is a problem to get through an anodic film, clean it with a rotary abrasive disk.

TASK 20-10-22-127-005

4. Clean with a Rotary Abrasive Disk

A. General
   (1) Use this procedure to remove anodize, Iridite, Alodine, BMS 3-11 resistant finish, or equivalent hard finishes that are not painted. You can also remove paint by this procedure but the disk will become quickly clogged. Do not use this procedure on plated surfaces or metals that are not painted, for example, CRES, titanium, or alclad aluminum. Clean CRES or alclad aluminum surfaces with solvent. Hand clean titanium with abrasives or clean with solvent.

B. Consumable Materials
   (1) B00109 Abrasive disk, cloth, open coat, 150-grit

C. Equipment
   (1) Disc Mandrel of Applicable Size (Fig. 701)

D. Procedure

Rotary Bonding Brushes and Abrasive Disk Mandrels
Figure 701

BRUSH OR DISK DIA. (IN.)	PILOT DIA. (IN.)	SHANK DIA. (IN.)	BONDING BRUSHES						DISK MANDRELS
			WIRE SIZE (IN.)		OSBORN NO.	MORRIS NO.	MANUFAC-TURERS BRUSH CO.	BOEING ST NO.	BOEING ST NO.
			MAX	MIN					
11/32	1/4	1/4	0.005	0.004				ST913K-34-24	ST913M-34-24
1/2	3/32	1/4	0.005	0.004	94-SV-37	P-31-SS	220-NN	ST913K-50-09	ST913M-50-09
1/2	1/8	1/4	0.005	0.004	94-SV-47	P-32-SS	221-NN	ST913K-50-12	ST913M-50-12
1/2	5/32	1/4	0.005	0.004	94-SV-48	P-33-SS	222-NN	ST913M-50-16	ST913M-50-16
1/2	3/16	1/4	0.005	0.004	94-SV-36	P-34-SS	223-NN	ST913M-50-19	ST913M-50-19
3/4	3/16	1/4	0.006	0.005		P-31-516-SS	224-NN	ST913K-75-19	ST913M-75-19
3/4	1/4	1/4	0.006	0.005		P-31-517-SS	225-NN	ST913K-75-25	ST913M-75-25
3/4	5/16	1/4	0.006	0.005		P-31-53-SS	226-NN	ST913K-75-31	ST913M-75-31
1.0	3/16	1/4	0.008	0.006		P-36-SS	227-NN	ST913K-100-19	ST913M-100-19
1.0	1/4	1/4	0.008	0.006		P-36-S1-SS	228-NN	ST913K-100-25	ST913M-100-25
1.0	5/16	1/4	0.008	0.006		P-36-S5-SS	229-NN	ST913K-100-31	ST913M-100-31

S 127-017

CAUTION: DO NOT LET PARTICLES FROM THE ABRASIVE CAUSE CONTAMINATION OF THE MECHANISMS OR ELECTRICAL EQUIPMENT. DAMAGE CAN OCCUR.

(1) Use a drill motor or other applicable drive to apply an abrasive disk of correct size to clean the necessary diameter.
   (a) Apply disk intermittently with light pressure and keep the face of the disk parallel to the metal surface.
   (b) Examine results after each time you apply the disk and continue operation until necessary area is clean.

NOTE: Keep the decrease in surface metal to minimum.

TASK 20-10-22-117-007

5. Remove Paint from Metal Surfaces With Lacquer Thinner or Solvent, Series 84

A. General

(1) Use this procedure to remove primer or lacquer-based paint or enamel from clad aluminum or other metal surfaces. Do not use lye, alkaline paint remover, or hydroxides to clean surfaces.
(2) This chart gives color codes for identification of bonding brushes for individual metals.

BONDING BRUSH COLOR CODE		
METAL	COLOR CODE	COLOR IDENTIFICATION
Aluminum	None	None
Ferritic	Blue	J7-42-5200
Magnesium	Green	J7-42-5700
Beryllium	Brown	J7-42-5400

B. Consumable Materials

(1) B00139 Lacquer Thinner - Federal Spec TT-T-266, or equivalent
(2) B00148 Methyl Ethyl Ketone (MEK) - TT-M-261
(3) G00033 Lint-free cheesecloth

C. Remove Paint

S 117-018

WARNING: DO NOT GET SOLVENTS IN YOUR MOUTH, OR YOUR EYES, OR ON YOUR SKIN. DO NOT BREATHE THE FUMES FROM SOLVENTS. SOLVENTS ARE HAZARDOUS MATERIALS. SOLVENTS MAY BE FLAMMABLE OR HARMFUL TO THE ENVIRONMENT. REFER TO PRODUCT MATERIAL SAFETY DATA SHEETS (MSDS) AND LOCAL REQUIREMENTS FOR PROPER HANDLING PROCEDURES.

(1) Apply lacquer thinner or solvent, Series 84 (AMM 20-30-84/201) to the specified area with a clean cheesecloth.

S 117-009

(2) Use a clean part of the cheesecloth each time you apply solvent to the surface. Make sure you do not get solvent on adjacent surfaces.

S 117-010

(3) When the specified area is fully clean, immediately rub dry with clean cheesecloth.

TASK 20-10-22-117-011

6. Clean Bare, Clad, or Plated Metal with Solvent

A. General

(1) Use this procedure to clean plated surfaces and CRES, titanium, or alclad aluminum that is not painted.

B. Consumable Materials

(1) G00033 Lint-free cheese cloth (AMM 20-30-07/201)

(2) B00799 Solvent - TT-N-95, Type I

C. Procedure

S 117-012

(1) Apply solvent to bonding surfaces with a cheesecloth.

S 117-013

(2) Rub with the necessary force to remove contamination you can see.

S 117-014

(3) Immediately dry surfaces with a lint-free cheesecloth.

LOCKWIRES - REMOVAL/INSTALLATION

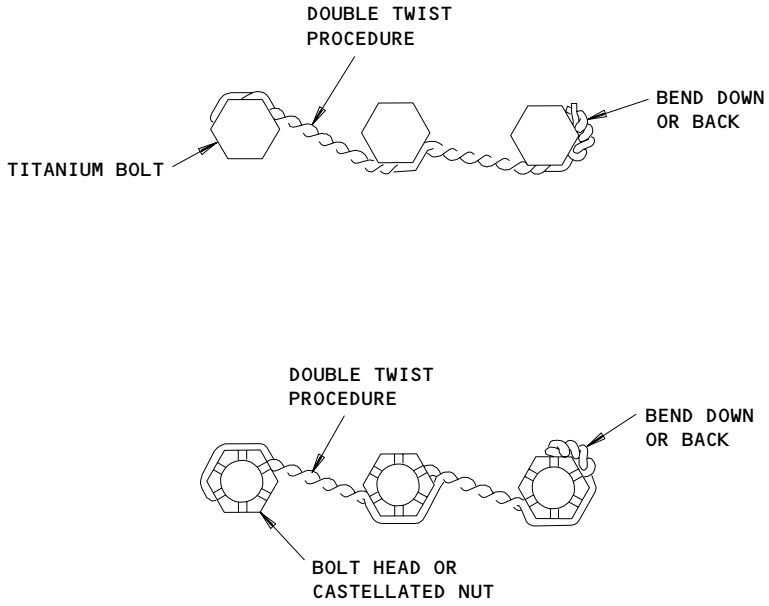
1. General
   A. This procedure contains one task. The task is the replacement of lockwires.
   B. If this procedure does not agree with specified maintenance procedures, use the specified maintenance procedure.
   C. Do not use lockwire more than once.
   D. Install lockwire so it is put in tension when the parts become loose.
   E. Make three to six twists at the end of the wire. Bend the twists back or under to give the wire ends protection so they will not catch something.
   F. Use the double twist procedure for all lockwire unless a single wire procedure is specified.
   G. Install and twist the safety wire so the loop around the head stays down. (If the loop tended to come up over the bolt head there would be a slack loop.)
   H. For multiple fasteners spaced less than four inches apart, the maximum number which can be safety wired together shall be the number than can be wired with a 24-inch length of wire.
   I. For fasteners four to six inches apart, wire together in series no more than three fasteners.
   J. Where fasteners are more than six inches apart, do not tie them in series unless tie points are provided on adjacent parts to shorten the wire span to less than six inches.
   K. Use a right-handed twist for all double twist installations.
   L. Safety-wire diameter shall be between 1/3 and 3/4 of the hole diameter, 0.032-inch diameter minimum.
   M. Safety-wire 0.020 inch in diameter may be used if:
      (1) The safety-wire hole is 0.045 inch diameter or smaller, or
      (2) The spacing between parts is less than two inches and the safety wire hole diameter is between 0.045 and 0.062 inch diameter.

TWIST PER INCH					
Safety Wire Dia. Inch	Less Than 0.019	0.019 to 0.026	0.023 to 0.042	0.043 to 0.065	More Than 0.065
Twists/Inch	11 to 14	9 to 12	7 to 10	5 to 8	4 to 7

TASK 20-10-23-964-001

2. Replace the Lockwire
   A. Remove the Lockwire

      S 024-002
      (1) Cut and remove the lockwire or remove the pin.



Lockwire - Installation
Figure 401

B. Install the Lockwire

S 804-007

(1) Use these types of wires for lockwire:
   (a) Use Monel, Inconel, or corrosion-resistant lockwire in high temperature areas.
   (b) Use copper wire, 0.020 in. diameter, on emergency equipment only. Use it where a seal is necessary on emergency equipment to show no person has used the equipment. Emergency equipment includes portable fire extinguishers, first aid kits, emergency valve, and oxygen regulators.
   (c) Use Clad 5056 aluminum alloy wire for lockwire that touches magnesium to prevent galvanic corrosion.
   (d) This table shows BAC standard wire sizes.

MATERIAL	SIZE (INCH)				
Monel or Inconel	.020	.032	.040	.051	.091
Corrosion Resistant Steel	.020	.032	.040	.051	.091
Aluminum Alloy	.020	.032	.040	.051	.091

S 424-003

(2) Use these steps to install lockwire to bolts and screws (Fig. 401):
   (a) On all fittings where you install lockwire, attach the fitting to the mating part or an adjacent part.
   (b) Install lockwire for right threads as shown in the figures for this procedure. Install lockwire for left threads opposite to that shown.
   (c) Make sure the loop of double wire goes around, not above, the head of the bolt or screw.

   CAUTION: NEVER LOOSEN OR TIGHTEN A NUT OR BOLT OUT OF ITS SPECIFIED TORQUE RANGE. DAMAGE CAN OCCUR.

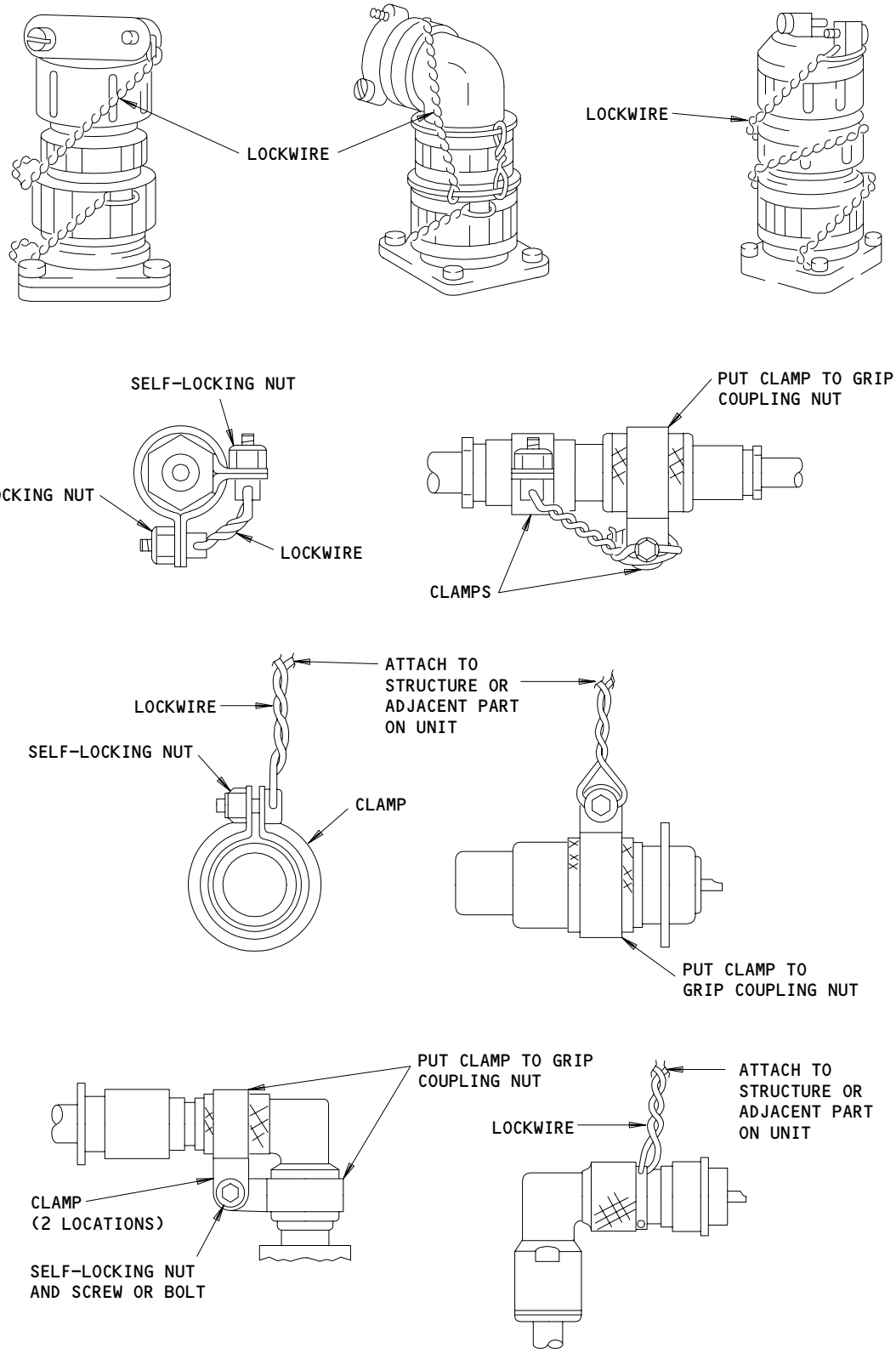
   (d) When you install lockwires on nuts and bolts, tighten to the low values of the torque range. If necessary, continue to tighten until a slot aligns with the safety hole.

S 424-004

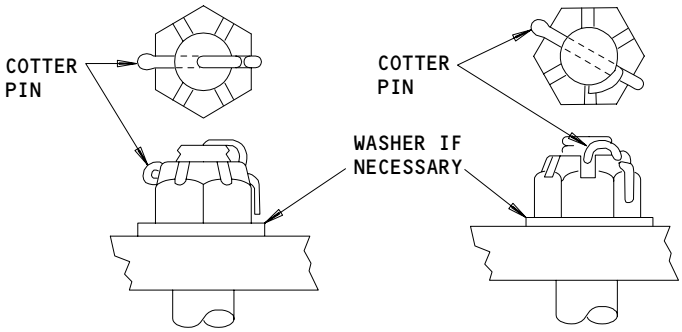
(3) To install lockwire on electrical connectors, see Fig. 402.
   (a) Use the instructions for the installation of lockwires to bolt and screws when you install lockwires on electrical connectors.

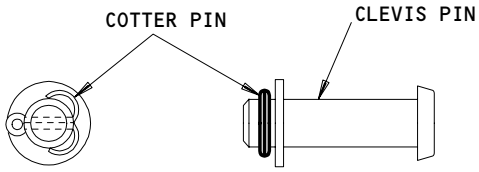
S 424-005

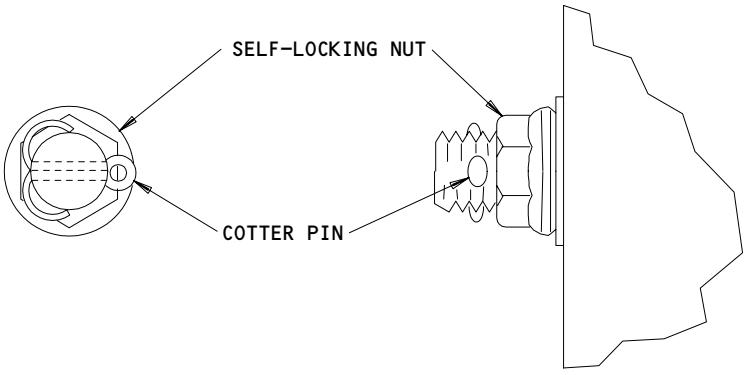
(4) To install cotter pins (Fig. 403), do the applicable step:
   (a) To install cotter pins in castellated nuts, install the pin with the head parallel to the slot in the nut. Bend cotter pin ends to the bolt end or to the castellated nuts slit adjacent to the pin end.

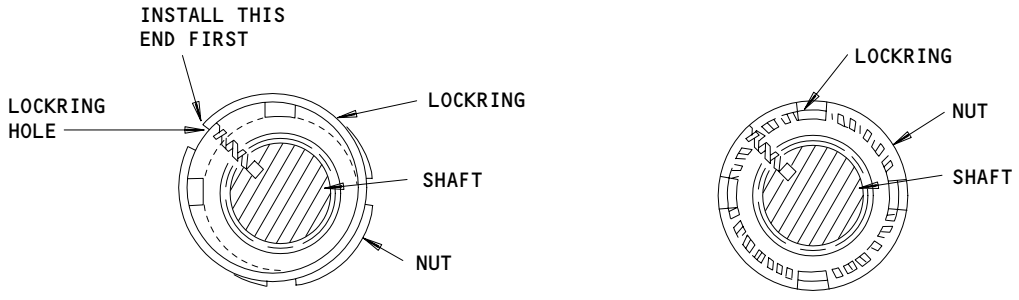


Connector Lockwire Installation
Figure 402









BEFORE INSTALLATION

AFTER INSTALLATION

Locking Pins - Installation
Figure 403

(b) To install cotter pins and washers on clevis pins, put the pin through the hole on the bolt and bend the pin ends around the side of the bolt.
(c) To install cotter pins in non-castellated nuts, install the pin through the hole on the bolt and bend the pin ends back on each side of the bolt approximately 90 degrees.

S 424-006
(5) To install lock rings (Fig. 403), do these steps:
(a) Put the bent hook of the lock ring into an aligned locking hole in the shaft and nut but do not spring the ring.
(b) Move the lock ring over the flange into the groove with minimum expansion of the lock ring.

RIG PINS - MAINTENANCE PRACTICES

1. General
   A. This procedure contains rig pin sets with a list of the rig pins contained in each set. The list gives Maintenance Manual rig pin number, rig pin part number (P/N), and rig pin size (diameter and length). The MM rig pin numbers include letter prefixes that specify where the rig pin is used. The prefixes are as follows:
      (1) A = Aileron
      (2) CDA = Aft Cargo Door
      (3) BCD = Bulk Cargo Door
      (4) D = Entry/Service Doors
      (5) E = Elevator

      (6) LCD = Large Cargo Door
      (7) LE = Leading Edge Slats
      (8) LDG = Nose Landing Gear Doors
      (9) LGA = Landing Gear Alternate Extension
      (10) LGB = Landing Gear Brakes
      (11) LGE = Landing Gear Extension and Retraction
      (12) NS = Nose Wheel Steering System
      (13) P = P&W Engine
      (14) R = Rudder
      (15) ST = Stabilizer
      (16) TE = Trailing Edge Flaps

   TASK 20-10-24-992-001
2. Table - Rig Pins
   A. General

Rig Pin Set A20004-78		Rig Pin Size	
		Diameter	Length
MM Rig Pin No.	Rig Pin P/N	+0.00-.002 in.	±.01 in.
A1	A20004-15	0.311	3.00
A2	A20004-17	0.311	4.00
A3	A20004-22	0.311	7.00
A4	A20004-19	0.311	4.50
A5	A20004-22	0.311	7.00
A6	A20004-22	0.311	7.00
A7	A20004-20	0.311	5.00
A8	A20004-15	0.311	3.00
A9	A20004-22	0.311	7.00
A10	A20004-17	0.311	4.00
A11	A20004-15	0.311	3.00
A12	A20004-21	0.311	6.00
A13	A20004-20	0.311	5.00
A14	A20004-15	0.311	3.00

Rig Pin Set A20004-78		Rig Pin Size	
		Diameter	Length
MM Rig Pin No.	Rig Pin P/N	+0.00-.002 in.	±.01 in.
A15	A20004-22	0.311	7.00
A16	A20004-16	0.311	3.50
A17	A20004-15	0.311	3.00
A18	A20004-15	0.311	3.00
A19	A20004-15	0.311	3.00
A20	A20004-15	0.311	3.00
BCD1	A20004-10	0.248	4.00
CDA1	A20004-12	0.311	1.50
CDA2	A20004-12	0.311	1.50
CDA3	A20004-15	0.311	3.00
CDA4	A20004-15	0.311	3.00
D1	A20004-16	0.311	3.50
D2	A20004-16	0.311	3.50
D3	A20004-27	0.373	10.00
D4	A20004-27	0.373	10.00
D5	A52003-1	0.312	2.50
D6	A20004-9	0.248	2.00
D7	A20004-9	0.248	2.00
D8	A20004-9	0.248	2.00
D9	A20004-9	0.248	2.00

Rig Pin Set A20004-78		Rig Pin Size	
		Diameter	Length
MM Rig Pin No.	Rig Pin P/N	+0.00-.002 in.	±.01 in.
E1	A20004-22	0.311	7.00
E2	A20004-22	0.311	7.00
E3	A20004-17	0.311	4.00
E4	A20004-17	0.311	4.00
E5	A20004-15	0.311	3.00
E6	A20004-15	0.311	3.00
E7	A20004-21	0.311	6.00
E8	A20004-21	0.311	6.00
E9	A20004-21	0.311	6.00
E10	A20004-21	0.311	6.00
E11	A20004-17	0.311	4.00
LCD1	A20004-60	0.1875	1.50
LCD2	A20004-60	0.1875	1.50
LCD3	A20004-60	0.1875	1.50
LCD4	A20004-60	0.1875	1.50

Rig Pin Set A20004-78		Rig Pin Size	
		Diameter	Length
MM Rig Pin No.	Rig Pin P/N	+0.00-.002 in.	±.01 in.
LCD5	A20004-60	0.1875	1.50
LCD6	A20004-60	0.1875	1.50
LDG1	A20004-26	0.373	3.50
LE1	A20004-17	0.311	4.00
LE2	A20004-9	0.248	2.00
LE3	A20004-9	0.248	2.00
LE4	A20004-73	0.186	2.00
LE5	A20004-9	0.248	2.00
LE6	A20004-9	0.248	2.00
LE7	A20004-73	0.186	2.00
LE8	A20004-6	0.186	1.75
LGA1	A20004-15	0.311	3.00
LGA2	A20004-23	0.311	9.00
LGA3	A20004-20	0.311	5.00
LGA4	A20004-14	0.311	2.50

Rig Pin Set A20004-78		Rig Pin Size	
		Diameter	Length
MM Rig Pin No.	Rig Pin P/N	+0.00-.002 in.	±.01 in.
LGB1	A20004-24	0.311	11.00
LGB2	A20004-24	0.311	11.00
LGB3	A20004-17	0.311	4.00
LGB4	A20004-17	0.311	4.00
LGE1	A20004-12	0.311	1.50
LGE2	A20004-12	0.311	1.50
LGE3	A20004-15	0.311	3.00
NS1	A20004-14	0.311	2.50
NS2	A20004-22	0.311	7.00
NS3	A20004-16	0.311	3.50
NS4	A20004-13	0.311	2.00
NS5	A20004-18	0.311	4.25
NS6	A20004-19	0.311	4.50
NS7	A20004-14	0.311	2.50
R1	A20004-25	0.311	12.00
R2	A20004-25	0.311	12.00

Rig Pin Set A20004-78		Rig Pin Size	
		Diameter	Length
MM Rig Pin No.	Rig Pin P/N	+0.00-.002 in.	±.01 in.
R3	A20004-14	0.311	2.50
R4	A20004-20	0.311	5.00
R5	A20004-13	0.311	2.00
R6	A20004-14	0.311	2.50
R7	A20004-14	0.311	2.50
R8	A20004-12	0.311	1.50
ST1	A20004-15	0.311	3.00
ST2	A20004-15	0.311	3.00
ST3	A20004-15	0.311	3.00
ST4	A20004-17	0.311	4.00
ST5	A20004-17	0.311	4.00
TE1	A20004-9	0.248	2.00
TE2	A20004-9	0.248	2.00
TE3	A20004-73	0.186	2.00
TE4	A20004-7	0.186	2.50
TE5	A20004-11	0.248	5.00
TE11	A20004-11	0.248	5.00

Rig Pin Set A20004-2		Rig Pin Size	
		Diameter (inch)	Length (inches)
MM Rig Pin No.	Rig Pin P/N	+0.000/-0.002 inch	±0.01 inch
P1	A20004-20	0.311	5.00
P2	A20004-20	0.311	5.00
P3	*[4]	----	----
P4	A20004-5	*[5]	4.00
P5	A20004-10	0.248	4.00
P6	A20004-20	0.311	5.00
P7	A20004-23	0.311	9.00

*[4] PERMANENTLY INSTALLED IN ENGINE FUEL CONTROL POWER LEVER.
*[5] 0.1565/0.1555

FLOOR PANEL PROTECTION - MAINTENANCE PRACTICES

TASK 20-10-25-822-002

1. Maintenance Practices - Floor Panel Protection

A. To prevent possible damage to floor panels during maintenance, do these steps:

S 862-003

(1) Let only one person at a time use the ladder, stand, or scaffolding.

S 862-004

(2) Use plywood bearing pads that are a minimum of 1/2-inch thick and one-foot square under each leg, if you have these conditions:

(a) You use ladders, stands, or scaffolding with leg-bearing surfaces. Leg-bearing surfaces include rollers, screws, and sharp edges.

(b) You have a leg-bearing surface of less than eight square inches for each leg.

HEAT GUNS, SOLDERING GUNS AND SOLDERING IRONS - MAINTENANCE PRACTICES

TASK 20-10-26-912-001

1. Use of Heat Guns, Soldering Guns, and Soldering Irons

A. General

(1) This procedure gives the minimum recommended safety procedures for heat guns, soldering guns, and soldering irons used near airplanes. These are general procedures. If regulations made by local agencies or procedures made by the airline are more applicable, use them. Boeing cannot know or write about all possible conditions which the airlines can have.

(2) You must examine the conditions and be careful. Customer airlines must know how heat guns, soldering guns, and soldering irons are used.

(3) Heat guns, soldering guns, and soldering irons can cause an explosion. Components in all of these devices can operate at temperatures higher than the fuel ignition temperature (450°F). Heat guns and soldering guns also can contain electrical switches which can cause sparks. These sparks can cause the fuel to burn.

(4) We do not recommend you use a device to supply heat in the fuel tanks. You can have a good flow of air in the fuel tanks. You can make them safe when you fill the fuel tanks with nitrogen. For the repair of the wires in the fuel tanks, we recommend you use procedures that use crimped splices and sleeves with nylon ties. These procedures are specified in WDM Chapter 20.

(5) Do not use heat guns, soldering guns, or soldering irons less than 100 feet from an airplane during these operations:
- When you fuel
- When you defuel
- When the fuel tanks are open.

(6) You can use heat guns, soldering guns, and soldering irons when and where smoking is permitted. If you use these devices where smoking is not permitted, you must first make sure there are not dangerous levels of fuel fumes in the work area.

(7) Zero is the safe fuel fume level at which to use devices that can cause ignition.

(8) Measure the fuel fume level with a combustible gas indicator that reads in "PERCENT LOWER EXPLOSIVE LIMIT" or "PERCENT EXPLOSIVE". For example, you can use Mine Safety Appliances, Model 2A or Davis, Model D-16. If you can read a fuel fume level on this equipment, two conditions occurred:
- A liquid fuel or fume source is near
- The local fuel fume levels are high or the ventilation is not sufficient.

Use the equipment to measure the initial fuel fume levels. Make sure the fuel fume levels are sufficiently low. Continue to monitor the fuel fume levels during the repair.

(9) Do not use a possible ignition source near open fuel tanks, fuel vents, or fuel leaks where fume concentrations cannot be known or controlled.

(10) If you use a possible ignition source near an airplane where smoking is not permitted, make sure a person monitors the work and any other work in the area. The person must be authorized to monitor airplane fire safety.

(11) A person who can measure the risk of the repair to be done must identify the emergency or fire fighting equipment necessary at the work area of the repair. The person must be authorized to monitor airplane fire safety.

(12) Do not start or continue to do work on a fuel system component while equipment that can cause the fuel to burn is near.

(13) Keep the number of maintenance and safety persons included to a minimum.

FLIGHT CONTROL SURFACES SAFETY HARNESS RECEPTACLE - MAINTENANCE PRACTICES

1. General
   A. There are five safety harness attachment receptacles on the wing top surface and three on the horizontal stabilizer top surface. Maintenance persons will attach their safety harnesses to these receptacles during repair or inspection of these surfaces and the flight control surfaces.

   TASK 20-10-27-402-001

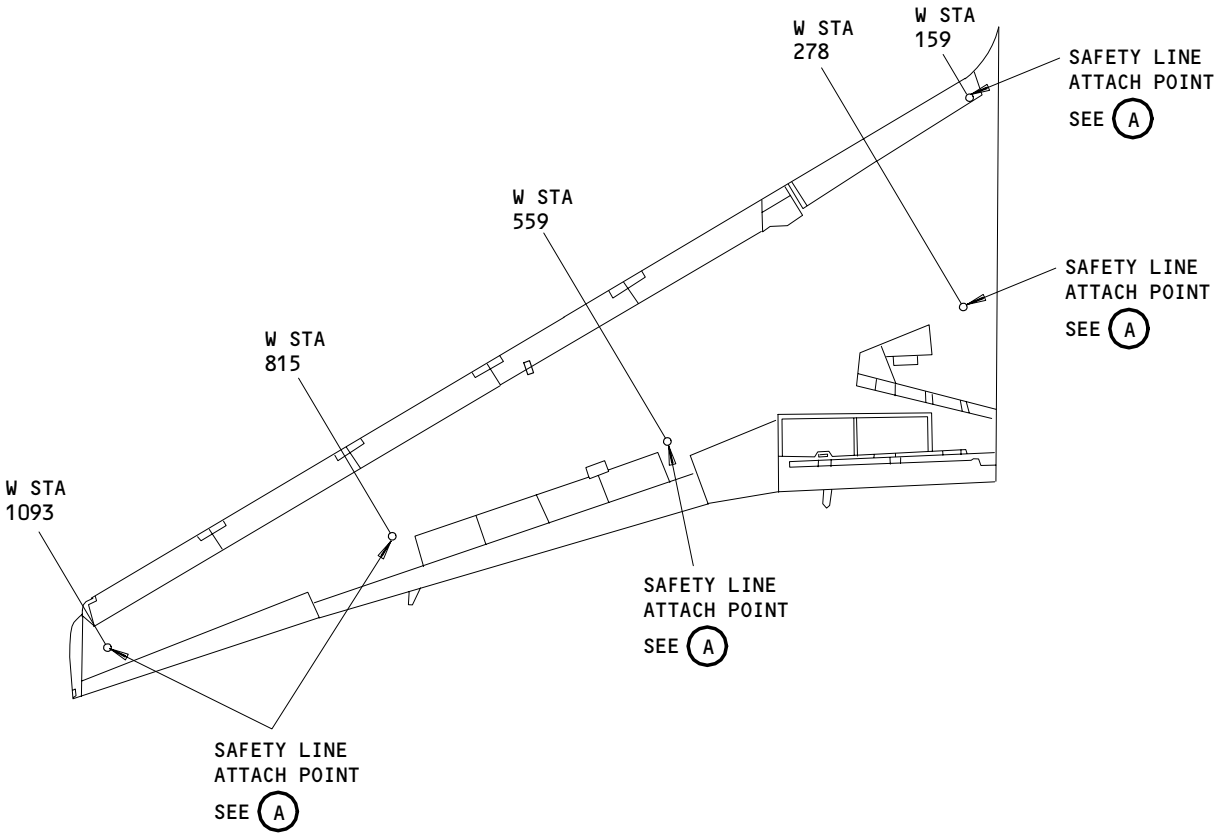
2. Attach Flight Control Surfaces Safety Harness (Fig. 201)
   A. Equipment
      (1) Attach Fitting Set - Wing/Horizontal Stabilizer Safety Harness (A20002-4).
   B. Procedure

      S 422-002

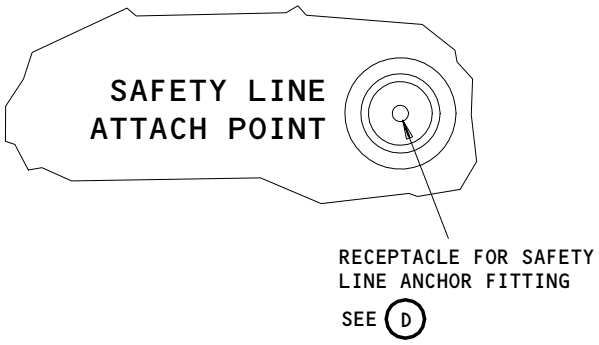
      (1) Attach your safety harness to the anchor fitting in the attachment receptacle.

      S 822-003

      (2) Adjust the anchor fitting until it is aligned with the airplane skin. If the fitting is not aligned, it will not engage correctly for the designed loading.

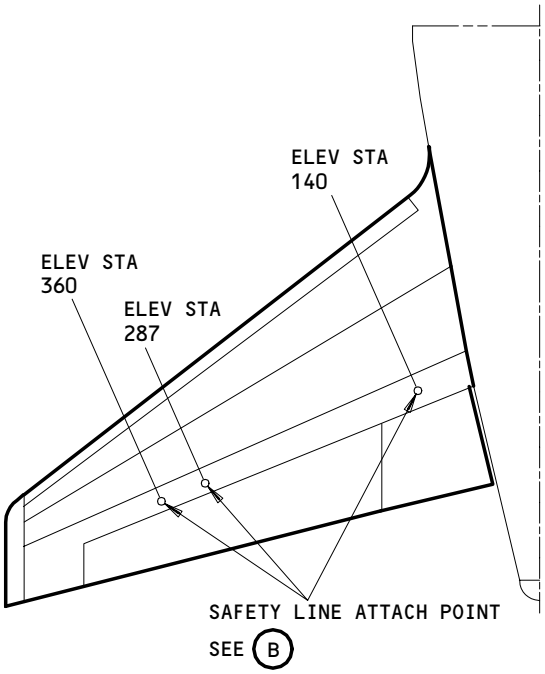


LEFT WING TOP SURFACE SHOWN
RIGHT WING TOP SURFACE OPPOSITE

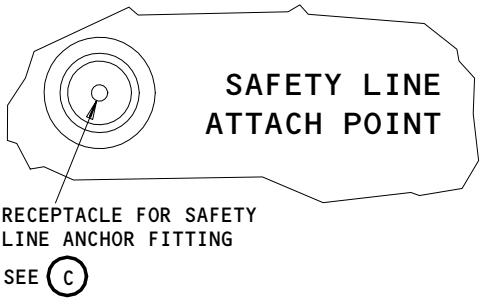


SAFETY LINE ATTACH POINT
(4 LOCATIONS)
A

Flight Control Surfaces Safety Line Attach Points
Figure 201 (Sheet 1)

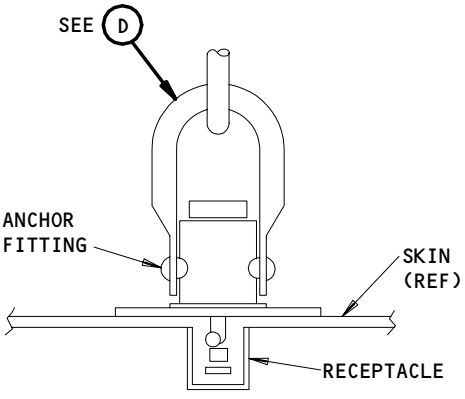


HORIZONTAL STABILIZER
TOP LEFT SURFACE SHOWN
TOP RIGHT SURFACE OPPOSITE



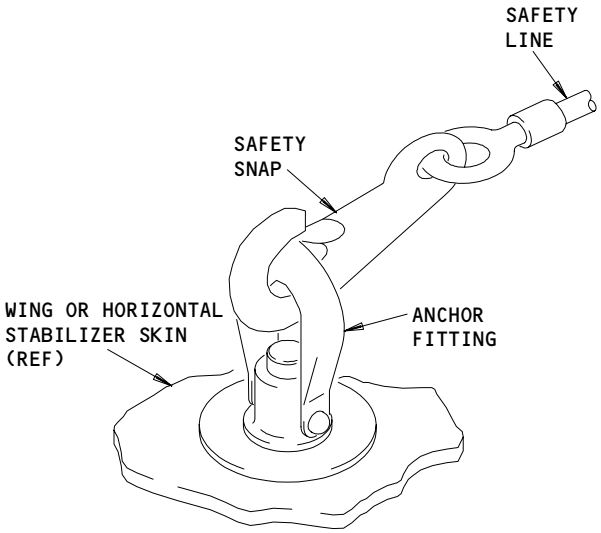
SAFETY LINE ATTACH POINT
(3 LOCATIONS)

B



RECEPTACLE FOR SAFETY LINE
ANCHOR FITTING

C



ANCHOR FITTING

D

Flight Control Surfaces Safety Line Attach Points
Figure 201 (Sheet 2)

LUBRICATION FITTINGS - REMOVAL/INSTALLATION

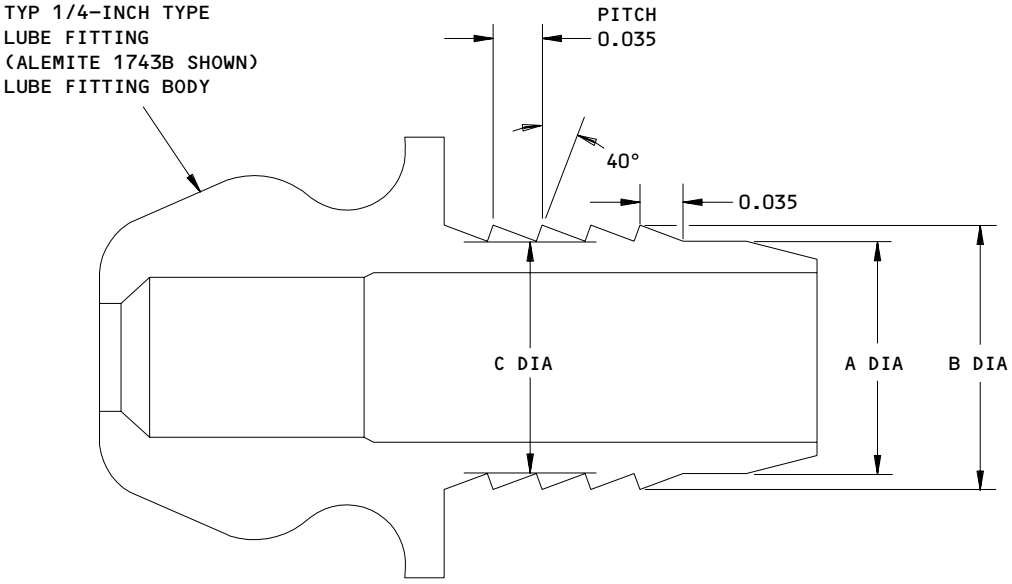
1. General
   A. This procedure contains two tasks.
      (1) The first task contains the installation instructions for a lubrication fitting (press-in type).
      (2) The second task contains the temporary lubrication instructions for blown-out lubrication fitting.

TASK 20-10-29-424-001

2. Install the Lubrication Fittings
   A. General
      (1) This task contains instructions for the installation of new lubrication fittings and lubrication fittings that were blown out.
   B. Equipment
      (1) Drive Tool - 5253-3 (for Alemite Type 1728B lubrication fittings)
      (2) Drive Tool - 5254-1 (for Alemite 1646B and 1992B lubrication angle fittings)
   C. Consumable Materials
      (1) B00074 Solvent - Degreaser, MIL-PRF-680 (Supersedes P-D-680)
      (2) B00143 Solvent - Trichlorotrifluorethane (Freon) MIL-C-81302
      (3) G00262 Nitrogen - Liquid, MIL-PRF-27401 Type II (Supersedes MIL-P-27401)
      (4) A50086 Primer - Loctite 7471 Primer T
      (5) G00106 Compound - Retaining , Single Component, Anaerobic MIL-R-46082
      (6) Cotton Swab (Commercially Available)
   D. References
      (1) AMM 20-30-89/201, Airplane Structure Cleaning Solvents
   E. Install a New Lubrication Fitting

      S 844-012
      (1) Get an applicable standard fitting to install in the hole.

      S 164-003
      (2) Do these steps to clean the lubrication fitting hole:
         (a) Use a cotton swab to remove as much grease as possible from the inner surface of the lubrication fitting hole.



1/4-INCH MODIFIED LUBE FITTING DETAILS

(A)

LUBE HOLE DIA	LUBE FITTING DIA	REPLACEMENT LUBE FITTING 1	
		STRAIGHT	ANGLED
0.194 MAX	3/16 2	1728B	1646B (65°),1992B (45°)
0.195-0.247	1/4 MODIFIED 2	SEE (A)	SEE (A)
0.248-0.249	1/4 3	1743B	1744B (65°),3024B (45°)
0.250-0.254	1/4 2	1743B	1744B (65°),3024B (45°)
0.255-UP	IF THERE ARE NO SPECIAL REPAIR INSTRUCTIONS IN THE COMPONENT OVERHAUL INSTRUCTIONS, CONTACT BOEING FOR REPAIR INSTRUCTIONS.		

NOTE: DESIGN LUBE HOLE DIA IS 0.188/0.189 INCH.

FINISH:

BRUSH CADMIUM PLATE MACHINED SURFACES PER SOPM 20-42-05.

1 ALEMITE (V95879) PART NUMBERS

2 INSTALL WITH ADHESIVE.

3 INSTALLATION WITH ADHESIVE OPTIONAL.

X = LUBE HOLE DIA IN MATING COMPONENT
A = SHANK DIA (X MINUS 0.007-0.012)
B = SERRATION OD (X PLUS 0.005-0.010)
C = SERRATION ROOT OD (X MINUS 0.003-0.010)

ALL DIMENSIONS ARE IN INCHES

Lubrication Fitting Modification and Installation
Figure 401

(b) Clean the hole to a depth of at least 0.5 inch with solvent, series 89 (AMM 20-30-89/201) on a clean cotton swab.
(c) Clean the hole until you can see no more grease or dirt removed from the hole.

S 424-011

CAUTION: MAKE SURE YOU USE THE CORRECT TOOL TO INSTALL THE LUBRICATION FITTING. MOVE THE FITTING IN A STRAIGHT LINE TO PREVENT DAMAGE TO THE MATING PART.

(3) Use the correct drive tool to install the fitting into the hole in the part the fitting connects to.

F. Install a Lubrication Fitting to Replace a Fitting that was Blown Out

S 844-013
(1) Get a special approved or an oversized fitting to install in the hole.

S 164-006
(2) Do these steps to clean the lubrication fitting hole:
(a) Use a cotton swab to remove as much grease as possible from the inner surface of the lubrication fitting hole.
(b) Clean the hole to a depth of at least 0.5 inch with solvent, Series 89 (AMM 20-30-89/201) on a clean cotton swab.
(c) Clean the hole until you can see no more grease or dirt removed from the hole.

S 394-009
(3) Do these steps to apply the primer:
(a) Use a cotton swab to apply a thin layer of primer to the inner diameter of the hole.
(b) Let the primer air dry at approximately 68°F for at least five minutes before you apply the retainer compound.

S 424-015

CAUTION: DO NOT APPLY TOO MUCH ADHESIVE ON THE FITTING AND THE PART IT CONNECTS TO. TOO MUCH ADHESIVE ON THE FITTING WILL CAUSE A BLOCKAGE TO THE LUBRICATION PASSAGES AND CAUSE DAMAGE TO EQUIPMENT.

(4) Do these steps to install the lubrication fitting:
(a) Use a cotton swab to apply a thin layer of adhesive to the inner diameter of the hole (between 0.25 and 0.40 inch in depth).
(b) Put the lubrication fitting into liquid nitrogen for at least one minute to make sure the fitting is fully cool.

CAUTION: MAKE SURE YOU USE THE CORRECT TOOL TO INSTALL THE LUBRICATION FITTING. MOVE THE FITTING IN A STRAIGHT LINE TO PREVENT DAMAGE TO THE MATING PART.

(c) Use the correct drive tool to install the lubrication fitting into the hole in the part the fitting connects to.

NOTE: Install the lubrication fitting into the hole in the mating part immediately . If you do not install the fitting immediately it will become too warm.

(d) Let the lubrication fitting cure for 12 hours at approximately 68°F before you use it.

TASK 20-10-29-604-018

3. Temporary Lubrication for Blown-out Lubrication Fittings

A. General

(1) This task contains the instructions to lubricate a component using a blown-out lubrication fitting when replacement of the lubrication fitting replacement is inconvenient.

(2) This procedure is only to be used in the event that a grease fitting has been blown out and the maintenance to repair the fitting is inconvenient, but lubrication is necessary to continue service.

(a) This procedure is only a temporary and should only be used until the fitting can be conveniently repaired or replaced.

B. Equipment

(1) Rubber-Tipped Grease Gun Adapter - B411 (Alemite P/N)

C. References

(1) AMM 20-30-04/201, Lubricants

D. Lubricate the Blown-out Fitting

S 014-026

CAUTION: MAKE SURE THAT YOU FOLLOW THE NORMAL LUBRICATION PROCEDURES FOR THE COMPONENT BEING LUBRICATED. FAILURE TO COMPLY MAY RESULT IN DAMAGE TO THE COMPONENT.

(1) Gain access to the blown-out lubrication fitting.

S 944-020

(2) Using the applicable grease gun and grease required for the location with the blown-out lubrication fitting, attach the rubber-tipped grease adapter to the grease gun.
(a) Reference AMM 20-30-04/201 for the proper lubricants.

S 644-021

(3) Press the rubber-tipped adapter firmly against the opening where the lubrication fitting was blown out.

S 644-022

(4) Gently pump the grease into the fitting opening, making sure that the rubber tip remains firmly seated against the opening.

S 144-023

(5) Clean up any excess grease.

S 414-024

(6) Close any panels opened for access.

S 844-025

(7) Return the aircraft to normal.

SEALS ON OPEN ELECTRICAL TERMINALS IN FLAMMABLE LEAKAGE ZONES MAINTENANCE PRACTICES

1. General
   A. This procedure contains one task. The task is to seal the open electrical terminals and connections in flammable leakage zones.
   B. When you replace or install components on the lighting systems in flammable leakage zones, seal these open items:
      - Lamp terminals
      - Terminal strips
      - Circuit breakers
      - Transformers
      - Switches
      - Hardwire
      - Wire junctions.

      Lamp terminals with a rubber sleeve are open.
   C. Do not seal the dual grounds in flammable leakage zones or the wire junctions in fuel tanks.
   D. Do not seal the generator terminals on the engines or APU.
   E. Install wire and protectors on all secondary switch leads and seal all secondary switch terminals in the flammable leakage zones. Make sure insulated splices are not open.

   TASK 20-10-31-392-001
2. Seal the Open Terminals
   A. Equipment
      (1) Paint brush, 1-inch wide - Commercially Available
   B. Consumable Materials
      (1) B00083 Aliphatic Naphtha - TT-N-95
      (2) A00767 Sealant BMS 5-45 TYPE II
      (3) A00230 Sealant BMS 5-37
      (4) A00247 Sealant BMS 5-95
      (5) A50009 Sealant BMS 5-142
   C. References
      (1) SWPM 20-30-00 Protection of Electrical Connections in a Flammable Leakage Zone.

D. Procedure

S 112-002

(1) Remove all dirt and grease for a minimum of one inch adjacent to the area you will seal. Use a cloth made moist with Naphtha.

S 392-004

CAUTION: DO NOT SEAL THE SHANK OF LAMP TERMINALS THAT ARE A SPRING-LOADED PART OF THE BAYONET LAMP SOCKET BASE. SEAL ONLY THE TERMINAL END AND ATTACHED HARDWARE. SEALANT ON THE SHANK LIMITS MOVEMENT OF THE LAMP CONTACT WHICH CAN CAUSE THE LIGHT ASSEMBLY TO BECOME TOO HOT. IF IT BECOMES TOO HOT, A FAILURE CAN OCCUR.

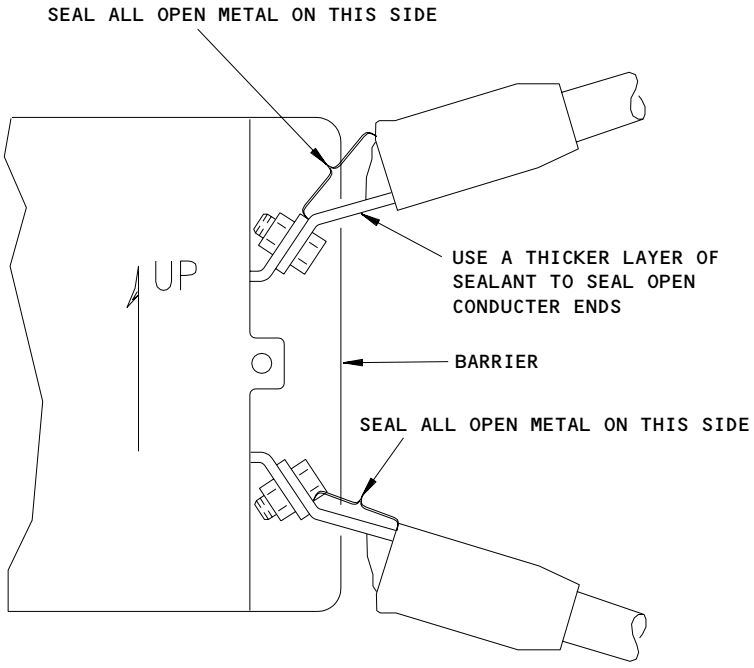
(2) Use a brush to apply one layer of sealant to the open areas. Make sure you seal all the open areas.
   (a) Refer to SWPM 20-30-00 for approved sealants.

S 392-005

(3) On ring torque terminals, apply sealant as follows:
   (a) Apply sealant to the side of the terminal which a metal object can hit if it falls (Fig. 201).

      NOTE: Seal each terminal as far as the attached hardware. You can fully seal the attached hardware. If there are barriers between phases or between components, the seal must extend into the space given protection by the barriers.

   (b) If the edges of the terminals are less than 0.5 inch from each other, apply sealant to the edges.



Sealant Installation on Ring Tongue Terminals
Figure 201

COAXIAL CABLE - MAINTENANCE PRACTICES

1. General
   A. 3M Advanced System Tester 900AST Series is the recommended TDR and the Tektronix Model 1502 is the (optional) TDR that can be used to inspect the coaxial cable.

TASK 20-10-32-212-001

2. Coaxial Cable Inspection
   A. General
      (1) Refer to 3M's Instruction Manual for information on how to test the coaxial cable using the 900AST.

HARTWELL TYPE LATCHES - ADJUSTMENT/TEST

1. General
   A. This procedure contains two tasks. The first is testing Hartwell latches. The second is adjusting Hartwell latches.
   B. Hartwell type latches are used on small flush-fitting service access doors such as those for the potable water and lavatory service panels and the forward and mid drain mast access doors.

TASK 20-10-34-705-005

2. Test Hartwell Latches, Series 5100
   A. Procedure

S 725-002

(1) Test Hartwell series 5100 latches.
   (a) Check that door turns freely to within +0.100 or -0.030 inch of contour at latch position.
   (b) The latch you want to check, press door to fit and come in line at door edge as shown in Fig. 501. Lock latch and check that preload is there by pushing latch bolt at location mentioned in Fig. 501. There must be 0.010 to 0.030 inch depression free play at this point. Adjust per par. 3 if you do not get free play.
   (c) Check that door latch bolt overlap on structure to be 0.25 inch as shown in Fig. 501.

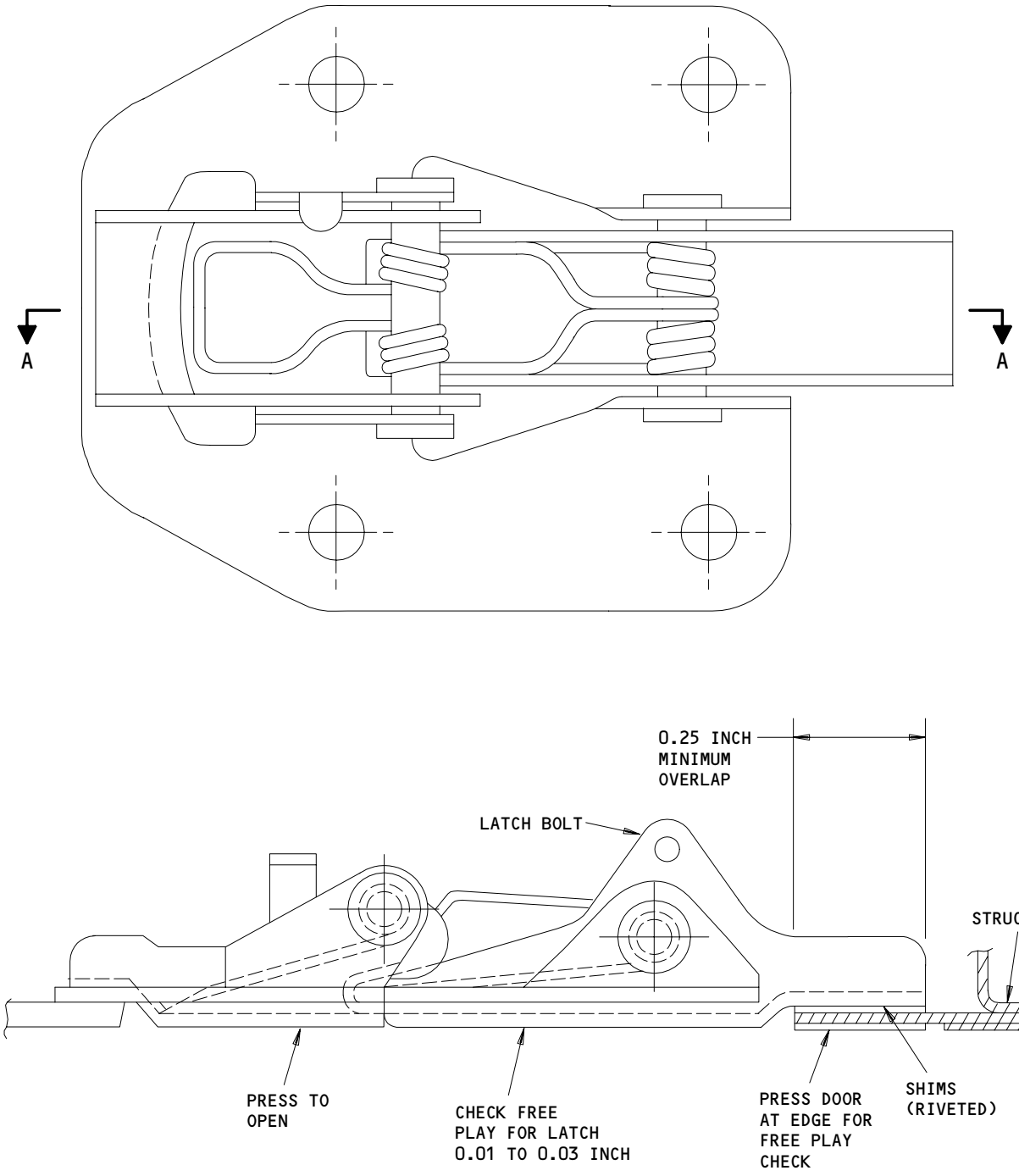
TASK 20-10-34-825-006

3. Adjust Latches (Fig. 501)
   A. Procedure

S 825-004

(1) If you cannot get 0.010 to 0.030 inch depression free play, add or subtract phenolic shims.

NOTE: Nominal 0.030 and 0.040 inch shims are installed to get dimensional condition shown in Fig. 501. Shim thickness may be different.



A-A

Hartwell Latches, Series 5100, Adjustment
Figure 501

POWER DEVICE CARTRIDGE - REMOVAL/INSTALLATION

1. General
   A. This procedure has these tasks:
      (1) The first task is the removal of cartridge.
      (2) The second task is the installation of cartridge.

TASK 20-10-35-004-001

2. Remove the Power Device Cartridge (Squib)
   A. General
      (1) This task is for the removal of power device cartridges (squibs).
   B. Equipment
      (1) Cap - Shorting or Faraday
      (2) Ohmmeter - Resistance Measuring Bridge
      (3) Wrist Strap - Adjustable, Conductive Static Control (14810)
   C. References
      (1) AMM 20-41-00/201, Static Grounding
      (2) AMM 24-22-00/201, Control (Supply Power)
   D. Remove the power device cartridge (squib).

      S 944-002
      (1) Do this task to ground the airplane: Static Grounding Procedure (AMM 20-41-00/201).

      S 944-003
      (2) Make sure you remove electrical power before you remove the power device cartridge (squib), do this task: Control (Supply Power) (AMM 24-22-00/201).

      S 944-004
      (3) Wear a static control wrist strap during the removal of the squib.

      S 764-005

      WARNING: USE A WRIST STRAP WITH A MINIMUM GROUNDING LEAD RESISTANCE OF 250 KILOHMS AND A MAXIMUM OF 1.5 MEGOHMS. IF YOU USE A WRIST STRAP WITH THE INCORRECT RESISTANCE AND YOU ACCIDENTALLY TOUCH A COMPONENT THAT HAS HIGH VOLTAGE, INJURIES CAN OCCUR.

      (4) Do these steps to do a resistance test of the static control wrist strap:
         (a) Use an ohmmeter to make sure the static control wrist strap assembly has a minimum resistance of 250 kilohms and a maximum of 1.5 megohms.

WARNING: MAKE SURE THAT THE GROUNDING LEAD ON THE WRIST STRAP TOUCHES YOUR SKIN. IF YOU INSTALL THE WRIST STRAP INCORRECTLY, DAMAGE TO EQUIPMENT AND INJURIES TO PERSONNEL CAN OCCUR.

(b) Put the static control wrist strap on the wrist of the person that will remove the squib
(c) Use an ohmmeter to make sure the resistance is less than 10 megohms.

S 944-006
(5) Connect the static control wrist strap to an applicable electrostatic ground jack.

S 944-007

WARNING: PUT A PROTECTIVE COVER ON THE SQUIB. IF YOU DO NOT PUT A PROTECTIVE COVER ON THE SQUIB, IT CAN FIRE SUDDENLY AND CAUSE INJURY TO PERSONNEL.

(6) Stray voltage on the airplane can cause the squib to discharge. Make sure any stray voltage is discharged before you remove the aircraft electrical connector.

S 024-008
(7) Remove the electrical connector.

S 484-009
(8) Make sure the faraday cap (protective cover) is installed on the squib whenever the airplane electrical connector is removed from the squib.

NOTE: The faraday cap is attached to the squib. This protective cover has electrically conductive surfaces to prevent possible squib explosion because of static discharge.

S 944-010
(9) After the faraday cap is attached to the squib, the wrist strap may be removed.

TASK 20-10-35-404-011

3. Install the Power Device Cartridge (Squib)

A. General

(1) This task contains the information to install the power device cartridge (squib).

B. Equipment

(1) Cap - Shorting or Faraday
(2) Ohmmeter - Resistance Measuring Bridge
(3) Wrist Strap - Adjustable, Conductive Static Control (14810)

C. References

(1) AMM 20-41-00/201, Static Grounding
(2) AMM 24-22-00/201, Control (Supply Power)

D. Install the power device cartridge (squib).

S 944-012

(1) Make sure you remove electrical power before you install the power device cartridge (squib), do this task: "Control (Supply Power)" (AMM 24-22-00/201).

S 944-013

(2) Wear a wrist strap during installation of the squib.

S 764-014

WARNING: USE A WRIST STRAP WITH A MINIMUM GROUNDING LEAD RESISTANCE OF 250 KILOHMS AND A MAXIMUM OF 1.5 MEGOHMS. IF YOU USE A WRIST STRAP WITH THE INCORRECT RESISTANCE AND YOU ACCIDENTALLY TOUCH A COMPONENT THAT HAS HIGH VOLTAGE, INJURIES CAN OCCUR.

(3) Do these steps to do a resistance test of the static control wrist strap:

(a) Use an ohmmeter to make sure the static control wrist strap assembly has a minimum resistance of 250 kilohms and a maximum of 1.5 megohms.

WARNING: MAKE SURE THAT THE GROUNDING LEAD ON THE WRIST STRAP TOUCHES YOUR SKIN. IF YOU INSTALL THE WRIST STRAP INCORRECTLY, DAMAGE TO EQUIPMENT AND INJURIES TO PERSONNEL CAN OCCUR.

(b) Put the static control wrist strap on the wrist of the person that will install the squib.
(c) Use an ohmmeter to make sure the resistance is less than 10 megohms.

S 944-015

(4) Connect the static control wrist strap to an applicable electrostatic ground jack.

S 484-016

WARNING: PUT A PROTECTIVE COVER ON THE SQUIB. IF YOU DO NOT PUT A PROTECTIVE COVER ON THE SQUIB, IT CAN FIRE SUDDENLY AND CAUSE INJURY TO PERSONNEL.

(5) Make sure the faraday cap (protective cover) is installed on the squib whenever the airplane electrical connector is removed from the squib.

NOTE: The faraday cap is attached to the squib. This protective cover has electrically conductive surfaces to prevent possible squib explosion because of static discharge.

S 944-017

(6) Stray voltage on the airplane can cause the squib to discharge. Make sure any stray voltage is discharged before you install the aircraft electrical connector.

S 424-018

(7) Remove the faraday cap and install the electrical connector.

S 944-019

(8) After the electrical connector is installed, the wrist strap may be removed.

STANDARD TORQUE VALUES - MAINTENANCE PRACTICES

TASK 20-11-00-422-003

1. Maintenance Practices - Standard Torque Values

A. Refer to the figures that follow for the torque data.

S 422-004

(1) When it is necessary to use an adapter, a corrected torque wrench value is necessary. Follow the examples in Fig. 201 to find the corrected torque wrench value T1 when you use an adapter (length B).

S 422-005

(2) The torque values shown in Fig. 202 give data for the correct quantity of pressure necessary to tighten fasteners. Some fasteners have threads that are lubricated. Some fasteners have threads that are not lubricated. The values which are necessary to tighten the fastener by the nut or by the bolt are also supplied.

S 422-006

(3) The minimum torque necessary to turn the self-locking nuts must be the value shown in Fig. 203. If the nut turns too easily or turns too hard when you install the nut on the bolt, refer to Fig. 203 to do a test of the nut.

S 912-007

(4) Torque values are given in Fig. 204 for Reduced Head Bolts.

S 912-008

(5) Torque values are given in Fig. 205 for Rigid Tube Coupling Connectors.

S 912-009

(6) Torque values are given in Fig. 206 for Pipe Thread Fittings.

S 912-010

(7) Torque values are given in Fig. 207 for Low Pressure and Return Line Fittings.

S 912-011

(8) Torque values are given in Fig. 208 for Flareless Tubing Fittings with lubricated threads.

S 912-012

(9) Torque values are given in Fig. 209 for Channel Band Clamps, Duct Support Clamps, Hose Clamps, and V-Band Clamps.

S 862-013

(10) Make sure that one male thread (minimum), plus the chamfer of the male thread, extends above the top of the nut. If the male thread does not have a chamfer, the male thread must extend one and one-half threads (minimum) above the top of the nut.

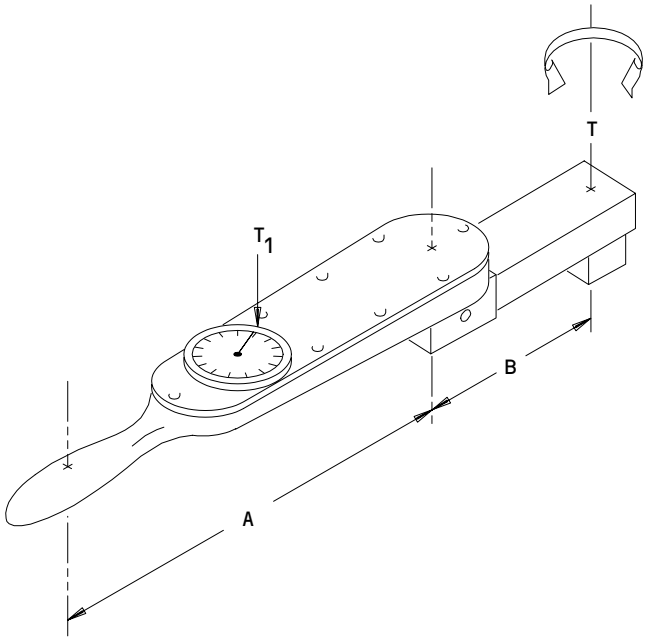
$$T_1 = \frac{TA}{A+B}$$

A = TORQUE LENGTH OF TORQUE WRENCH
B = TORQUE LENGTH OF ADAPTER
T = ACTUAL TORQUE OF NUT
T_1 = TORQUE OF WRENCH SHOWN (CORRECTED TORQUE)

EXAMPLE A = 12 IN.
B = 3 IN.
T = 160 POUND-INCHES

$$T_1 = \frac{160 \times 12}{12+3}$$

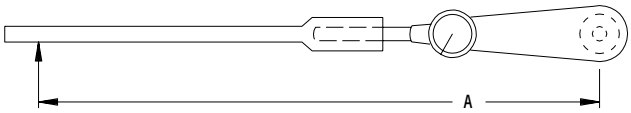
T_1 = 128 POUND-INCHES



METHOD I

Torque Wrench Adapter
Figure 201 (Sheet 1)

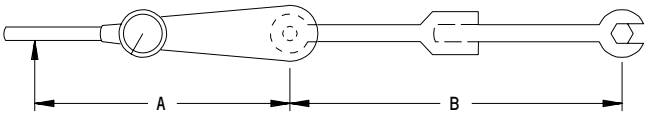
HANDLE EXTENSION ONLY.
NO CORRECTION NECESSARY.



METHOD II

ADAPTER WITH THE EXTENSION BETWEEN THE ADAPTER AND THE WRENCH. BOTH ARE IN LINE WITH THE WRENCH. INDICATED TORQUE T_1:

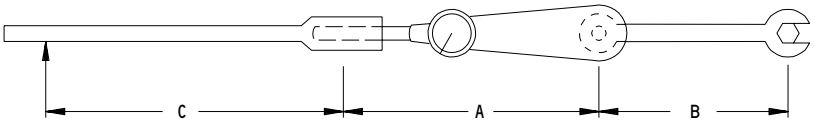
$$T_1 = \frac{TA}{A+B}$$



METHOD III

BOTH HANDLE EXTENSION AND ADAPTER, INDICATED TORQUE T_1:

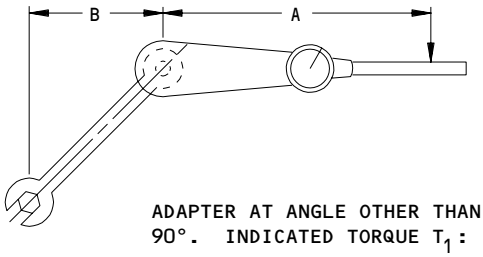
$$T_1 = \frac{Tx(A+C)}{A+B+C}$$



METHOD IV

IF POSSIBLE, METHODS V AND VI SHOULD NOT BE USED. WHEN IT IS NECESSARY TO USE THESE METHODS, THE FOLLOWING CONDITIONS MUST BE APPLICABLE.

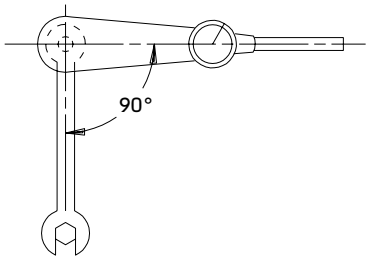
1. THE ADAPTER PLUS ANY EXTENSIONS USED BETWEEN THE WRENCH AND THE ADAPTER MUST NOT BE MORE THAN THE LENGTH OF THE WRENCH.
2. WHEN A FORCE IS APPLIED AT 90 ± 3 DEGREES TO THE HANDLE OF THE WRENCH, IT IS RECOMMENDED THAT A STIRRUP – TYPE HANDLE WITH A POINTER (INDICATING ANGLE OF LOADING) BE USED TO MAKE SURE LOADING IS AT THE CORRECT ANGLE.



ADAPTER AT ANGLE OTHER THAN 90°. INDICATED TORQUE T_1:

$$T_1 = \frac{TA}{A+B}$$

METHOD V



ADAPTER AT RIGHT ANGLE TO THE WRENCH. NO CORRECTION NECESSARY.

METHOD VI

Torque Wrench Adapter
Figure 201 (Sheet 2)

NUT TIGHTENING TORQUE 1 5

NUT	PART NUMBER AND STYLE	N10HR (12-POINT), N10JG (12-POINT), N10HC (BARREL NUT), N10YN (12-POINT), N11X (BARREL NUT)	NAS1804-1805 (12-POINT), N10GW (12-POINT), N10JA (PLATE-NUT), N10B (12-POINT), N10JB (PLATE-NUT), N10RM (PLATE-NUT), NAS577 (BARREL-NUT), N10JD (CASTELLATED NUT THICK STYLE 7/16 MTHRU 1-1/4 ONLY), N10ZC (BARREL NUT), N11W (HEX), N11Z (12-POINT), AS3485 (HEX), AS3486 (12-POINT) 4				N10JC (SHEET METAL HEX-SIZES #4 THRU 7/16 ONLY), ALL PLATE-NUTS EXCEPT N10JA, N10JB, AND N10RM, ALL CLIP-NUTS, INSERTS, AND TAPPED HOLES, MS21042 HEX, MS21043, N10JD (CASTELLATED-THICK STYLE ALL SIZES 3/16 THRU 3/8), MS14144 (CASTELLATED-THICK STYLE), N10R (HEX), N10YR (HEX) N11AG (HEX), MS21045 (HEX) NAS679 (HEX), N11N (CASTELLATED-THICK STYLE ALL SIZES 3/16 THRU 1-1/4) 4					N10JC, MS21245 (HEX SIZES 1/2 THRU 1-1/2) N10JD, N11N, MS14145 (CASTELLATED-THIN STYLE ALL SIZES -103 THRU -120) 4		BACN10YJ NYLON NUT
	STYLE	12-POINT	12-POINT	HEX HEAD	PAN HEAD	100° HEAD	INTERNAL WRENCHING	12-POINT	HEX HEAD	PAN HEAD	100° HEAD	SOCKET HEAD	ALL		ALL
BOLT	PART NUMBER	B30MT 1 B30NG B30NH B30US B30TR	B30FD 2 B30LE 2 B30MR B30PN 2 B30XL B30ZF MS21250	B30LM B30NE B30NM B30XJ NAS6603 THRU NAS6620 NAS6703 THRU NAS6720	B30EM B30LN B30NS NAS1216	B30EM B30LP B30LR B30LU B30MS B30NN B30XJ	B30UG MS20004 THRU MS20024	B30LT B30NL B30NJ B30UU	B30LJ B30NR B30NF B30PF B30PU B30PW B30XN NAS428 NAS563 THRU 572 NAS1801 NAS1802 NAS6203 THRU NAS6220	B30BE B30BG B30LK B30NT B30Z6 NAS600 THRU NAS606 NAS623 NAS1217 NAS1218 NAS8204 THRU NAS8206	B30LH B30LR B30LU B30PC B30SW B30TP B30WP B30ZC NAS514 NAS517 NAS7604 THRU NAS7616	MS21262 MS24678 NAS1351 NAS1352	ALL (EXCEPT REDUCED SHEAR AND B30XD)		ALL (EXCEPT REDUCED SHEAR AND B30XD)	
	TORQUE RANGE (POUNDS-INCH)															
	THREAD SIZE	DRY BOLT	LUBED BOLT 3	DRY BOLT	LUBED BOLT 3			DRY BOLT		LUBED BOLT 3			DRY OR LUBED BOLT 3		DRY OR LUBED BOLT 3	
	2-56 OR 2-64	---	---	---	---	---	---	---		---			---		---	
	4-40 OR 4-48	---	---	---	---	---	---	---		---			---		---	
	6-32 OR 6-40	---	---	---	---	---	---	---		---			---		---	5-6
	8-32 OR 8-36	---	---	---	---	---	---	---		---			---		---	
	10-32	82-88	53-57	---	---	---	---	25-35		---			---		---	6-7
	1/4-28	107-113	73-77	82-88	---	63-67	---	63-67		63-67			39-41		---	---
	5/16-24	204-216	155-165	165-175	---	107-113	---	120-130		107-113			78-82		---	---
	3/8-24	388-412	290-310	310-330	---	194-206	---	194-206		170-180			126-134		---	---
	7/16-20	655-695	388-412	514-546	---	330-350	---	290-310		262-278			243-258		---	---
	1/2-20	1070-1140	558-592	825-876	---	529-561	---	616-654		529-56			388-412		---	---
	9/16-18	1510-1590	873-927	1210-1280	---	786-834	---	946-1000		786-834			650-690		---	---
	5/8-18	2040-2160	1460-1550	1600-1700	---	1060-1130	---	1260-1340		1070-1130			795-845		---	---
	3/4-16	3690-3910	2960-3140	2860-3040	---	1790-190	---	2570-2730		1860-1980			1600-1700		---	---
	7/8-14	5720-6070	4070-4320	4460-4730	---	2910-3090	---	3390-3600		2910-3090			2320-2470		---	---
	1-12 OR 1-14	8680-9210	6400-6800	6790-7210	---	4410-4680	---	5430-5760		4410-4680			3630-3860		---	---
	1-1/8-12	11000-11600	8580-9060	8530-9060	---	5620-5970	---	6790-7210		5620-5970			4460-4730		---	---
	1-1/4-12	17000-18000	11200-11800	13200-14000	---	8340-8850	---	10600-113000		8340-8850			6790-7210		---	---
	1-3/8-12	21400-22600	16000-17000	---	---	---	---	---		---			---		---	---
	1-1/2-12	---	---	---	---	---	---	---		---			---		---	---

1 WHEN ANY BOLT IS TO BE INSTALLED BY WRENCHING THE HEAD, SUCH AS WHEN YOU INSTALL BOLTS INTO PLATE-NUTS, CLIP-NUTS, BARREL-NUTS, INSERTS, OR TAPPED HOLES, THE INSTALLATION TORQUE MUST BE THE MAXIMUM TORQUE SHOWN IN THE TABLE FOR THE NUT ±10%.

2 WHEN B30LE OR PN BOLTS ARE INSTALLED WITH N10HR NUTS, USE THE INSTALLATION TORQUE SHOWN FOR N10GW NUTS.

3 LUBRICATED BOLTS INCLUDE DRY-FILM-LUBRICATED (MIL-L-8937) BOLTS AND BOLTS WITH ANTI-FRICTION COMPOUNDS SUCH AS EASE-OFF 990, MIL-C-11796, AND MIL-PRF-23827 APPLIED TO THE THREADS.

4 WHEN YOU SAFETY FINE CASTELLATED NUTS, TIGHTEN THE NUT TO THE LOW SIDE OF THE SELECTED TORQUE RANGE; IF NECESSARY, CONTINUE TO TIGHTEN IT UNTIL A SLOT ALIGNS WITH THE SAFETY HOLE.

5 IF THE NUT AND BOLT ARE SHOWN, BUT NOT IN THE SAME COLUMN, USE THE TORQUE RANGE WITH THE LOWEST MAXIMUM LIMIT.

Torque Values for Bolts and Nuts
Figure 202 (Sheet 1)

102600

NUT TIGHTENING TORQUE 1			
NUT	PART NUMBER AND STYLE	COARSE THREADED NUTS, INSERTS AND TAPPED HOLES	
BOLT	STYLE	ALL COARSE BOLTS AND SCREWS	
	PART NUMBER	ALL	
THREAD SIZE		TORQUE (POUND-INCHES) DRY BOLT	MAXIMUM 4
---		---	---
---		---	---
---		---	---
---		---	---
10-24		13.5-14.5	21
1/4-20		29-31	45
5/16-18		49-52	100
3/8-16		97-103	170
7/16-14		146	280
1/2-13		262-278	520
9/16-12		349-371	650
5/8-11		466-494	900
3/4-10		800-850	1500
7/8-9		1500-1590	2700
1-8		2520-2670	4500
1-1/8-7		3540-3760	7200
1-1/4-7		4360-4630	10,000
---		---	---
---		---	---

Torque Values for Bolts and Nuts
Figure 202 (Sheet 2)

THREAD SIZE	DIAMETER DASH NO.	NAS1423 AND NAS509 JAM NUTS 6			ALL OTHER NONSELF-LOCKING JAM NUTS 7		
		TORQUE, INCH-POUNDS			TORQUE, INCH-POUNDS		
		MINIMUM	TARGET	MAXIMUM	MINIMUM	TARGET	MAXIMUM
0.1900-32	-3	13	13	15	18	19	20
0.2500-28	-4	18	18	20	24	25	26
0.3125-24	-5	34	35	36	49	50	52
0.3750-24	-6	40	45	46	63	65	67
0.4375-20	-7	63	65	67	97	100	103
0.5000-20	-8	78	80	82	112	115	118
0.5625-18	-9	87	90	93	130	135	140
0.6250-18	-10	97	100	103	146	150	155
0.7500-16	-12	155	160	165	233	240	247
0.8750-14	-14	213	220	227	320	330	340
1.0000-12	-16	272	280	288	407	420	433
1.1250-12	-18	359	370	380	534	550	567
1.2500-12	-20	437	450	464	655	675	695

JAM NUTS

6 LOCKWIRED JAM NUTS
7 NON-LOCKWIRED JAM NUTS

Torque Values for Bolts and Nuts
Figure 202 (Sheet 3)

LOCKING TORQUE – SELF-LOCKING NUTS 1						
	FINE THREADS (REF BPS-N-70)				COARSE THREADS (REF MIL-N-25027)	
	TORQUE (POUND-INCHES)				TORQUE (POUND-INCHES)	
	USED NUT		NEW NUT			
SIZE	MINIMUM BREAKAWAY	MAXIMUM LOCKING	MINIMUM 1ST CYCLE BREAKAWAY	SIZE	MINIMUM LOCKING	MAXIMUM LOCKING
4-48		–	–	2-56	0.2	2.5
6-40	1.0	10	–	4-40	0.5	5
8-36	1.5	15	–	6-32	1.0	10
10-32	2.0	18	–	8-32	1.5	15
1/4-28	3.5	30	7	10-24	2.0	18
5/16-24	6.5	60	12	1/4-20	4.5	30
3/8-24	9.5	80	18	5/16-18	7.5	60
7/16-20	14.0	100	26	3/8-16	12.0	80
1/2-20	18.0	150	34	7/16-14	16.5	100
9/16-18	24.0	200	46	1/2-13	24.0	150
5/8-18	32.0	300	60	9/16-12	30.0	200
3/4-16	50.0	400	90	5/8-11	40.0	300
7/8-14	70.0	600	135	3/4-10	60.0	400
1-14	90.0	800	180	7/8-9	82.0	600
1-12	90.0	800	180	1-8	110.0	800
1-1/8-12	117.0	900	234	1-1/8-7	137.0	900
1-1/4-12	143.0	1000	285	1-1/4-7	165.0	1000
1-3/8-12	165.0	1100	330	1-3/8-6	200.0	1200
1-1/2-12	195.0	1250	386	1-1/2-6	230.0	1400
1-3/4-12	245.0	1450	490	1-3/4-5	300.0	1800
2-12	300.0	1700	600	2-4.5	360.0	2200
				2-1/4-4.5	430.0	2600
				2-1/2-4.5	500.0	3000

1 THE FOLLOWING CONDITIONS MUST BE USED FOR TORQUES (REF BPS-N-70):

A. THE MINIMUM-TO-MAXIMUM TORQUE RANGE IS USED TO FIND THE CONDITION OF A USED SELF-LOCKING NUT AND BOLT SET.

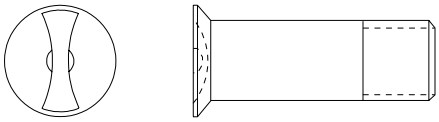
B. ALL NUT THREADS SHALL BE NEW OR UNDAMAGED. A NUT IS CONSIDERED INSTALLED WHEN A MINIMUM OF ONE THREAD PLUS THE CHAMFER OF THE MALE THREAD EXTENDS BEYOND THE TOP OF THE NUT. IF THE MALE THREAD DOES NOT HAVE A CHAMFER, THE MALE THREAD MUST EXTEND ONE AND ONE-HALF THREADS (MINIMUM) ABOVE THE TOP OF THE NUT.

C. THE REMOVAL WILL BE COMPLETE WHEN THE LOCKING DEVICE IS DISENGAGED.

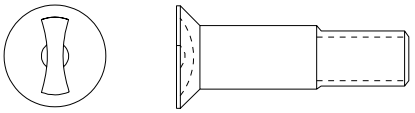
D. THE MINIMUM BREAKAWAY TORQUE IS THE TORQUE REQUIRED TO TURN A NUT OR BOLT FROM AN INSTALLED POSITION. THIS CONDITION IS FOR BOLT THREADS WITH NO LOAD ON THE BASE OF THE NUT.

E. THE MAXIMUM LOCKING TORQUE IS THE MAXIMUM TORQUE DURING THE INSTALLATION OR REMOVAL OF NUTS WITH NO LOAD ON THE BASE OF NUT.

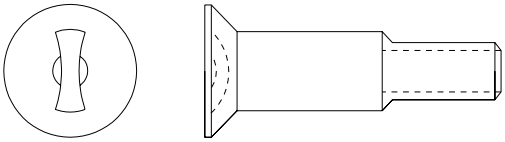
Locking Torque Values for Self-Locking Nuts
Figure 203



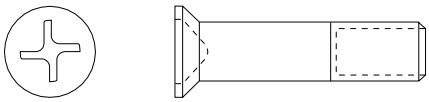
BACB30DP (CRES)
BACB30EL (STEEL)
NAS1581 (CRES)



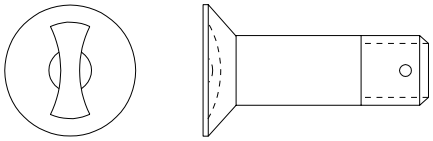
BACB30FB (STEEL)
BACB30RF (STEEL)
BACB30UW (STEEL)



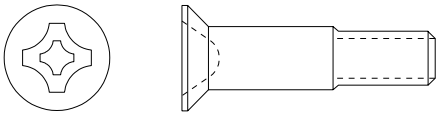
BACB30NU (TITANIUM)



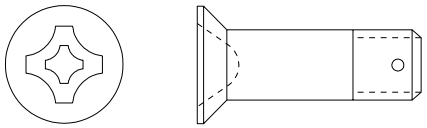
BACB30UR (TITANIUM)



BACB30LL (CRES)



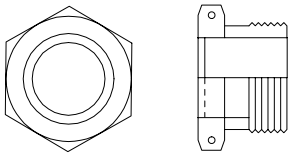
BACB30VF (TITANIUM)
BACB30XD (TITANIUM)



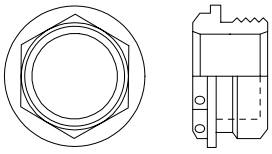
BACB30ZE (CRES)

BACB30DP, BACB30EL, BACB30FB, BACB30LL, BACB30RF, BACB30NU, BACB30UR, BACB30UW, BACB30VF, BACB30XD, BACB30ZE, NAS1581	
BOLT SIZE	TORQUE RANGE POUND -INCHES (Nm)
1/4-28	38-40 (4.29-4.52)
5/16-24	92-98 (10.39-11.07)
3/8-24	97-103 (10.96-11.64)
7/16-20	155-165 (17.51-18.64)
1/2-20	223-237 (25.20-26.78)
9/16-18	300-320 (33.90-36.15)
5/8-18	407-433 (45.98-48.92)
3/4-16	660-700 (74.57-79.09)
7/8-14	1070-1130 (120.89-127.67)
1-12 OR 1-14	1600-1700 (180.77-192.07)

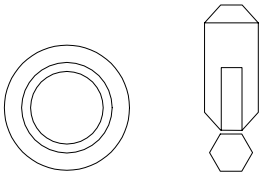
Torque for Reduced-Head Bolts
Figure 204



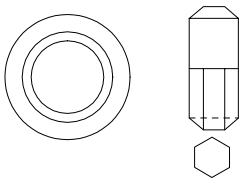
NAS591



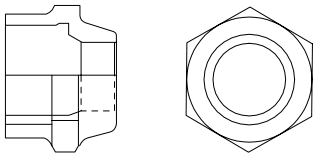
NAS594



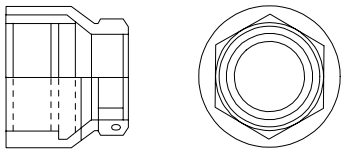
NAS592



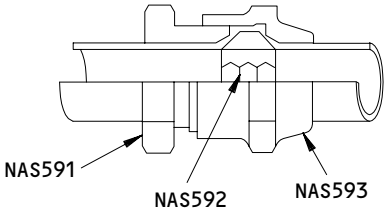
NAS595



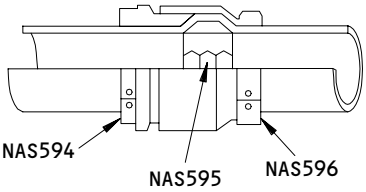
NAS593



NAS596



CONNECTION ASSEMBLY (REF)



CONNECTION ASSEMBLY (REF)

TUBE OD (INCHES)	ALUMINUM ALLOY FITTINGS NAS591-593		STAINLESS STEEL FITTINGS NAS594-596	
	TORQUE (POUND-INCHES)		TORQUE (POUND-INCHES)	
	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM
1	480	720	480	720
1-1/4	600	900	600	900
1-1/2	600	900	600	900
2	900	1200	900	1200
2-1/2	1500	1800	1800	2100
3			1800	2100
4			2400	2700

Standard Torque Values for Rigid Tube Coupling Connectors
Figure 205

PIPE THREAD SIZE (INCHES)	ALL PIPE EXCEPT STAINLESS STEEL TO STAINLESS STEEL		STAINLESS STEEL TO STAINLESS STEEL PIPE FITTINGS	
	TORQUE (POUND-INCHES)		TORQUE (POUND-INCHES)	
	WORKING	MAXIMUM	MINIMUM	MAXIMUM
1/8	100	175	100	150
1/4	150	300	100	275
3/8	225	450	100	400
1/2			100	500
3/4			150	600
1			200	800

Standard Torque Values for Pipe Thread Fittings
Figure 206

TUBE OD (INCHES)	FITTING NUT SIZE	TORQUE 1 (POUND-INCHES)	TORQUE 2 (POUND-INCHES)
1/4	-4	110	65
5/16	-5	140	90
3/8	-6	170	130
1/2	-8	280	260
5/8	-10	360	360
3/4	-12	450	500
1	-16	750	700
1-1/4	-20	900	900
1-1/2	-24	900	900
2	-32		2000

NOTE: THE TORQUE VALUES ARE APPLICABLE TO ALL WALL THICKNESSES FOR A GIVEN DIAMETER TUBE AND HAVE A ±5% TOLERANCE.

1 THE TORQUE VALUES ARE APPLICABLE TO:

(1) FLARED ALUMINUM TUBE ENDS
(2) FLARELESS ALUMINUM TUBE ENDS WITH BACS13BX SWAGED SLEEVES
(3) FLARELESS TYPE HOSE END FITTINGS WITH ALUMINUM INSERTS
(4) STANDARD MS FLARELESS TUBE ENDS ON 6061-T6 ALUMINUM TUBING AND ON ANNEALED CRES TUBING. ANNEALED CRES TUBING IS IDENTIFIED BY A WIDE YELLOW BAND ADJACENT TO THE TUBING-USE IDENTIFICATION CODE MARKINGS

2 THE TORQUE VALUES ARE APPLICABLE TO FLARED HOSE END FITTINGS WITH ALUMINUM INSERTS

Standard Torque Values for Low Pressure and Return Line Fittings
Figure 207

TUBING SIZE (INCHES)		INSTALLATION TORQUE ON FLARELESS TUBING FITTINGS/BOSSES 3 4 (POUND-INCHES, ±5%) NOTE: YOU MUST USE CARE WHEN YOU SELECT THE CORRECT TORQUE FOR REDUCER FITTINGS. YOU MUST FIND THE CORRECT FITTINGS INSTALLATION TORQUE FOR THE SIZE OF THE BOSS OR BULKHEAD.	
OD	TUBE DASH NO.	STEEL AND TITANIUM TUBES 1	ALUMINUM AND ANNEALED CRES TUBES 2
3/16	-3	100	80
1/4	-4	140	110
5/16	-5	190	140
3/8	-6	270	170
1/2	-8	500	280
5/8	-10	700	360
3/4	-12	900	450
1	-16	1200	750
1-1/4	-20	1600	900
1-1/2	-24	2000	900
2	-32	2000	---

NOTE: 1. TO USE ALUMINUM TUBE TORQUE VALUES FOR ALUMINUM, STEEL, OR TITANIUM FITTINGS IN ALUMINUM BOSSES.
2. TO USE STEEL TUBE TORQUE VALUE FOR STEEL OR TITANIUM FITTINGS INSTALLED IN STEEL OR TITANIUM BOSSES.

1 THESE TORQUE VALUES ARE APPLICABLE TO THESE TUBE ENDS:
A. 21-6-9 STEEL WITH BACS13BX SWAGED SLEEVE
B. CRES STEEL WITH BACS13BX SWAGED SLEEVE
C. AMS-T-6845 CRES WITH BACS13AP PRESET SLEEVE 5
D. HOSE END FITTINGS WITH STEEL INSERTS (NIPPLES)
E. ALL TITANIUM TUBE ENDS.

2 THESE TORQUE VALUES ARE APPLICABLE TO THESE TUBE ENDS:
A. ALUMINUM WITH BACS13BX SWAGED SLEEVES
B. 6061-T6 ALUMINUM WITH PRESET BACS13AP SLEEVES 6
C. ANNEALED CRES WITH PRESET BACS13AP SLEEVES 6
D. HOSE END FITTINGS WITH ALUMINUM INSERTS (NIPPLES).

Installation Torque for Flareless Tubing Fittings
Figure 208 (Sheet 1)

3 YOU MUST USE CARE WHEN YOU SELECT THE CORRECT TORQUE FOR REDUCER FITTINGS. YOU MUST FIND THE CORRECT FITTINGS INSTALLATION TORQUE FOR THE SIZE OF THE BOSS OR BULKHEAD.

4 TUBE MATERIAL SPECIFICATIONS:
A. 6061-T6 ALUMINUM - AMS-T-7081, WW-T-700/6
B. ANNEALED CRES - MIL-T-8504, MIL-T-8606, MIL-T-8808
C. 1/8 HARD CRES - AMS-T-6845
D 21-6-9 CRES - BMS 7-185
E. TI-3AL-2.5V - BMS 7-234

5 THESE TORQUE VALUES ARE APPLICABLE TO STANDARD MS FLARELESS TUBE ENDS (BACS13AP SLEEVES) ON AMS-T-6845 (304-1/8 HARD) TUBING WITH THE MINIMUM WALL THICKNESS BELOW:

SIZE	-4	-5	-6	-8	-10	-12
WALL THICKNESS	0.020	0.020	0.028	0.034	0.049	0.049

USE THESE TORQUE VALUES FOR SPECIAL THIN WALL AMS-T-6845 (304-1/8h) TUBING:

SIZE	-8	-10	-12
WALL THICKNESS	0.028	0.035	0.042
TORQUE (POUND-INCHES)	375	575	725

6 USE THESE TORQUE VALUES FOR STANDARD MS FLARELESS TUBE ENDS (BACS13AP SLEEVES) ON 6061-T6 ALUMINUM AND ANNEALED CRES TUBING WITH THE MINIMUM WALL THICKNESS BELOW:

SIZE	-3	-4	-5	-6	-8	-10	-12	-16
WALL THICKNESS	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.035

USE THESE TORQUE VALUES FOR SPECIAL THIN WALL ANNEALED CRES TUBING:

SIZE	-6	-10	-12
WALL THICKNESS	0.020	0.020	0.020
TORQUE (POUND-INCHES)	160	250	325

Installation Torque for Flareless Tubing Fittings
Figure 208 (Sheet 2)

BOEING PART NUMBER (BAC5001-9, TABLE VII)	DASH NUMBER ( )	TORQUE (POUND-INCHES) +5 -0
BACC10AUU()	250-275	70
	300-500 550-600	100
BACC10BR8()	100-900	100
BACC10CT2()	100-600	
BACC10DP()A	150-250	50
BACC10DP()B	300	
BACC10DP()AB	350-400	
	450-600	70
BACC10DU()AB	100-175	50
	200-275	55
	300-450	60
	500-600	65
	700-1000	75
BACC10EY()B	150-800 425-800	105
	150-400	75
BACC10EZ()B	125-275	75
	300	105
	125-300	
BACC10LE()	150-175	40
	200-275	45
	300-450	50
	475-600	55
	650-900	65
BACC10HX()	100-300	10
	325-500	15
	550-800	20
NUCO (U430453)	125	55-65
BACC10KH	200-275	45
	300-475	55
	500-550	60
	600-650	65
	700	70
BACC10AC	150-200	40-50
	225-300	60-70
	315-550	120-140

COUPLING CLAMPS, V-BAND, AND CHANNEL-BAND [1]

[1] THE RECOMMENDED TIGHTENING PROCEDURE IS AS FOLLOWS:
1. APPLY THE INSTALLATION TORQUE AS GIVEN IN THE TABLE.
2. HIT THE ENTIRE CIRCUMFERENCE OF THE CLAMP LIGHTLY WITH A WOOD, LEATHER, OR SOFT PLASTIC MALLET.
3. DO STEPS 1 AND 2 UNTIL THE TORQUE WILL STAY CONSTANT.

Standard Torque Values for Clamps
Figure 209 (Sheet 1)

CHANNEL BAND CLAMPS		
TYPE	DUCT OD (INCHES)	TORQUE (POUND-INCHES)
BACC10CT	1.00-6.00	100-105 2

DUCT-SUPPORT CLAMPS		
TYPE	DUCT OD (INCHES)	TORQUE (POUND-INCHES)
BACC10AD	2.00-8.00	20-25

HOSE CLAMPS		
TYPE	HOSE OD (INCHES)	TORQUE (POUND-INCHES)
BACC10BN	1.75-20.00	20

ROYLYN COUPLING		
TYPE	DUCT OD INCHES/MATERIAL	TORQUE (POUND-INCHES)
BACR12H	1.50/5052-0 1.50/STAINLESS 1.75/5052-0 2.00/5052-0 2.50/5052-0	600-1000 900-1200 900-1200 1300-2500 2000-3000

2 INSIDE OF COUPLING IS NOT LUBRICATED.

Standard Torque Values for Clamps
Figure 209 (Sheet 2)

OFF-AIRPLANE DATA LOADING - MAINTENANCE PRACTICES

1. General
   A. On-board software loadable LRUs can be loaded with software on the airplane using the AMM Software Installation procedures for each software loadable LRU or off the airplane using these off-airplane loading procedures. The AMM on-airplane Software Installation procedure for each software loadable LRU is contained within the respective ATA chapter for the LRU. This procedure provides details for the software loading of an LRU off the airplane.

   TASK 20-15-01-472-001

2. Off-Airplane Software Installation
   A. Equipment
      (1) Off-airplane data loading equipment may have the capability to support various interfaces: i.e., ARINC 429, ARINC 629, RS232, and PC cards. Off-airplane data loading equipment may be used to load several software loadable LRUs. Reference the airlines off-airplane data loading policy to determine which LRUs can be off-airplane loaded with the following equipment. For off-airplane data loading equipment information contact an off-airplane data loading equipment vendor directly.
         (a) QSL7X7, Shop Data Loader
             Qualtair Equipment and Engineering (Vendor Code 1HEC2)
             15720 Mill Creek Boulevard, Suite 200, Mill Creeek, WA 98012
         (b) 615 FDS, Flightline Dataload Station
             Qualtair Equipment and Engineering (Vendor Code 1HEC2)
             15720 Mill Creek Boulevard, Suite 200, Mill Creeek, WA 98012
         (c) Data Loader - Shop
             Pentar Avionics Headquarters
             19820 North Creek Parkway Suite 102, Bothell, WA 98011
         (d) or equivalent.
   B. Procedures

      S 022-002
      (1) Off-airplane data loading is accomplished on software loadable LRUs that are removed from the airplane or are taken out of stores.

      S 422-003
      (2) An LRU which is removed from the airplane for the purpose of off-airplane loading must be installed using the AMM Removal and Installation procedures. The R & I procedures will require that you make sure that the correct software is installed in the LRU.

S 942-004

(3) Refer to the appropriate airline's documentation for the correct software part number or numbers for each software loadable LRU prior to performing this software loading procedure.

S 942-005

(4) The procedures for software loading using off-airplane data loading equipment are documented in the respective supplier's off-airplane data loading equipment user's manual.

S 942-006

(5) Refer to the airline's off-airplane data loading policy for additional off-airplane loading equipment and procedures information.

TASK 20-15-11-402-001

1. On-Airplane Software Installation

A. General

(1) Software Installation Times

(a) The time required to install software in a component is variable and is dependent on several factors that include:

1) Retrieval of the correct software media, applicable equipment and Maintenance Manual procedure.
2) Setup procedures.
3) Data transfer time.
4) Software configuration check.
5) Return to usual airplane configuration.
6) Airline completion procedures.

(2) Data Transfer Times

(a) The data transfer time is the actual time from disk or disks insertion into the data loader until the data transfer is complete.

(b) The data transfer time depends on:

1) The number of disks.
2) The type and size of software files on each disk.
3) The unique protocols and processors of the data loader.
4) The unique internal protocols and processors of the component.
5) Disks inserted in a timely manner.

(c) Typical data transfer times are:

1) Operational Program Software (OPS): approximately 5 to 16 minutes per disk; for example, if the OPS has four disks, then the complete installation can take as long as 64 minutes.
2) Operational Program Configuration (OPC): approximately 1 to 3 minutes per disk.
3) Databases (DB): approximately 3 to 15 minutes per disk.

4) Airline Modifiable Information (AMI): approximately 3 to 15 minutes for each disk.

(d) Short Load

1) Some components can do a short load.
2) During a short load, only pieces of software that are different from what is already in the component are installed during data transfer. This can cause a data transfer time that is much shorter than the time given in Table 201. It is possible that some disks will not be used during software installation.
3) You know that the correct software is installed when the correct software part number shows for the software configuration check.
4) The Flight Management Computer (FMC) is an example of a component that can do a short load.

(3) Table 201 - Data Transfer Times

(a) Table 201 shows data transfer times for components that are approved for on-airplane software installation. Not all components are installed on all airplanes. If a component is installed on an airplane, then there is a software installation procedure applicable to that airplane. The software installation procedure is in the AMM chapter-section given in the table.

(b) The types of software installed in a component on one airplane can be different than the types of software installed in the component on a different airplane. For example, the FMC navigation data base software must be installed in the FMC in all airplanes, but the other software that is necessary for the FMC is different for different FMC software part numbers.

1) A component on the list can have some hardware part numbers that are approved for software installation and other hardware part numbers that are not approved for software installation. An example of this is the flight data acquisition unit.
2) Refer to airline part number records to find software part numbers for applicable components.

(c) Data transfer times are approximate times in minutes for software installed from disks with a data loader. Data transfers can fail, and failure of the data transfer will increase the total time necessary for software installation. Data transfer times are supplied only as an aid to help you schedule work.

(d) The times given are for the installation of one piece of software into one component.

1) If a component has more than one piece of software, then you must add the time for each piece to find the total data transfer time for the component.

2) If a system has more than one of a given component, and software is to be installed in each one, you must multiply the time given in the table by the total number of components to find the total data transfer time for the system.
   a) For example, if a left and a right component are installed on the airplane, you must multiply the time given in the table by two to find the total data transfer time for the two components.
   b) Some systems can cross-load software between components. Usually it is faster to cross-load software than to install software with a data loader. The Flight Management Computer System (FMCS) is an example of a system that can cross-load.

Table 201

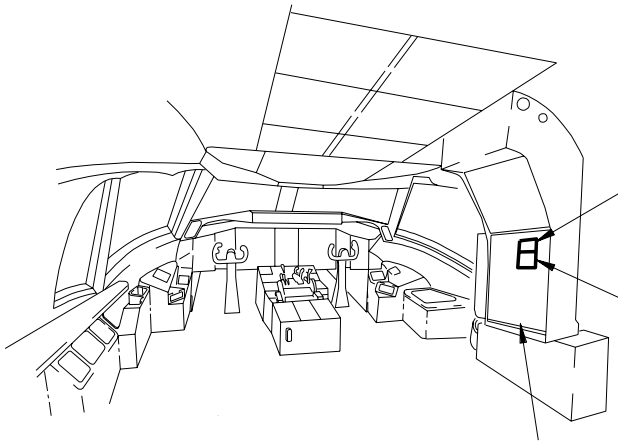
AMM Chapter Section	Component	Software	Data Transfer Time (in Minutes)
23-25	Satellite Data Unit (SDU) (Rockwell Collins)	OPS ORT (DB) (1 OR 2)	15 to 48 1 to 5
23-25	Satellite Data Unit (SDU) (Honeywell)	USER ORT (DB) SECURED ORT (DB)	1 to 5 1 to 5
23-22	ACARS Management Unit (MU/CMU) (some Allied Signal units)	CORE & Application (OPS) Airplane Database (DB)	5 to 16 1 to 15
23-22	ACARS Management Unit (MU/CMU) (some Rockwell Collins units)	CORE (OPS) AOC (DB)	2 to 16 3 to 15
23-22	ACARS Management Unit (MU/CMU) (some Teledyne units)	Application (OPS)	5 to 16
23-22	ACARS Multi-Purpose Display Unit (MIDU) (Allied Signal)	OPS *[1]	3 to 6
23-32	Digital Interface Unit (Passenger Flight Information Display System)	Airshow DB *[2]	3 to 15
23-34	Cabin Services System (CSS) Passenger Service Controller (PSC)	OPS (Phase I) OPS (Phase II) DB (Phase I) DB (Phase II)	6 to 10 12 to 18 1 to 2 6 to 12
23-34	Cabin Services System (CSS) Local Area Controller (LAC)	OPS (Phase I) OPS (Phase II) DB (Phase II)	4 to 5 5 to 15 6 to 12

Table 201

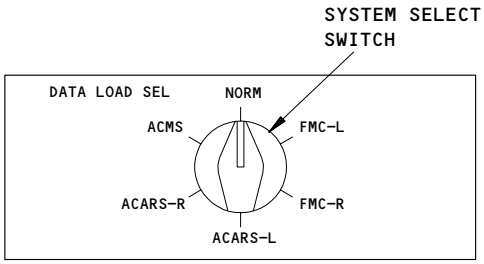
AMM Chapter Section	Component	Software	Data Transfer Time (in Minutes)
23-34	Cabin Services System (CSS) Overhead Electronics Unit (OEU)	DB (Phase II)	6 to 12
31-31	Digital Flight Data Acquisition Unit (some units)	DFDAU Mandatory (OPS) *[3] ACMS Monitoring (OPS) *[3]	5 to 32 3 to 20
31-35	Optical Quick Access Recorder (Teledyne)	OPS *[4]	30
31-41	Engine Indicating & Crew Alerting (EICAS) Computer (-1000 Series)	OPS OPC	5 to 16 1 to 3
34-22	EFIS Symbol Generator	OPS	5 to 16
34-46	Enhanced Ground Proximity Warning Computer (EGPWC)	DB *[1]	5 to 45
34-61	Flight Management Computer (FMC) (FMC SW P/N -90X)	OPS OPC AMI FIDO NAV DB	35 to 112 1 to 3 2 to 15 1 to 3 6 to 30
34-61	Flight Management Computer (FMCS) (FMC SW P/N -95X)	OPS NAV DB	5 to 16 6 to 30
34-61	Flight Management Computer (FMCS) (FMC SW P/N -93X, -94X)	NAV DB	6 to 30

*[1] Software is installed from PCMCIA card.
*[2] Software is installed from disk or CD-ROM.
*[3] Software is installed from disk or PCMCIA card.
*[4] Software is installed from disk drive at component front panel

(4) Data Loaders
   (a) This procedure supplies general information about data load equipment. You can find the data load equipment for the airplane configuration in the Flight Management Computer System (34-61-00/001).
   (b) A data loader is a disk drive that connects to a component through interface wiring. Software disks are inserted into the disk drive and the data is transferred to the component.
   (c) There are two types of data loaders: Airborne Data Loaders (ADL), and Portable Data Loaders (PDL).
   (d) An airborne data loader is a data loader that is installed in the flight compartment on the P61 panel.
   (e) A portable data loader (PDL) is equipment that is moved to the airplane to install software. The PDL is removed from the airplane when the task is complete.
   (f) If a data loader control panel is installed on the P61 panel, then software can be installed in components that have interface wiring for a data loader. The data loader control panel has a switch position for each component that can receive software. INOP labels are attached on switch positions that are not available for software installation.
   (g) If the airplane has a data loader control panel, then it will also have an airborne data loader (ADL) or a connector panel for a portable data loader (PDL) on the P61 panel.
   (h) If an FMC data base loader connector is installed in the flight compartment on the P6 panel, then FMC software is installed through that connector with a PDL.
   (i) Figure 201 shows examples of data loader control panels, airborne data loaders, the connector panel for a portable data loader, and FMC data base loader connectors.
(5) Alternative Software Installation
   (a) Usually software is installed with a data loader in the flight compartment. But some components have a disk drive, CD-ROM drive, PDL connector, or PCMCIA (Personal Computer Memory Card International Association) interface for software installation at the front of the component.

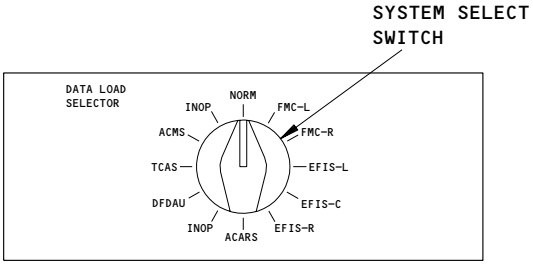


FLIGHT COMPARTMENT



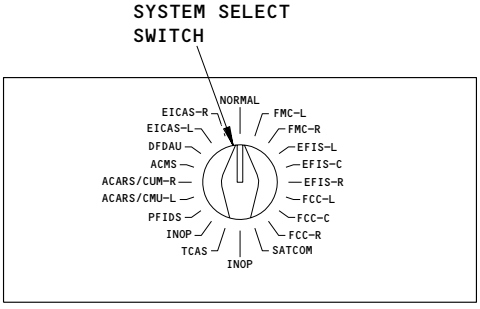
DATA LOADER CONTROL PANEL (EXAMPLE)

A



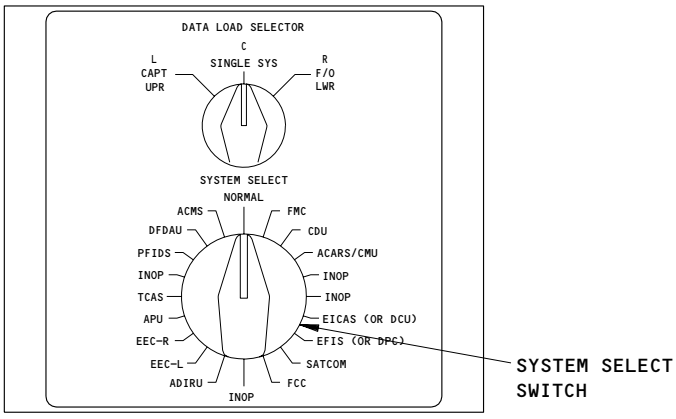
DATA LOADER CONTROL PANEL (EXAMPLE)

A



DATA LOADER CONTROL PANEL (EXAMPLE)

A



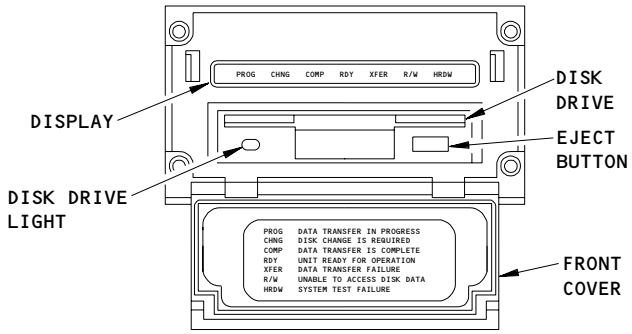
DATA LOADER CONTROL PANEL (EXAMPLE)

A

On-Airplane Software Installation
Figure 201 (Sheet 1)

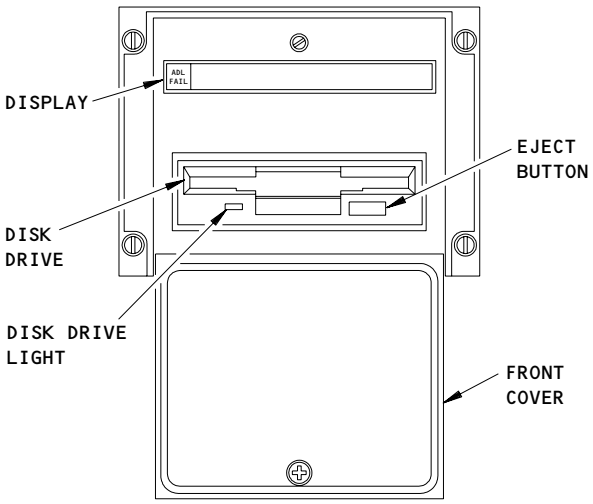
EFFECTIVITY
AIRPLANES WITH
DATA LOADER CONTROL PANEL

L43825



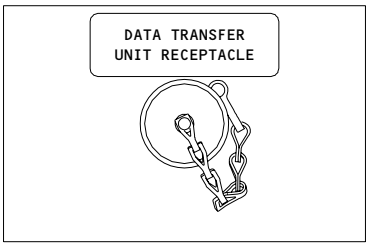
AIRBORNE DATA LOADER
[ALLIED SIGNAL (SUNDSTRAND)]

B



AIRBORNE DATA LOADER
(TELEDYNE)

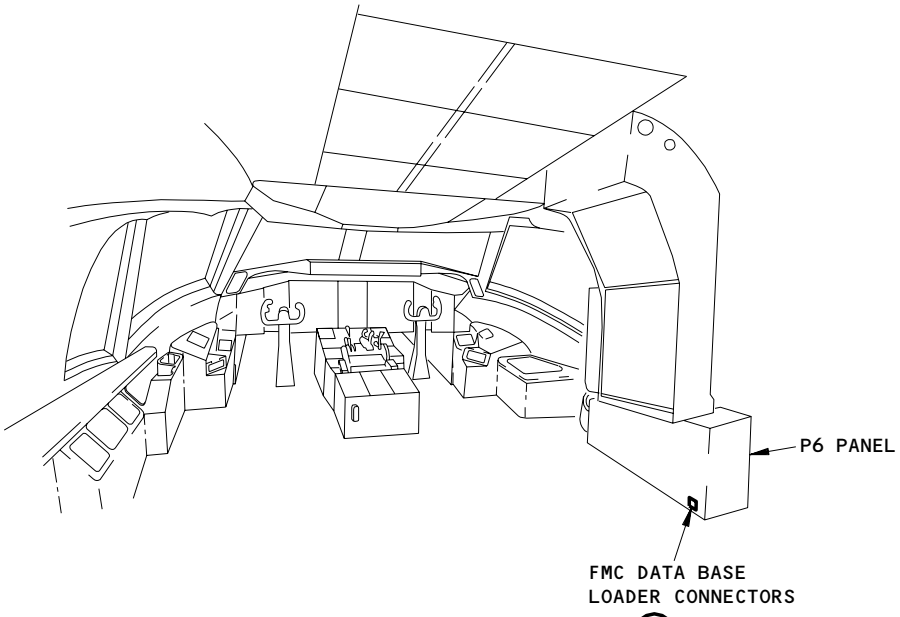
B



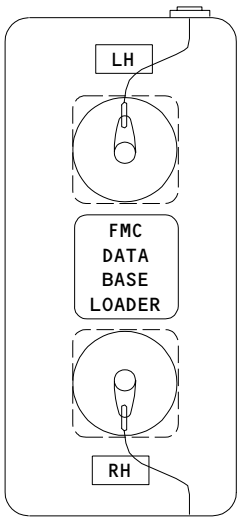
CONNECTOR PANEL
FOR PORTABLE DATA LOADER

C

On-Airplane Software Installation
Figure 201 (Sheet 2)



FLIGHT COMPARTMENT



FMC DATA BASE
LOADER CONNECTORS
(EXAMPLE)

D

On-Airplane Software Installation
Figure 201 (Sheet 3)

EFFECTIVITY
AIRPLANES WITH
FMC DATA BASE LOADER CONNECTOR

L43838

(6) Airborne Data Loaders (ADL)
(a) This procedure supplies examples for operation of these ADLs:
1) Allied Signal (Sundstrand)
2) Teledyne
(7) Portable Data Loaders (PDL)
(a) A PDL has an interface cable that is connected to the DATA TRANSFER UNIT RECEPTACLE connector (P61) or to the FMC DATA BASE LOADER connector (left side) in the flight compartment. The circuit breaker that supplies power for the PDL must be open when a PDL is connected or disconnected.
(b) PDLs are not Boeing supplied parts. Refer to the data loader supplier for instructions for PDL operation.
(8) OPC Content
(a) AIRPLANES WITH OPC;
OPC content can be found on myBoeingFleet.com via the "Airplane Loadable Software" link.

B. References
(1) AMM 24-22-00/201, Control

C. Allied Signal (Sundstrand) Airborne Data Loader Procedure

S 862-003
(1) The Allied Signal ADL has these status lights:
(a) PROG (In Progress) - shows as software installation occurs.
(b) CHNG (Change) - shows when it is time to install the next disk.
(c) COMP (Complete) - shows when the software installation is completed.
(d) RDY (Ready) - shows when the disk is in the disk drive and the ADL is ready to install the software in the component.
1) If the RDY indication flashes, then the data loader is in standby mode while it waits for the component to validate the data.
(e) XFER (Transfer Fail) - shows when the software installation is not completed. Open and close the circuit breaker for the component, and start the installation again.
(f) R/W (Read/Write) - shows when the ADL cannot read or write the data on the disk. Open and close the circuit breaker for the component, and start the installation again. If the problem continues, then replace the disk.
(g) HRDW (Hardware) - shows when the ADL fails the self test.

S 862-004
(2) Supply electrical power (AMM 24-22-00/201).
(a) Make sure that the power is not removed while you install software.

NOTE: A power interruption will cause a failure of the software installation.

S 862-005
(3) Make sure that the system select switch on the data loader control panel (P61) is set to the NORMAL position.

S 862-006
(4) Open this circuit breaker:
(a) On the overhead circuit breaker panel, P11:
1) 11G24, DATA LOADER

S 012-007
(5) To open the ADL front cover, pull at the top edge.

S 862-008
(6) Push the eject button on the ADL.
(a) If a plastic protective disk is ejected from the disk drive, then remove it.

S 862-009
(7) Close this circuit breaker:
(a) On the P11 panel:
1) 11G24, DATA LOADER

S 862-010
(8) Wait until all the status lights are off.

NOTE: The status lights will flash on and off while the ADL does a self test.

S 862-011

(9) Make sure that the circuit breakers are closed for the applicable component or system that will receive the new software.

S 422-012

(10) Do these steps at the ADL to install the software:

NOTE: You must know the correct software part numbers for the component. For the component to be an approved installation, software with the correct part numbers must be installed.

NOTE: This is a general procedure for software installation. Some components have other steps that are necessary. The software installation task for the component will include all necessary steps.

(a) Set the switch or switches on the data loader control panel to the applicable position for your component or system.

(b) Carefully push the first disk (label up) into the disk drive.

NOTE: If the destination component is active, the installation sequence will begin and the RDY light will come on. When the data transfer begins, the PROG light will come on. The RDY light can flash when the component validates the data. If the software is on more than one disk, the CHNG light will come on when it is time to put in the subsequent disk.

(c) If the CHNG light comes on, wait approximately 10 seconds and then push the eject button.

NOTE: The installation can fail if you wait too long before you remove and install disks.

1) Remove the disk from the disk drive.
2) Put the subsequent disk into the disk drive.

3) If there are more than two disks for the software installation, then remove and install disks until the COMP light shows.

(d) When the COMP light comes on, wait approximately 10 seconds and then push the eject button.

(e) Remove the disk from the disk drive.

(f) If there was a plastic protective disk in the disk drive before you installed software, then put it back into the disk drive.

S 862-013

(11) Set the system select switch on the data loader control panel to the NORMAL position.

S 412-014

(12) Close the front cover on the ADL.

S 742-015

(13) Make sure that the correct software part numbers are installed in the component.

NOTE: The software installation task for the component has the steps to do a software configuration check.

S 862-016

(14) Remove electrical power (AMM 24-22-00/201).

D. Teledyne Airborne Data Loader Procedure

S 862-017

(1) Supply electrical power (AMM 24-22-00/201).

(a) Make sure that the power is not removed while you install software.

NOTE: A power interruption will cause a failure of the software installation.

S 862-018

(2) Make sure that the system select switch on the data loader control panel (P61) is set to the NORMAL position.

S 862-019

(3) Open this circuit breaker:

(a) On the overhead circuit breaker panel, P11:

1) 11G24, DATA LOADER

S 012-020

(4) To open the ADL front cover, turn the cover knob clockwise and pull.

S 862-021
(5) Push the eject button on the ADL.
(a) If a plastic protective disk is ejected from the disk drive, then remove it.

S 862-022
(6) Close this circuit breaker:
(a) On the P11 panel:
1) 11G24, DATA LOADER

S 862-023
(7) Wait until the display shows INSERT DISK #1.

NOTE: The display lights and the ADL FAIL light will go on and off while the ADL does a self test. When the self test is complete, the display will show INSERT DISK #1.

S 862-024
(8) Make sure that the circuit breakers are closed for the applicable component or system that will receive the new software.

S 422-025
(9) Do these steps at the ADL to install the software:

NOTE: You must know the correct software part numbers for the component. For the component to be an approved installation, software with the correct part numbers must be installed.

NOTE: This is a general procedure for software installation. Some components have other steps that are necessary. The software installation task for the component will include all necessary steps.

(a) Set the switch or switches on the data loader control panel to the applicable position for your component or system.
(b) Carefully push the first disk (label up) into the disk drive.

NOTE: The display will show DISK INSERTED and then VOL:. If the destination component is active, the display will then show the file, extension and the percent of the file transfer completed. If there is more than one file, the ADL will install the next file until all files are completed. If the software is on more than one disk, then the display will show CHANGE DISK or INSERT DISK when it is time to put in the subsequent disk.

NOTE: If TRANSFER FAIL shows, then the installation is not completed. Open and close the circuit breaker for the component, and start the installation again.

IF READ/WRITE FAIL shows, then there is a problem with the disk. Open and close the circuit breaker for the component, and start the installation again. If the problem continues, then replace the disk.

(c) If CHANGE DISK or INSERT DISK shows on the display, wait approximately 10 seconds and then push the eject button.

NOTE: The installation can fail if you wait too long before you remove and install disks.

1) Remove the disk from the disk drive.
2) Put the subsequent disk into the disk drive.
3) If there are more than two disks for the software installation, then remove and install disks until LOAD COMPLETE shows on the display.

(d) When LOAD COMPLETE shows on the display, wait approximately 10 seconds and then push the eject button.
(e) Remove the disk from the disk drive.
(f) If there was a plastic protective disk in the disk drive before you installed software, then put it back in the disk drive.

S 862-026
(10) Set the system select switch on the data loader control panel to the NORMAL position.

S 412-027
(11) Close the front cover on the ADL.

S 742-028
(12) Make sure that the correct software part numbers are installed in the component.

NOTE: The software installation task for the component has the steps to do a software configuration check.

S 862-029
(13) Remove electrical power (AMM 24-22-00/201).

E. Optional Loading Methods

NOTE: Use this procedure when a airplane is configured for a ADL, but a PDL is the only type of loader available.

S 862-030
(1) Make an adapter cable to attach the PDL to an ADL connector.
  (a) Use the PDL supplier's manual to find the pins on these connectors to assemble an adapter cable:
    1) The MS27473T18A53S connector connects with the PDL connection.
    2) The MS27508E18A53P connector connects with the airplane connection.

S 862-031
(2) Make sure that the ADL is not energized and the select switch is in the NORMAL position.

S 022-032
(3) Turn four mounting screws to the left to remove the ADL.

S 022-033
(4) Remove the ADL.

S 862-034
(5) Disconnect the airplane connector from the rear of the ADL.

S 862-035
(6) Connect the adapter cable as follows:
  (a) The MS27473T18A53S connector connects with the PDL connection.
  (b) The MS27508E18A53P connector connects with the airplane connection.

S 422-036
(7) Use one of the PDL procedures to install the LRU software.

CONTROL CABLES - INSPECTION/CHECK

1. General
   A. Use these procedures to verify the integrity of the control cable system. The procedures must be performed along the entire cable run in each system. To ensure verification of the portions of the cables that are in contact with pulleys and quadrants, the control cables must be moved by operation of the applicable system's controls, to expose those portions of the cables.
   B. The first task is an inspection of the control cable wire rope.
   C. The second task is an inspection of the control cable fittings.
   D. The third task is an inspection of the pulleys.
   E. These three tasks may be performed concurrently at one location of the cable system on the airplane if desired for convenience.

TASK 20-20-02-216-038

2. Inspection of the control cable wire rope.
   A. Examine the wire rope.

S 146-052

(1) Clean the cables (as necessary) for the inspection (AMM 12-21-31/301).

S 226-041

(2) Perform a detailed visual inspection to make sure that the cable does not contact parts other than pulleys, quadrants, cable seals or grommets installed to control the cable routing. The minimum cable clearance from power feeder cables is 1.0 inch. The minimum cable clearance from other parts is 0.20 inches except 0.10 inches within 10 inches of a pulley or quadrant. Look for evidence of contact with other parts. Correct the condition if inadequate clearance or evidence of contact is found.

S 226-042

(3) Perform a detailed visual inspection of the cable runs for incorrect routing, kinks in the wire rope, or other damage.
   (a) Replace the cable assembly if:
      1) The individual wires in each strand appear to blend together (outer wires worn 40 percent or more) (Refer to Fig. 601).
      2) If a kink is found.
      3) If corrosion is found.

S 226-043

(4) Perform a detailed visual inspection of the cable. To do a check for broken wires, rub a cloth along the cable. The cloth will identify broken wires by catching on them.
   (a) Replace the 7 x 7 cable assembly if:
      1) There is two or more broken wires in 12 continuous inches of cable.

2) There is three or more broken wires anywhere in the total cable assembly.

(b) Replace the 7 X 19 cable assembly if:

1) There is four or more broken wires in 12 continuous inches of cable.

2) There is six or more broken wires anywhere in the total cable assembly.

S 216-051

(5) Inspect the carbon steel control cable lubrication.

(a) Make sure there is sufficient lubrication on the control cable.

(b) If the lubrication is not sufficient, lubricate the control cables (AMM 12-21-31/301).

NOTE: Do not apply the grease or oil to stainless steel (CRES) control cables.

TASK 20-20-02-216-039

3. Inspection of the control cable fittings.

A. Examine the control cable fittings.

S 226-044

(1) Perform a detailed visual inspection to make sure that the means of locking the joints are intact, (wire locking, cotter pins, turnbuckle clips, etc.). Install any missing parts.

S 226-045

(2) Perform a detailed visual inspection of the swaged portions of swaged end fittings for surface cracks or corrosion. Replace the cable assembly if cracks or corrosion are found.

S 226-046

(3) Perform a detailed visual inspection of the unswaged portion of the end fitting. Replace the cable assembly if a crack is visible, if corrosion is present, or if the end fitting is bent more than two degrees.

S 226-047

(4) Perform a detailed visual inspection of the turnbuckle. Replace the turnbuckle if a crack is visible or if corrosion is present.

TASK 20-20-02-216-040

4. Inspection of pulleys.

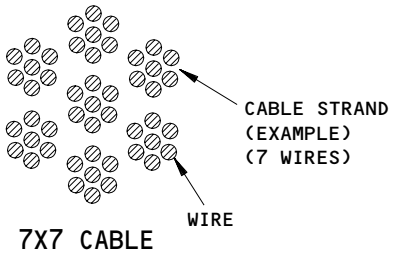
A. Examine the pulleys.

S 226-048

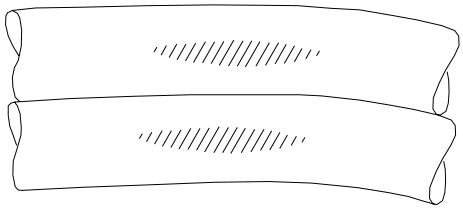
(1) Perform a detailed visual inspection to make sure that pulleys are free to rotate. Replace pulleys which are not free to rotate.

S 226-049

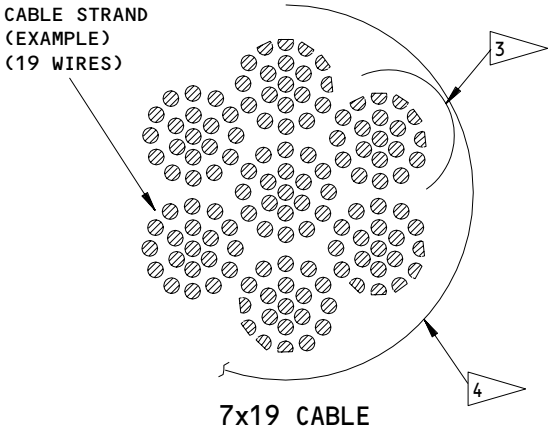
(2) Replace any pulleys that match the description in Fig. 602.



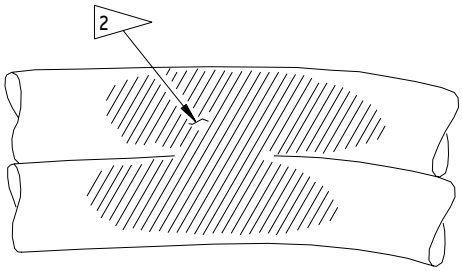
7X7 CABLE



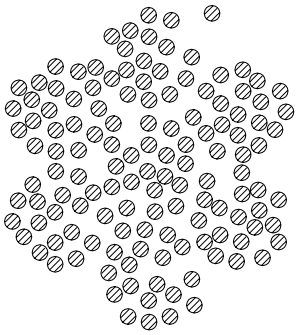
EACH OUTER WIRE WORN
LESS THAN 40%
(WORN AREAS NOT BLENDED)



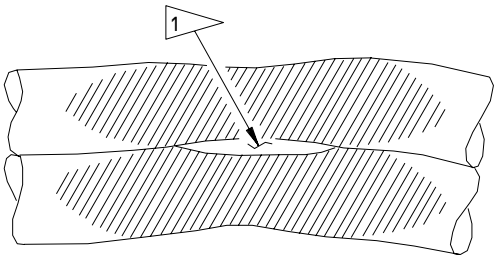
7x19 CABLE



EACH OUTER WIRE WORN 40–50%
(WORN AREAS ARE BLENDED)



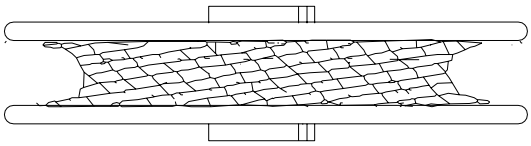
EXAMPLE OF INTERNAL WEAR



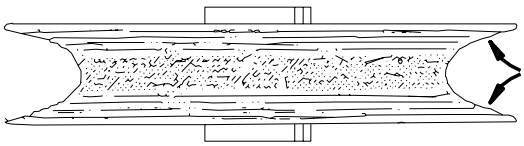
EACH WIRE IS WORN MORE THAN 50%

1. VISIBLE SPACE BETWEEN WIRES.
2. WEAR CONDITION RESULTING IN BLENDED SURFACES BETWEEN WIRES.
3. THE OUTER WIRE WEAR AREA ON CABLE STRAND. A VISIBLE SPACE BETWEEN WIRES 1 OR A FULLY BLENDED SURFACE 2 SURFACE.
4. CABLE WEAR MAY OCCUR ON ONE SIDE ONLY OR ON FULL CIRCUMFERENCE. CABLE WEAR CAN EXTEND ALONG THE CABLE FOR A DISTANCE EQUAL TO USUAL CABLE TRAVEL.

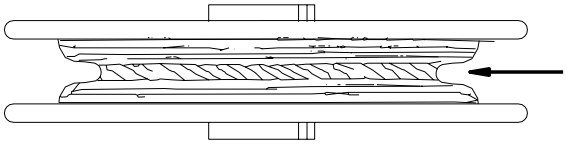
Cable Wear Patterns
Figure 601



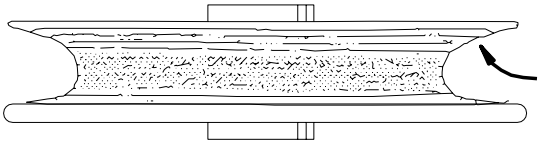
CABLE TENSION TOO HIGH



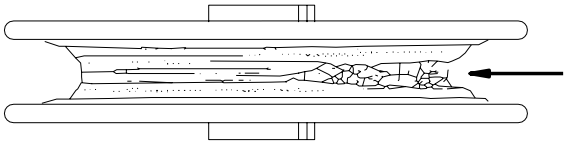
PULLEY NOT ALIGNED CORRECTLY



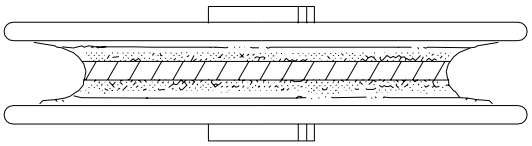
PULLEY GROOVE WITH
EXCESSIVE WEAR



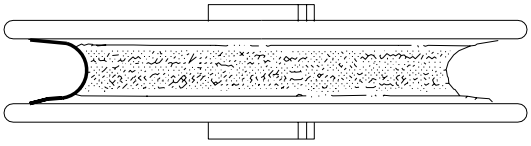
CABLE NOT ALIGNED CORRECTLY



PULLEY WILL NOT TURN



OR



NORMAL CONDITION

Pulley Wear Patterns
Figure 602

279824

SPECIFICATIONS AND MATERIALS - MAINTENANCE PRACTICES

TASK 20-30-00-802-001

1. Maintenance Practices - Specifications and Materials

A. General

(1) Equivalent Consumable Materials

(a) When the procedures in this manual identify a consumable material other than a solvent, you can use an equivalent alternative material that meets the same specification as the original material. For solvents, you must use the information provided by the solvent series tables. If you use alternative materials, make sure that they give the same results and are as safe to the parts and personnel as the consumable material specified in the procedure.

(2) Specifications and materials sections contain lists of consumable materials that can be necessary during regular maintenance of the airplane. Lists are by material:
- Adhesives, Cements, and Sealers
- Cleaners and Polishes
- Finishing Materials
- Lubricants
- Strippers
- Miscellaneous Materials.

(3) The vendor code is a five-character code that identifies a company or a division of a company. Vendor codes are included to help you get the necessary material.

(4) Look at the introduction of the Illustrated Parts Catalog for a list of vendor codes, company names, and company addresses. The vendor codes are in alphabetical and numerical sequence.

ADHESIVES, CEMENTS, SEALERS - MAINTENANCE PRACTICES

1. General
   A. This procedure contains a table of adhesives, cements, and sealers used during maintenance on airplanes. The table gives the material specification (if applicable), the material name and/or number, and the vendor code.

   TASK 20-30-01-992-001

2. Table - Adhesives, Cements, and Sealers
   A. General

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
Adhesive		Adhesive - Catalyst, DC-93-076-1/8	71984
		Bostik 7132C	70707
		Permabond 910 Cyanoacrylate Adhesive	61078
		EPOXY A-2	98911
		Epoxy Resin EA-956	33564
		Epoxy Compound Abradable GE Spec P6TF1, GE C01-060	61680
		Filler, TUF-ON P-24A	09073
		Filler, Ad-Tech 15-Mod-3	
		Furane HT 1835 Resin	99384
		Furane 9816 Hardner	99384
		Hysol A8-F5144 Resin	04347
		Hysol No. 356 Hardner	04347
		Hysol EPD-608	12405
		Expoxi-Patch Kit MB516	81205
		Pro-Seal 727-A	83527
		Pro-Seal 727	83527
		RC680	05972
		RTV-159	81205
		RTV 1200, Clear	71984
		Rubber Cement, B.F. Goodrich No. 4	25472
		Rubber cement, RTV 730	71984
		Silicone (black) RTV-103 GE C01-006	01139
		Silicone (transparent) RTV-108 GE C01-056	01139

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
		SR529 Adhesive Base with SRC-18 Catalyst	71984
		STABON T-100	82999
	BAC 5010, Type 60	RTV 174	01139
		RTV 102	01139
		DC Q3-7063	01184
	BAC 5010, Type 68	93-076 Base	71984
		93-076-2 Catalyst	71984
		DC 1204 Primer	71984
	BAC 5010, Type 72	Bostik 7132C adhesive with BOSCODUR 24 catalyst	70707
	BAC 5010, TYPE 109 BMS 5-14	RTV122 RTV123 RTV128	01139
		Pro-Seal 590M	83527
		M6249	89616
	BMS 5-28, Type 18	Epocast 1618 D/B (Supercedes Epocast 1618A/B)	99384
	BMS 5-30		
		EC 1458	34360
		Bostik 4145	98502
	BMS 5-36, Type II Grade 1	Loctite 414	05972
		Loctite 416	05972
		Permabond 102	0846B
		Loctite 916	05972
	BMS 5-55		
		EC 1870	04963
	BMS 5-91, Type 1	Pressure Sensitive Film	
		3M Y9181	76381
		TM 3129-00	0891B
	Type 2		
		3M 468	76381
		E&H 775	9U930
	Type 3		
		3M Y9181	76381
	BMS 5-92, Type 1	Base EC-2216B (white) Catalyst EC-2216A (amber)	04963

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
	BMS 5-105, Type II, Class 1 Type V Type VI	EC 3532 A/B	04963
	BMS 5-109, Type I	2-Part Epoxy, Room Temperature Cure EA 934 Part A Resin Part B Hardner	12405
		Leveling Compound, EPON 815	22893
	BMS 5-126, Type II	Epibond 1534A/B Part A Resin Part B Hardener	2684
	BMS 5-126, Type III	Epibond 1536A/B Type A Resin Type B Hardener	2684
	BMS 8-245 Type II, Class 1, Grade 08	For composite bonding at 350°F cure FM 300K. 08 PSF Adhesive Film	83339
Cement, Rubber		Silastic 140 Silicone Rubber Cement	71984
		Epibond 126 HN9812 Hardener	99384
Compound, Catalyst, Reducer		Diethylenetriamine (Technical Grade)	Com'l
Compound, Potting	BMS 5-28, Type 6		
		Epocast 33-A/9216	99384
		DC738	71984
		DC3145	71984

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
Compound, Release Agent	BMS 8-40	GE162	30221
		PR 1201Q	83574
		Pro-Seal 727	83527
		GC-1300	04011
		MS-122RA	18598
		MS-122RB	
Compound, Sealing	BMS 5-13		83527
	BMS 5-16	Pro-Seal 567	83527
		PR 205	83574
	BMS 5-19, Class B-1/2	EC 1239 B-1/2	04963
		Pro-Seal 719 B-1/2	83527
		PR 9021 B-1/2	83574
		EC 801	76381
	BMS 5-19, Class B-1		83527
	BMS 5-19, Class B-2,	PR 9021 B-2	83574
		GC-401	04011
		Pro-seal 719 B-2	83527
	BMS 5-19, Class B-4,	Pro-Seal 719 B-4	83527
		EC1239 B-4	04963
		PR 9021 B-4	83574
	BMS 5-19, Class B-8		83527
	BMS 5-45, Class A-2, Type I	P/S 890 A-2	COML

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
	BMS 5-45, Class A-2, Type II	Pro-Seal 890 A-2	COML
	BMS 5-45, Class B-1/2, Type I	PR-1776M B-1/2	COML
	BMS 5-45, Class B-2, Type I	PR-1776 B-2	COML
	BMS 5-45, Class B-2, Type II	PR-1776 B-2	COML
Non-Chromated	BMS 5-150, Class B-2	PR 1775 Sealant	85570
	BMS 5-44, Class B-1/2	Pro-Seal 890 B-1/2	83527
	BMS 5-44, Class B-2	Pro-Seal 890 B-2	83527
	BMS 8-45	EC 1252A Color Specified	76381
Compound - Sealing & Insulation	BMS 5-37, Class B	Sealing & Insulation Compound	83574
		MA25S Trowelable, Type II Precured, Type III	27610
		Crown Metro 68-C3-1 Trowelable, Type II Precured, Type III	06367

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
Compound, Sealing, Locking, Retaining	MIL-S-22473	Sealing, Locking, Retaining Compound	Com'l
		Thread Locktite 277	05972
		Loctite 222	05972
		Microseal 100-1	81205
		Sealant PWA 616	81205
Compound/ Sealing, Locking, Retaining	MIL-S-46163	Compound Locking, Sealer, TP2 Grade IV	07217 81349
		Thread locking Locktite 242	05972
Compound, Self - Leveling	BMS 5-125, Type II	PR 1440 LS A/B	83574
		Pro-Seal 873 A/B	83527
Resin - Fiberglass	BMS 8-201, Type II	Resin - Fiberglass	81205
		Hardener - Epocast No. 946	99384
		Resin - Epocast No. 50A	99384
Seal		Metco Seal AP	A9B35
Sealant		DC 340	71984
		DC Silastic 732	71984
		Dow Corning FS 345	71984
		Dow Corning 93006 Rubber Silicone	71984 81205
		Flexane 80	16059

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
		Nuocure 28 (Tin Octoate)	99559
		RFE96J	76381
		RTV 60	01139
		RTV 106	01139
		RTV 103	01139
		RTV 162	01139
		Silicone RTV 154 with S4213 Primer	01139
		Silicone Rubber RTV560	01139
		Loctite 290	05972
Sealant,	BMS 5-35, Type I, Grade A	Electrically Conductive 584-29	18565
	BMS 5-45	Sealant, Integral Fuel Tank	Coml
	BMS 5-95, B-1/4	PR 1826 B-1/4	83574
	B-1/4	PR 1828 B-1/4	83574
	B-1/2	PR 1826 B-1/2	83574
	B-1/2	PR 1828 B-1/2	83574
	B-1/2	PR 1436G B-1/2	83574
	B-2	Pro-Seal 870 B-2	83527
	B-4	PR 1436G B-2	83574
	C-24	PR 1436G C-24	83574
	C-48	PR 1436G C-48	83574

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
	BMS 5-81,	Integral fuel tank, Secondary Fuel	
	Type II		
	Class 1	PR 1196	83574
	Class 2	PR 1197	83574
Sealant and Primer	BMS 5-63, Class B-4		58093
		Compound	
		Dapcocast 18-4	58093
		Primer	
		Dapco No. 1-100	58093
Sealant, Chromate	BMS 5-95,		
	Type I, Class B-1/2	PR 1436G B-1/2	83574
	Type I, Class B-2	PR 1436G B-2	83574
	Type I, Class B-4	PR 1436G B-4	83574
	Type I, Class E-2	PR 1436G E-2	83574
	Type I, Class F-1	PR 1432GP	83574
	Type I, Class B-2	Pro-Seal 870 B-2	83527
	Type I, Class C-20	Pro-Seal 870 C-20	83527
	Type I, Class C-80	Pro-Seal 870 C-80	83527
	Type I, Class C-168	Pro-Seal 870 C-168	83527
	Type I, Class G-80	Pro-Seal 870 Sprayable-80	83527
	Type I, Class G-120	Pro-Seal 870 Sprayable-120	83527
	Type I, Class G-168	Pro-Seal 870 Sprayable-168	83527
Sealant, Temperature Resistant	MIL-S-8802	PR 1422	83574
Sealant, Windshield		1425 (Polysulphide) B-1/2 or B-2	83574

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
		Micromesh Kit SNZ Pro-Seal 860 Class B	32834 83527

PERMITTED SUBSTITUTES FOR INITIAL SPECIFIED SEALANT							
INITIAL SPECIFIED SEALANTS	PERMITTED ALTERNATIVE SEALANTS						
	BMS 5-45	BMS 5-63	BMS 5-95	BMS 5-142 1	PR-1826 2	PR-1828	BMS 5-150
BMS 5-19	YES	NO	NO	NO	YES	NO	NO
BMS 5-26	SEE TABLE III	NO	NO	NO	YES	YES	NO
BMS 5-32	YES	NO	YES	YES	YES	YES	NO
BMS 5-45	---	NO	NO	NO	YES	NO	NO
BMS 5-63	NO	---	NO	NO	NO	NO	NO
BMS 5-79	YES	NO	SEE TABLE II	YES	YES	YES	NO
BMS 5-95	YES	NO	---	YES	YES	YES	YES (CLASS B-2 ONLY)
BMS 5-142	YES	NO	YES	---	YES	YES	YES

TABLE I

BMS 5-79 SEALANT ALTERNATIVES	
INITIAL MATERIAL	ALTERNATIVE MATERIAL
BMS 5-79 CLASS B-1/2 CLASS B-2 CLASS B-4 CLASS B-8 CLASS C-24 CLASS C-48 CLASS D-2	BMS 5-95 CLASS B-1/2 CLASS B-2 CLASS B-4 NONE CLASS C-20 CLASS C-80 BMS 5-16

TABLE II

NOTES

1 THIS ALTERNATIVE IS NOT PERMITTED FOR MATING SURFACE SEAL, PRE-PACK SEALING, AND WET FASTENER INSTALLATION PROCEDURES.

2 THIS SEALANT HAS A PRIMER THAT MUST ALSO BE USED.

Alternate Sealants Data
Figure 201 (Sheet 1)

BMS 5-26, TYPES, CLASSES, GRADE	SUPERSEDED BY BMS 5-45, CLASSES, GRADE
TYPE I, CLASS A-1/2, GRADE 1	CLASS A-2, GRADE 1 OR GRADE 2
TYPE I, CLASS A-2, GRADE 1	CLASS A-2, GRADE 1 OR GRADE 2
TYPE I, CLASS B-1/2	CLASS B-1/2
TYPE I, CLASS B-2	CLASS B-2
TYPE II, CLASS A-2, GRADE 1	CLASS A-2, GRADE 1
TYPE II, CLASS A-2, GRADE 2	CLASS A-2, GRADE 2
TYPE II, CLASS B-2	CLASS B-2
TYPE II, CLASS C-24	CLASS C-24
TYPE II, CLASS C-48	CLASS C-48
TYPE II, CLASS C-168	CLASS C-168

TABLE III

BMS 5-95, TYPES, CLASSES	AVAILABILITY, USES
TYPE I	AVAILABLE IN FORM B (BULK), FORM K (KIT), OR FORM P (MIXED AND FROZEN SEALANT, ALSO KNOWN AS PREMIXED AND FROZEN (PMF)).
TYPE II	AVAILABLE IN FORM P (MIXED AND FROZEN SEALANT, ALSO KNOWN AS PREMIXED AND FROZEN (PMF)) ONLY. SUPERSEDED BY TYPE I FOR FUTURE DESIGN AND PROCUREMENT.
CLASS B	FOR FILLETING, INJECTION, AND PREPACKING AND FAYING SURFACE APPLICATION.
CLASS C	FOR BRUSH AND FAYING SURFACE SEALING APPLICATIONS WHERE A LONG SQUEEZE-OUT LIFE IS REQUIRED.
CLASS E	FOR SPRAY APPLICATION AS COATING.
CLASS F	FOR SPRAY APPLICATION AS PRIMER.
CLASS G	FOR SPRAY, BRUSH, OR ROLLER APPLICATIONS WHERE LONG SQUEEZE-OUT LIFE AND LOWER VISCOSITY ARE REQUIRED.

TABLE IV

Alternate Sealants Data
Figure 201 (Sheet 2)

CLEANERS AND POLISHES - MAINTENANCE PRACTICES

1. General
   A. The following is a list of cleaners and polishes that could be required during regular maintenance of the airplane. Listing is by material and grouped according to type and/or use. Acceptable vendors and/or material specification and or Boeing process specifications are included as an aid in obtaining the required material.
   B. The specific use and/or alternatives of any material are controlled by the specific maintenance procedure. This listing provides a convenient list of materials listed in the maintenance procedures and does not provide authorization for material substitution. Refer to applicable maintenance procedure for the proper material to be used.
   C. Material other than those listed can be tested using the procedures in Boeing document D6-17487, Certification Testing of Aircraft Maintenance Materials, to verify that any substitute material will not be injurious to airplane surfaces when used as specified by the manufacturer.
   D. D6-7127, Cleaning Interiors of Commercial Transport Aircraft, outlines methods of evaluation for materials to be used in cleaning of Boeing commercial aircraft interiors. It contains materials and processes as a guideline for cleaning during general maintenance.
   E. Solvent Alternatives
      (1) Because of new environmental protection regulations, alternatives to some solvents are now necessary. To make it easy to find applicable solvent, there are now new tables of solvent selections in the Aircraft Maintenance Manual (AMM).
      Refer to subjects AMM 20-30-80/201 and on for these tables, which give selections of solvents along with their material bulk code and related specification.
      Table 201 shows a list of tables of solvent selections, by the type of procedure and the surface to be cleaned, which you will find in subjects AMM 20-30-80/201 and on:

Table 201			
ATA	Table Description	Series	BAC Specification
AMM 20-30-80/201	General Cleaning of Metal	80	BAC 5750
AMM 20-30-81/201	General Cleaning of All Organic Coatings	81	BAC 5750
AMM 20-30-82/201	General Cleaning of Solvent Resistant Organic Coatings	82	BAC 5750
AMM 20-30-83/201	General Cleaning of Composites	83	BAC 5750
AMM 20-30-84/201	Final Cleaning of Metal Prior to Painting	84	BAC 5750
AMM 20-30-85/201	Final Cleaning of All Organic Coatings Prior to Painting	85	BAC 5750
AMM 20-30-86/201	Final Cleaning of Solvent Resistant Organic Coatings Prior to Painting	86	BAC 5750
AMM 20-30-87/201	Final Cleaning of Composites Prior to Painting	87	BAC 5750
AMM 20-30-88/201	Final Cleaning of Metal Prior to Non-Structural Bonding	88	BAC 5750
AMM 20-30-89/201	Final Cleaning of All Organic Coatings Prior to Non-Structural Bonding	89	BAC 5750
AMM 20-30-90/201	Final Cleaning of Solvent Resistant Coatings Prior to Non-Structural Bonding	90	BAC 5750
AMM 20-30-91/201	Final Cleaning of Composites Prior to Non-Structural Bonding	91	BAC 5750
AMM 20-30-92/201	Final Cleaning Prior to General Sealing	92	BAC 5000

Table 201			
ATA	Table Description	Series	BAC Specification
AMM 20-30-93/201	Final Cleaning Prior to Fuel Tank Sealing	93	BAC 5504
AMM 20-30-94/201	Final Cleaning Prior to Application of Rain Erosion Resistant Coating	94	BAC 5880
AMM 20-30-95/201	Final Cleaning Prior to Aerodynamic Smoothing and Fairing	95	BAC 5030
AMM 20-30-96/201	Final Cleaning of Oxygen Components Exposed to Oxygen	96	BAC 5402
AMM 20-30-97/201	Final Cleaning Prior to Structural Bonding	97	BAC 5514
AMM 20-30-98/201	Cleaning of Specific Polymerics	98	BAC 5750
	Cleaning of Phenolics or Nylon	98-1	BAC 5750
AMM 20-30-99/201	Final Cleaning of Composites Prior to Structural Bonding	99	BAC 5578

(2) Each ATA in (Table 201) defines a specific group of solvents based on a single cleaning process of similar materials. To provide better cross referencing, each ATA also has a unique "series" number and a corresponding "series" bulk code. Both of these items are provided for internal use and are not intended for requisition purposes. The individual material name or material bulk code from the "U-File Bulk Material List" should be used in requisitioning materials.

TASK 20-30-02-992-001

2. Table - Cleaners and Polishes

A. General

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
Abrasives		Aluminum Oxide Discs and Sheets, Microlin Pads	70614
		Aluminum Oxide Discs and Sheets, Type F Nylon Pad	06565
		Aluminum Oxide Discs and Sheets, Bear-Tex Pad	21270
		Cloth Disc, Open Coat, 150-Grit	06565, 76381 93642
		Scotchbrite No. 747 Pads	76381
	P-P-121	Abrasive Paper	Coml
		Abrasive Paper, 600 Grit or finer	Coml
	P-C-451	Abrasive Cloth	Coml
		Disc, Abrasive - cloth, Open Core, 150 Grit	93642
		(continued)	

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
		Paper, Silicon Carbide 240 Grit or finer	Coml
		Wool, Aluminum	Coml
		Wool, Stainless Steel	Coml
		Scotchbrite Type R Abrasive, 100 Grit or Finer	76381
		Scotchbrite Sheet, Pads, Finishing Type A	76323
Electrical Contact Cleaners		03416/LPS-No Flash Electro Contact Cleaner (15 oz)	66724
		09128/LPS-Electro 140° Contact Cleaner (1 gal)	66724
		MS-381HCM/Miller-Stephenson Contact Cleaner (8 oz)	18598
		1677-12S/Tech Spray ENVI-RO-TECH (12 oz)	54700
Brightener - Acid (For Aluminum)		Kelite L-20	89138
Brightener and Rust Preventer		Everite	04442
Chamois	KK-C-300	Oil Tan Leather Spec	Coml
Cleaners, Alkaline, Waterbase		GMC 528B	09402
		Kelite 28	89138
		(continued)	

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
		Ceebee 280	71361
		Oakite 61	44389
		Oakite 204	44389
		Pennwalt 2271R	99987
		Turco Jet Clean C	61102
		Turco Jet Clean E	61102
		Dubois C-1102	72008
		Calla 301	19457
		TEC Formula No. 1	25227
		Tec 86-2	25227
		Pacific Chemical B-82	93965
		Metaclean AC	98364
	MIL-C-87936, Type I Superceded by MIL-C-87937	Air-Tec 23	61102
		B&B 713 Jet-2	21361
		B&B Jet-3	21361
		815 AF	94058
		Fleetline JC-5, Formula 47-JF-71	44389
		Calla 800	19457
		(continued)	

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
Cleaners, Alkaline, Heavy Duty, Manual		Airshow W	94058
		ALTREX B	OXVDO
		Navee 427	86440
		Greasesolve	83339
Cleaning Compound	P-C-437, Type I	High pressure (steam) cleaner Steam White-R 153-X Steam X-38 30, 725 Octagon 451 Pennywalt 2476	 21361 85884 61102 19321 82925 86460
		Spraywhite E	89138
Cleaner		SHAMCO - Soapless base high concentrate 40-1 (rug, carpet and upholstery)	16634
		Clean Quick	CGO17
		Orvus WA Paste	CGO17
		Glo Do-All Formula ID	34364
		Glo Do-All Formula 3B	34364
		Auto Polish and Cleaner Dupont No. 7	81205 88607
Cleaners, Foam		Oakite 74L	44389
Cleaners, General		Learock S-30, Buffing Compound	75554
		(continued)	

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
		Learock 888, Buffing Compound	75554
		Meguiare Mirror Glaze MGH-17	14088
		Dustless Acrylic Window Cleaner	28014
	P-P-560	Acrylic Window Cleaner	Coml
		SE-700 Detergent	0903B
		Wyandotte FS - Electrocleaner	83339
		Johnson's Pride Cleaner Wax	81205 32132
		Static Stop Cleaner Wax	81205 28014
		A-T-P Cleaner	06335
Cleaner, Engine		Turco 4848-92	61102
Cleaner, Gaspath		Ardrox 6110	81205
Cleaners, Glass Windows and Mirrors		Glyst Concentrated Glass Cleaner A-1859	61102
		Glasswax *[1]	53793
		Micro-Gloss Mirror Cleaner	81205 32834
Cleaners, Interior		Freon 113	18873
		(continued)	

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
		Freon TF Freon TF 116-121	18873 23037
Cleaners, Special	CONC. 1031	Decarb Concentrate 1031	CG001
		Detergent high concentrate 40.1	16634
		DOWCLENE EC	Coml
		Formula 815 MX	94058
		Formula 815 NP	94058
		Oakite 36	44389
		Process K (Phosphoric Acid Type for Aluminum)	89138
		Turco W.O. No. 1 (Phosphoric Acid Type for Steel Heat-Treated Below or at 220 KSI)	61102
Pad, Rain Repellent Residue Remover		Pad-Ardrox 275-G	K6858
Degreaser and cleaner		MS-180 Freon TF	18598
		(continued)	

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
Disinfectant		Calla 7127 Ogee 350 Chengdu Yushen Aviation Technology Inc. Building 1-2-4B No.1, Biyun Road. Hongpailou, Wuhou District, Chengdu (610041), PR China	1KQX9
Jointing Compound		PL32M Medium Hylomar	13029
Polishes, Metal		Metal Glo No. 2	61102
		Met-All	Coml
		Brilliant Shine	15087
		Brasso Polish	81205 Coml
		Meguiars Mirror Glaze MGH-10	81205 14088
POLISH		PLEX-I-GLOW	93920
		SIMONIZE WAX	81238
Power, Moulding		Acrylic A100	77902
Remover, Corrosion	O-A-88	Nitric Acid	Coml
	MIL-M-10578, Type II	Phosphoric Acid Corrosion Removing and Metal Conditioning Compound	coml
		Turco Prepaint	61102
		Oakite 31	44381
		GMC 801	09462
		(continued)	

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
Remover, Rust, Alkaline		Turco 4181	61102
Soap, Liquid		Turco 1526	61102
Solvent	PD-680	Dry Cleaning	Coml
Solvent	PMC 9010	ARDROX 5412	K6858
	TT-N-95	Aliphatic Naphtha	Coml
	TT-I-735	Isopropyl Alcohol	Coml
	TT-M-261 or J1S-K-8903	Methyl Ethyl Ketone	Coml
	TT-B-838	Normal Butyl Acetate	Coml
	BMS 11-7	T-2279A T-825 Turco 4460	09869 71191 61102
	O-T-620A	Chlorothene Nu	71984
		Stoddard, Type 1	Coml
		Stoddard, Type 2	Coml
	MIL-T-81533A	Trichloroethane 1, 1, 1 (Methyl Chloroform) Inhibited, Vapor Degreasing	Coml
	MIL-T-27602 or ASTM D4080	Trichloroethylene, Stabilized	Coml
	ASTM 845 or 846	Xylene	Coml
	O-T-236	Trichloroethylene, Technical Grade	Coml
		Naphtha	Coml
		(continued)	

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
	TT-T-266	Lacquer Thinner	Coml
		Freon BF and TF Mixture	18873
	TT-M-268	Methyl Isobutyl Ketone	Coml
	TT-T-548, Grade A	Toluene (Toluol)	Coml
	JAN-T-171, Grade A	Toluene (Toluol)	Coml
	O-A-51	Acetone	Coml
	BMS 11-5, Type 1	Turco 4108	61102
	BMS 11-6	Trichlor Permachlor NA Triclean D Blascosolv Nialc MD Trichlor	93915 17125 18873 07581 09287 01988
	BMS 11-7	T-2279A T-825 Turco 4460	09869 71191 61102
	ASTM D4080	Therma-Sol	CG019
		Cyclohexanone	Coml
	O-A-396,	Ethyl Alcohol	Coml
	MIL-D-6998	Methylene Chloride (DICHLOROMETHANE)	96717 71983
		TL-52 Thinner	98502
		Thinner, Metco Seal AP	VA9B35
	A.S.T.M. D484-52	Stoddard Solvent	0870B
		(continued)	

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
	B.S. 245	White Spirit	0870B
		Shell 360	86961
	O-T-62D	Trichloroethane 1, 1, 1 (Methyl Chloroform)	Coml 86440
Stripper		Turco 52923 - Organic Paint, Brush-on	61102
		Turco 5351	61102
		Trichloroethane-O-T-620C	K0655
Solvent		Freon TMS	99167 Coml

*[1] Not to be used with Hydrophobic Coated Windows.

FINISHING MATERIALS - MAINTENANCE PRACTICES

1. General
   A. This procedure contains a table of finishing material used during maintenance on airplanes. The table gives the material specification (if applicable), the material name and/or number, and the vendor code.

   TASK 20-30-03-992-001

2. Table - Finishing Materials
   A. General

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
Basecoat	BMS 5-108 Type I, Class B-2 Type II	Base Coating Non-skid decorative coating	30676
	MIL-C-15074	Corrosion Preventive	Coml
	MIL-C-16173	Corrosion Preventive	Coml
	MIL-C-11796, Class 1, 2 & 3	Corrosion Preventive (Soft Film, Medium Film and Hard Film)	Coml
Coating		Abrasion, Erosion, Resistant 92-009 Primer RTV1201	 71984 71984
		Abrasion Resistant, Teflon Finish (Brush or Spray)	98795

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
	BAC 5705, Type I	Desothane HS Base Component CA8022/B7022 (BAC7022 white, semigloss) Curing Solution CA8020D	81205
	BAC 5705, Type I	Desothane HS Base Component CA8012/B701 (BAC701 black, flat) Curing Solution CA8010D	81205
		Erosion (Nose Radome) Strocoat 7100	99530
		High Temperature Coating For Titanium, B-2000	71191
	MIL-C-5541, Type II, Grade C, Class 1	Conversion Coating for Aluminum and Aluminum Alloys Alodine 1000(L) (Clear) Alodine 1200 (Colored)	 84063 84063
	MIL-C-5541, Type II, Grade C, Class 3	Colored Surface Treatment (Conversion Coating) for Aluminum Iridite 14-2	 70865
	BMS 10-21, Type II	Antistatic and Conducting Base 528 x 306 Activator 910 x 464 Constant 10.5	 85570 85570 85570
	Type III	Base 528 x 310 Activator 910 x 464 Constant 10.5	85570 85570 85570
		Base 10-P2-3 Activator EC-110 Constant 10.08	06367 06367 06367
		Base 463-6-84 Activator X-566 Constant 9.8	98502 98502 98502

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
	BMS 10-82, Type I	Liquid Bright Gold No. 6854	27163
	BMS 10-86, Type I	Teflon-Filled	98795 3K685
	BMS 10-86, Type II	Teflon-Filled	98795
		Duralon JF, White	0813B
Coating	BAC 5710 Type 49	Thermoclad Duralon Nylon Epoxy Primer - Duralon EF-1 Thinner - MEK Topcoat - Duralon J.E. Nylon	81205 0813B 0813B 0813B
	BAC 5710 Type 48	Chemglaze Polyurethane Primer Chemglaze 9924 Part A - Base Part B - Curing Agent Thinner - B2318-42, MEK or MIBK Elastometric Polyurethane Coating (Chemglaze M213/ White, M313/Black, or M413/ Gray) Part A - Base (M213, M313 or M413) Part B - Curing Agent (M200) Thinner - 9951 Topcoat - Chemglaze II Polyurethane, A371 Black Thinner - 9951	81205 30676 30676 30676 30676 30676 30676 30676 30676 30676
		Chemglaze M113	30676
Coating Nonreflective		Alexit Suede Coating 428-21 Com Primer 911-P4 Topcoat: 428-21 Basecoat 405-28 Curing Solution Componet	76381
Coating Erosion (Nose Radome)		Prestec Paint No: 2381 Optional BMS 10-60 Type II	59470

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
Coating, Protective Alkaline Removable		Leeder 321 N (TEC 243-4F7G)	17209
Compound - Corrosion Inhibiting - Advanced	BMS 3-29	DINOL AV30	OL040
Enamel	BMS 10-11, Type II	Finch System Andrew Brown System	98502 71191
	BMS 10-60, Type I	Exterior Decorative Protective	98502 85570
	BMS 10-60, Type II	Corrosion Resistant	85570
Edge Sealer	BAC 5710 Type 41	Edge Sealer Base - 683-3-2 Clear Catalyst - X-310A	81205
Edge Sealer		Desothane Edge Sealer CA8000/B900B Desothane HS Activator CA8000B	91208
Finish	BMS 10-73, Type I	Silk Screen Ink	0360B
	BMS 10-73, Type II	Silk Screen Ink	0360B
Finish		Tartan Clear Acrylic	81205
		Corogard paint EC-843 & EC-843S	04963

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
	BMS 10-100	Aeroflex paint G-12-E-25 Ultraflex paint 763-66-9200	OKXA5
Finish, Protective	BMS 3-11-Resistant	Hydraulic Fluid Resistant Finch 683-3-2 Base Finch X-310A Catalyst	98502
	BMS 10-20, Type 2	Corrosion Resistant 454-4-1 Base CA 109 Activator TL52 Thinner	98502
	MIL-C-27725	Corrosion Resistant	Coml
Hardener		Magna 10-C-32	98795
		Magna 50-C-3	98795
Reducer		Magna 66-C-28	98795
Paint		Intumescent AVCO 1600 BTX (Component A Base, Component B Hardener)	93221
	BMS 10-55, Type I	Interior, Decorative, Water Emulsion	98502
	BMS 10-55, Type II	Interior, Decorative, Water Emulsion	98502
	BMS 10-72, Type V	Exterior Decorative	33564
	BMS 10-72, Type VI	Exterior Decorative	33564
	MIL-W-5044	Nonslip Walkway Compound (Griptred) Type I 37875 White	Coml

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
	MIL-W-5044	Nonslip Walkway Compound, Type I 37038 Black	
	BMS 10-83, Type II	Polyurethane	86972
Primer	BMS 10-11, Type I	Finch System Desoto System 1, 2, or 3 Bostik 1007	98502 85570 70707
	MIL-P-8585	Zinc Chromate, Low Moisture Sensitivity	Coml
	BMS 10-79, Type I, Class A	Corrosion Resistant 513-731 Primer Base 910-709 Curing Solution	85570
	BMS 10-79, Type II, Class A	Corrosion Resistant (For High Erosion Areas) 513 X 329 Primer Base 910 X 456 Curing Solution	85570
	BMS 10-79, Type III, Class A	Corrosion Resistant (For High Erosion Areas) 515 X 336 Primer Base 910 X 458 Curing Solution	85570
	BMS 10-83, Type I	Primer	86972
		DC 1200	71984
		DC 1204	71984
		SS-4004	30221
		Primer for Use with DC-92-024 Sealant RTV 1200	71984
		Duralon EF	0813B
Primer	BMS 10-79 Type II	Primer	85570

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
Primer	BAC 5710 Type 51	DeSoto High Temp Polyurethane Green Base - 825-0009 Catalyst - 910-175 Thinner - 020-044	81205 81205 85570 85570 85570
		Chemglaze 9924, Wash	30676
		Loctite Locquic Primer Grade T	05972
	TT-P-1757 Replaces MIL-P-8585	Primer Coating, Zinc Chromate, Low Moisture - Sensitivity	Coml 98502 98502
Resins		Acrylic Casting PS-18 (Windshield Repair)	95696
		Acrylic Cement PS-30 (Windshield Repair)	95696
		Mat-227 (Windshield Repair)	12035
Surface Static Conditioner		Magna 28-C-1	98795
Surfacer		Magna 8-W-5	98795
Thinner	9954 Thinner		30676

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
	Thinner	C25/90S	0KXA5
Topcoat		Chemglaze A371, Black	30676

LUBRICANTS - MAINTENANCE PRACTICES

1. General
   A. This procedure contains a table of lubricants used during maintenance on airplanes. The table gives the material specification (if applicable), the material name and/or number, and the vendor code.

   TASK 20-30-04-992-001

2. Table - Lubricants
   A. General

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
Antiseize Compound	BMS 3-28	Armite LP-AS-328	84180
	SAE AMS 2518	Thread Lube Or Acheson GP460 or GE SPEC A50TF201 Class A or GE C02-058	Coml Coml Coml

(continued)

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
	MIL-PRF-907	High Temperature	
		Fel-Pro C5-A	73165
		Fel-Pro C-661	73165
		'Dag' Dispension No. 243	70079
		Led-Plate No. 250	84180
		Cheserton	80557
		Thred-Gard	00643
		GC-76	84180
		No-Lok	02905
		Kopr-Kote	07431
		SS-30	07431
		No. 550	07431
		No. 60 Lead Seal	07431
		LiquiMoly N.V. Thread Compound	98113
		Low Viscosity Anti-Seize	05972
		Anti-Seize Compound	05972
		Micro Metals Compound No. 77	37014
		Never-Seez	15145
		Kopr-Shield	07431
		Fel-Pro 200	73165
		Never Seez NSBT-8N Pure Nickel	90983
	AMS-M-7866	Molybdenum Disulphide, Lubricating Grade	Coml
		Fel-Pro 51004	81205 73165
		Silver Goop	02570

(continued)

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
		Ease Off 990 (P06-32)	87889
Compound	VV-D-1078	Silicone	71984
		Antiseize Broycote 655	07440
		Anti-Seize C5A	73165
	MIL-L-23398	Solid Film Lube MolyKote 3402 Kal-Gard AD Lubri-Bond 220	 71984 0377B 85932
		PWA 36035	COML
Fuel Additive		Biobor JF	24611
Fluid		Cutting Freon TB-1	03138
		Silicone - Dow Corning 510	71984
Grease		Unitemp	59595
	D00571	Batco X8401-2 Polyalkylene glycol-lithium	60226
		Braycote 248	98308
		MolyKote No:33	71984
		Penetrox A	09922
	MIL-PRF-7808	Lubricant	7X000
	BMS 3-24	Airplane Ball and Roller Bearings, Wide Temperature Range Aeroshell 16 (Alternate Grease to BMS3-33)	 54527
		(continued)	

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
	BMS 3-33	General Purpose Aircraft Grease Aeroshell Grease 33 (Preferred Grease to BMS 3-24)	 54527
	MIL-G-25537	Grease Aeroshell No. 14	 54527
	MIL-G-25013	Aircraft Ball and Roller Bearings	Coml
		Flourosilicone, Type FS-1292, Dow Corning	71984
	AMS-G-6032	Gasoline and Oil Resistant	Coml
	MIL-PRF-81322	General Purpose, Wide Temperature Range Mobilgrease 28 Aeroshell 22	Coml 77988 54527
		High Vacuum Molykote III Compound	 71984
	MIL-PRF-23827	Instrument Gear and Actuator Screw	Coml
	MIL-G-3545	Landing Gear Wheel Bearings High Temperature Aircraft Aeroshell 5	Coml 54527
	MIL-G-21164	Molybdenum Disulphide	Coml
	AMS-G-4343	Pneumatic System Thread	Coml
		FS1292 (Fluor-Silicone)	71984
		(continued)	

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
Hydraulic Fluid	BMS 3-11	Fire Resistant Type IV, Class 1 Chevron Hyjet IV-A, IV-A PLUS Skydrol LD4 Type IV, Class 2 Skydrol 500B4 Type V, Class 1, Grade B Skydrol 5	 81230 76541 76541 76541
	MIL-PRF-5606	Petroleum Base	Coml
	MIL-PRF-6083	Petroleum Base, For Storage and Operation	Coml
		Lubrizol 1395	05238
Lubricant		Acryloid HF-825	07950
		Grease DC33	71984
		Assembly, Petrolatum, Soft, White Fonoline	79394
		Assembly Lube, Hydraulic System MCS352B	 76541
		Beeswax	Coml
		Bonding Gasket, Silicone DC4	71984
		(continued)	

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
		DC 5	71984
		DC 111	71984
		Dryfilm Thixotrope, PL198	K6835
		Essna 382	11770
		Everlube 811	11770
		Extreme-Pressure, Anti-Scoring No. 3	11957
		Fel-Pro C300	73165
		Fluorolube 660	09287
		High Temperature Anti-Seize PWA 581-B BG Microlube	05045
		Liquid Moly NV	98113
		Landing Gear Shock Strut Additive Lubrizol 1395	2V670
		Lubrizol 1395	05238
	BAC 5506	MCS352 Skydrol Assembly	76541
		Molykote 321-R	94499
		Molykote G-N	71984
		Molykote M-30	71984
		Molylube Spray Powder	12474
		Engine Oil - PWA 521	05045
		OS128 or MCS210	76541
		(continued)	

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
		Parker O Lube	02697
		Parker Super O Lube	02697
	VV-P-235	Petrolatum	Coml
	VV-P-236	Petrolatum	Coml
		PWA 550-3	COML
Lubricant		Sandstrom 27A	34227
		Sanovac 5 473-079-9001	76541
		Super-O-Lube	02697
		Surfkote A1625	01094
		WD-40	59364
		Royco 11MS	07950
		Aeroshell 11MS	54527
Lubricant Dry Film		Everlube 967	11770
		Dry Film Fel-Pro C200	73165
		(continued)	

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
		PMC 9934	
Lubricating Oil	GE D50TF1 Type II	Mobil Jet No. II	81230
	P&WA 521 Type II	Stauffer Jet II	97854
	MIL-PRF-6085	Instrument/Aircraft Low Volatility PQ Rust Preventive No. 160 L-245X Brayco 885 Univis P-12 Cosmolubric No. 270-A Product 80 KC-85A Anderol L-401-D Visconorust 1615 Royco 885 Aeroshell Fluid 12	 29700 92895 70575 98303 29700 73277 82925 99559 0837B 07950 07950
	BMS 3-8	Solid Film K350 Electrofilm 5396 Spraymix No. 1A Everlube 620	 57678 85932 06186 11770
		Krytox 240 AC Thread	18873
		Fluorosilicone FS-21265	 71984
		Premix, P/N 688272-2	58417
	MIL-L-23398	Dryfilm Lubri-Bond A Surf-Kote A-1625	 85932 01094
		BP Turbo Oil 2380	29700
		(continued)	

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
Engine Oil	MIL-PRF-23699	Mobile Jet Oil II Brayco 899 Castrol 5000 HATCOL 1680 Mobil Jet Oil 254 TURBONYCOIL 599 STO-5700 ROYCO 899 Aeroshell Turbine Oil 500, 560 Stauffer Jet II	77988 98308 K0132 3W990 77988 0843B 85239 07950 54527 97854
	PW521B Type II (PW SB 238)	 Aeroshell Turbine Oil 500, 555 Royco Turbine Oil 500, 555 Castrol 205, 5000 Mobil Jet Oil II RM139A RM147A RM246A RM247A RM249A RM254A RM270A Stauffer Jet II	 86961 07950 K0132 77988 97854
	MIL-PRF-7808	Aircraft Turbine Engines, Synthetic Base	Coml
	MIL-PRF-7870	General Purpose, Low Temperature	Coml
		Turbo Lubricating, Grade 1010	77001
		(continued)	

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
	MIL-PRF-6081	Grade 1010	
		P.Q. Turbo Oil 10	92895
		Winsor Lube L-110	10575
		Hyborne 1010	17425
		460	98308
		3B	02847
		10B	02847
		Delta 1280, Delta Petroleum Co. Inc., P.O. Box 10399, Jefferson, LA 70181	
		Jet Engine Oil 1010	0836B
		Compound 32452	86459
		Petrolube	86459
		Petrolube 4142	86459
		Royco 460	07950
		Royco 481	07950
		Royco 481C	07950
		Aeroshell Turbine Oil 2	K5591

STRIPPERS - MAINTENANCE PRACTICES

1. General
   A. This procedure contains a table with strippers used during maintenance on airplanes. The table gives the material specification (if applicable), the material name and/or number, and the vendor code.

   TASK 20-30-05-992-001

2. Table - Strippers
   A. General

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
Bottle		Polyethylene, Squirt	Coml
Cloth		Lint-free, Clean, Wiping	Coml
Remover		TEC243 or TEC243F, Water Base (For alkaline-removable coating)	25227
Strippers, Inorganic		Chromic Acid	Coml
		Sodium Dichromate - Sulfuric Acid	Coml
	O-N-350	Nitric Acid	Coml
		Nitric Acid (Inhibited)	Coml
		Sulfuric Acid	Coml
		Nitric-Peroxide-Acetic Acid	Coml
Strippers, Organic		Alcor LO-2030M	CG015
		Cee Bee A-228-D	71361
		(continued)	

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
	TT-M-268	Methyl Isobutyl Ketone	Coml
	ASTM-845 or -846	Xylene, Grade A	Coml
		Fiber Resin ES-1	26348
		Turco 800	61102
		Turco 5873	61102
Strippers, Paint		Turco 5351	61102
		Turco 4338	61102
		Cee Bee A-306B	71361
		Cee Bee R-256A	71361
		Pennwalt EZ Strip 19E	86460
		Oakite Rustripper	44389
	AMS 1424D	Ethylene Glycol Monobutyl Ether (Butyl Cellosolve)	Coml
Scraper		Plastic (See AMM 51-31-01/201)	

MISCELLANEOUS MATERIALS - MAINTENANCE PRACTICES

1. General
   A. This procedure contains a table of miscellaneous materials used during maintenance on airplanes. The table gives the material specification (if applicable), the material name and/or number, and the vendor code.

   TASK 20-30-07-992-001

2. Table - Miscellaneous Materials
   A. General

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
Abrasives		Paper - 240 Grit	Coml
		Paper - 100 grit or finer	Coml
		Paper - Aluminum Oxide 320 Grit	Coml 06565
		Paper Aluminum Oxide Grit 180	06565
		Paper Aluminum Oxide Grit 280	06565
		P-P-101 Abrasive Paper - 400 Grit	Coml
		Paper - 400 to 600 Grit	Coml
		Acrylic Restoral Kits KR-70 HP-100 MA-1 NC-78-1	32834
Acid	MIL-A-13528	Hydrochloric	Coml
		(continued)	

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
Additive, Fuel	MIL-I-27686	Anti-Icing PFA55M8	46934
		Biobor JF - Biocide	24611
Agent parting		AZ 634-2 (preferred)	0A3C8
		Del Chem X-769 (alternative)	86460
		Green Strippable Coating 598-5002 (alternative)	17359
		4A-183 (alternative)	17359
Anti-Icing/ Deicing, Type I, II Fluid	MIL-A-8243	Anti-Icing and Deicing	Coml
Anti-Icing/ Deicing, Type I	AMS 1424 ISO 11075 AEA Type I	Newtonian Fluids Newtonian Fluids Newtonian Fluids	Coml
Anti-Icing/ Deicing, Type II	AMS 1428 ISO 1178 AEA Type II	Non-Newtonian Fluids Non-Newtonian Fluids Non-Newtonian Fluids	Coml
Antiskid Material		Antiskid Material 60 Mesh No. TP027-0165	
Antistatic (Windows)		Activol 1390M	07648
		(continued)	

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
Braid		Flat TG40	81851
Brush		Hand	Coml
		Soft Bristle Fiber	96383
		Soft Bristle Paint	Coml
Bubble Release		9971	76005
Catalyst		9989 Catalyst	76005
Cheesecloth		Rymple Cloth No. 301,300,201	75218
	BMS 15-5	Shurwipe	86159
	BMS 15-5	Gauze Sponges	97327
		New, Clean, Dry, Lint-free	Coml
Chlorine Dioxide		Stabilized 2% Solution (Water Purifying)	COML
Clay		Modeling Clay	6E538
Cloth		Lint-free, clean	Coml
Coating, Protective		Spraylat TR 5157-1	87354
		Fire insulation MA25S	27610
		(continued)	

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
Coke		Powdered, 20-mesh and smaller (DS02F7-S1)	45215
Compound		Ribbon, Packing EC 1788	A9B35
	BMS 3-23, Type I	Corrosion Inhibiting Boeshield T-9 (colorless) Boeshield T-9HF (colorless)	 ZO033 45738
	Type II	Boshield T-9 (Colored) Boeshield T-9HF (Colored) Dinitrol AV8	ZO033 45738 OL040
	BMS 3-27,	Corrosion Inhibiting Material Mastinox 6856 K International Celomar 75 Blvd Winston Churchill 76 Le Havre, France	
	BMS 3-38, (Supersedes BMS 3-27)	Corrosion Inhibiting Material Non Drying Paste Cor-Ban 27L Zip-Chem Products 400 Jarvis Drive Morgan Hill, California 95037	
		(continued)	

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
	BMS 3-26,	Corrosion Inhibiting Dinitrol AV25B, AV25B-2	OLO40
	Type I	LPS Formula B997 Ardox 3321 Dinitrol AV100B	66724 9X974 OLO40
	Type II	LPS Formula B1007 Ardox 3322	66724 9X974
	BMS 3-28	Anti-Seize general purpose ARMITE LP-AS328	84180
	BMS 3-29, Preferred Optional BMS 3-23 and BMS 3-26	Corrosion Inhibiting Advanced Dinitrol AV30	OLO40
	BMS 3-35,	Corrosion Inhibiting Advanced Dinitrol AV15	OLO40
	BMS 3-38,	Corrosion Inhibiting Compound	81205
	MIL-C-11796 Class 3	Corrosion Preventive	Coml
Conditioner		Water WA-2A	37676
		Retaining Loctite 592	05972
Cotton		Flannel	Coml
Cord	MIL-C-5040, Type IA	Nylon	Coml
		(continued)	

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
Dehumidifier	MIL-D-3464 Class 1	Dessicant	98092
Deodorant, Toilet Flushing		Turco Deodar	61102
		Jet Degerm	15108
		West-Sanitar	64807
		Monogram DG 19	29780
		Sani-Pak 2031M	18195
		Racasan Airline Powder	K1618
		Super-Sanitar	64807
		No. 101 Timson Aircraft Chemical Toilet Deodorant. Unit Chemical Corp., 4161 Redwood Ave., Los Angeles, CA.	
		Non Filter CLogging (N.F.C.) Aircraft Chemical Toilet Deodorant Lloyd George Assoc., 400S Burnside, No. 2E, Los Angeles, CA.	
		(continued)	

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
		Super Sanitex Super Sanitex III Selig Chemical Industries, 840 Selig Drive SW, Atlanta, GA 30378	
		Elkee F-1	04421
		Magnus Aviation Burnside, No. 2E	37733
		Head-O-Matic, Alex Milne Assoc.	
		Cee Bee 20 McGean-Rohco Inc. 9520 East Ceebee Drive Downey, CA 90241-0016	
Dessicant		Drierite	70000
Detector, Leak, Oxygen System		Sherlock CG, Type 1	23316
Detector, Leak, Pressure Test	MIL-L-25567-D Type 1	Leak-Tec 160X	03530
Developer		Wet Solvent (Ardrox System) Ardrox 9D6	U0046
		Wet Solvent (Ardrox System) Tracer - Tech D499C	83328
		Wet Solvent (Magnaflux System) Zyglo ZP9C	37676
		(continued)	

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
		Wet Solvent (Turco System) Fluro-Chek NAD NF	61102
Disinfectant		Airwick Anti-Microbial Topical Gel	89044
		Acid - Citric,	Coml
		Calcium Hypochlorite (70%)	Coml
		Chlorine Dioxide (Stabilized 2% Solution)	Coml
		Liquid Sodium Hypochlorite (5%)	Coml
		Liquid Sodium Hypochlorite (10%)	Coml

(continued)

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
		Lysol Brand	73820
		West Wescodyne	56883
Dye, Transfer		Dykem Hi-Spot Blue (Prussian Blue)	98148
Dyes Red Dye		Automate Red BSF	32063
Etchant		TEC - 361	25227
Fabric,		Dacron D-117	CG008
		D-118	CG008
	BMS 8-64	Flow Resistant, Acoustic	71562
	BMS 8-7, Type I	Nylon, Vapor Permeable, Neoprene Coated NN5102 CRP No. 2241 Neoprene-Coated No. 687	 76381 07804 97376

(continued)

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
	BMS 8-139, Class I, Type 120	Glass, Prepreg High-Temperature Epoxy Resin	91610
	Class I, Type 181		91610
	BMS 8-143 Type II	Glass, Resin Impreg-nated, For Interior Decorative Laminates	0841B 30137 0892B
Fastener Traction Material		E-Z Grip Friction Drops	81205
Film		Mylar	
Filter - Air		Fiberglass Material Front Line Blue FG with Skin-Dry	01767
Foam	BMS 8-133, Type I, Grade 20, Form A	Urethane, Flame Retardant, Rigid	28014
		Scott Filter, Porosity Grade 45 PPI, Color Grey, Flame Retardant	3J310

(continued)

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
Gauze			Coml
Honeycomb, Nylon		HRH-10	91610
Indicator		Humidity MS20003	96906
Insulation	BMS 8-103	Cork Compound	Coml
Laminate	BMS 8-98, Type IIA, Grade A, Class 1, Gloss G	Decorative, Tedlar	0888B 0889B 0890B
	Gloss M		0888B 0889B 0890B
	Type IIA, Grade B, Class 1.5, Gloss G	Gloss G	0888B 0899B 0890B
	Type IIB, Grade A, Class 1, Gloss M	Gloss M	0888B
	Gloss G		0888B
		(continued)	

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
	Type III, Grade A, Class 1, Gloss S		18873
	Type III, Grade A, Class 2, Gloss M		18873
	Gloss L		18873
	Type III, Grade B, Class 2, Gloss L		18873
	Type III, Grade B, Class 4, Gloss L		18873
	BMS 8-254, Type I	Textured, Retention Material	01666 0891B
	Type II		13932
	Type III		13932
Liner, Cargo	BMS 8-262	Kevlar, Reinforced Thermoset	92666
Liner, Cargo	BMS 8-223	Glassfiber reinforced, phenolic laminate, fire resistant	01413 39317
Maskant, Spraylat		SC-1071	87354
		(continued)	

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
Microballoons Phenolic type		BJO-0930	80524
Nitrogen	BB-N-411, Type 1, Class 1, Grade A	Gaseous	Coml
		Liquid	Coml
Oxygen	MIL-O-27210, Type 1	Gaseous	Coml
Paper, Greaseproof		Greaseproof Grade A, Type 2, Class 2	76209
Paper, Laminated		Moisture Resistant Laminated Angier 30	6E915
Paper, Nomex	BMS 8-143, Type I		0892B
	VV-P-272C	Plastic-Coated	Coml
Paraffin		PMC 9552	6E538
Penetrant		Penetrant (Ardrox System) Ardox 985P2	U0046
		Penetrant (Magnaflux System) Zyglo ZL22C	37676
		Penetrant (Turco System) Fluro - Chek P40B	61102
		(continued)	

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
		Penetrant (Turco System) Fluro - Chek P41	61102
Powder, Plasma Flame Spray	BMS 10-67, Type 1	Tungsten Carbide with Cobalt	08662 39918 95138
	BMS 10-67, Type 7	Aluminum	39918 08662
Putty, Glazing		No. 4, Dual Purpose	16008 81205 6E538
Rag		Epoxy Tack No. 413	Coml
Rag	C-60	Epoxy Coat Tack Rag	1ST28
Refrigerant		Dow Frost	96717
Remover Pad		Ardrox 275-G	K6858
Rubber, Silicone		DC Sylgard 186 Clear	96717
		(continued)	

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
Rubber Anti-Skid Material		Altos stock No. TP027 + 165 Altos Rubber	81205
Sealer		7C-20	81205
Sheet, Abrasive		Scotchbrite	76381
Sheet, Aluminum		2024-T3 X .25 inch	01634
Sheet, Miscellaneous		Polyethylene	Coml
Sheeting		Transparent Polyethylene PS17-64	2E844
Sleeving		Heat Shrink, Black RNF 100 (.093 x.046)	08795
	MIL-I-7444 Type 1	Nonheat - Shrinkable	Coml
Soap		Castile	Coml

(continued)

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
Sponge, Cellulose		L-S-626 Synthetic (Aircraft Cleaning)	Coml
Sponge, Gauze		Dry Lint Free	Coml
Surface Preparation	ASTM D 2693, E1119	Propylene Glycol	Coml
Tape, Aluminum Foil		Permacel P112	99742
Tape, Barricade		Orange, 3 inches wide 4mils thick, Non Adhesive GO2443	81205
		Scotch Y-427	76381
		Mystic 7300	32975
		Mystic 7300 Superceded by 3M 8402	32975 76381
		Mystic 7452, 7453 Superceded by 3M 425	32975 76381
		Mystic 7355	32975
		Scotch No. 425	26066
		Pressure Sensitive	26066
		(continued)	

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
		Vibration Dampening Tape 434	52152
Tape, Cargo Lining Joint Seal	BMS5-146 Type 1	Permacel P626	81205
Tape, Double Back		Permacel P55	99742
		Permacel No. 94 (1 or 2 Inches Wide)	99742
		3M No. 468 MP	26066
Tape, General		3M No. 214	26066
		3M No. 213	26066
		3M No. 418	26066
		3M 474	76381
		3M No. 474-1	76381
		3M-Y8561	76381
		Mystik 6223	32975
		Mystik 7505	32975
		Permacel 70	99742
		Permacel No. 212D	99742
		(continued)	

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
		Permacel 421	99742
		Permacel 2650	99742
		Permacel 718 (1 or 2 inches wide)	99742
		Permacel P-705	99742
		Permacel 3M No. 365	26066
		Polyke No. 290	09661
		Polyken No. 822 Plastic Polyethylene (Black)	CG029
		Repair, OT-6C (OT-5 optional)	0821B
		Rubatex with MP300 Adhesive R326V	82942
		Scotchcal 850 Scotchcal 853 Permacel 95	76381 76381 99742
		Tuck 51 Fiberglass	83334
		Tuck 210	83334
		Vibration Damping 3M SJ2040X	26066
	BMS 8-283	Rubatex R326V with X601D adhesive	82942
		(continued)	

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
Tapes for A/P Stored Outside		3M 471 Yellow Vinyl Adhesive GO2219	70210 6P896
Tape, Glass Cloth, Flame Resistant		Permacel 621 Permacel 212HD	99742 99742
Tape, Fiberglass		Owens Corning ECC-A	45255
Tape, Flame Resistant		Adhesive 3M No. 474 Adhesive 3M No. 367	26066 26066
		Permacel P-29 Silver	99742
Tape, Insulation Blanket	BMS5-149	Type XI, Class 1, Grade C OT-49W	81205 23788

(continued)

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
Tape, Advanced Insulation Blanket	BMS5-157	Type I, Class 1, Grade B, Form 1, Composition MPVF OT-157	81205 23788
Tape, Lightning Diverter Strip, Self Adhesive		Strikeguard 16795	55635
Tape, Masking	ASTM D6123	3M #250 Masking Tape	
Tape, Mylar		Transparent	26066
		Permacel No. 92 (17 inches wide, 0.005-inch gage, with interliner)	99742
Tape, Protective		G122 and Protex 20V	06929
		(continued)	

MATERIAL	SPECIFICATION	MATERIAL NAME AND/OR NUMBER	VENDOR CODE
Reinforced Silicone Stretchtape		RL6000SA S1255-02 (Alternate)	1EPZ3
Tape, Teflon	MIL-T-27730	1/4-inch wide	Coml
Tape, Vinyl Plastic		Permacel 306	99742
Thread	V-T-295, Type II, Size E	Nylon	Coml
Tubing		Heat Shrink Tubing R876	
Wiper			Coml
Wheel, Buffing		Cotton Flannel	9E538
Wrap, Tubular		SPI RAP 500015-2, NATURAL NYLON	COML

AIRPLANE STRUCTURE CLEANING SOLVENTS (SERIES 80) - MAINTENANCE PRACTICES

1. General
   A. This subject contains a list of solvents for general cleaning of metals as given in BAC5750. This subject gives only the list of solvents. It does not tell you which solvent to use or how to use the solvents.

TASK 20-30-80-102-001

2. General Cleaning of Metal (Series 80)
   A. General
      (1) This selection of solvents uses BAC5750 as a guide. This list of solvents has the Series Bulk Code of B01000, but this code is only for reference, to identify this complete group. In your orders to get the solvents of this list, you must identify each individual solvent by its name, bulk code, or other specification, as shown. Do not use the Series Bulk Code. Refer to the U-File for the applicable vendors.
   B. Procedure

S 112-002

(1) In Table 201, find the applicable solvent.

General Cleaning of Metal (Series 80)
Table 201

Material Name	Material Bulk Code	Other Specifications
1,1,1-Trichloroethane	B00090	
Acetone	B00062	JIS-K-1503
Aerfluor 343		
BMS 11-7	B00184	MIL-C-38736B
CDG-110		
CDG-211		
Citra Safe	B00634	
Citra Safe, Deodorized		
d-Limonene		

General Cleaning of Metal (Series 80) Table 201		
Material Name	Material Bulk Code	Other Specifications
DeSo Clean 45	B00647	
EP-921		
Ethyl Alcohol, denatured	B00068	
Ethyl-3-Ethoxy Propionate (EEP)		
Extra Solv		
FCC-55		
Freon TES or Genesolve DES		
Freon TF or Genesolve D	B00143	
Glidsafe Prepsolv		
Isopropyl Alcohol (IPA)	B00130	
MEK:1,1,1-Trichloroethane 1:1		
MEK:Sec-Butyl alcohol 42:58 percent		
MEK:Toluene 1:1		
Methyl Ethyl ketone (MEK)	B00148	
Methyl Isobutyl Ketone (MIBK)	B00151	JIS-K-8903
Methyl Propyl Ketone (MPK)	B00666	
MIBK:MEK 3:2		
MIL-C-81302, Type I	B00143	
M0K or M0K*		

General Cleaning of Metal (Series 80) Table 201		
Material Name	Material Bulk Code	Other Specifications
MIL-PRF-680, Type I, II, or III	B00074	
Shopmaster RTU		
Toluene	B00094	
TT-N-95, Type II	B00083	
TT-T-291, Type I, II, or III	B00762	
Turco 4460 BK		
Turco 6226		
Turco 6709		
Wedco 3500		

AIRPLANE STRUCTURE CLEANING SOLVENTS (SERIES 81) - MAINTENANCE PRACTICES

1. General
   A. This subject contains a list of solvents for general cleaning of all organic coatings as given in BAC5750. This subject gives only the list of solvents. It does not tell you which solvent to use or how to use the solvents.

TASK 20-30-81-102-001

2. General Cleaning of All Organic Coatings (Series 81)
   A. General
      (1) This selection of solvents uses BAC5750 as a guide. This list of solvents has the Series Bulk Code of B01001, but this code is only for reference, to identify this complete group. In your orders to get the solvents of this list, you must identify each individual solvent by its name, bulk code, or other specification, as shown. Do not use the Series Bulk Code. Refer to the U-File for the applicable vendors.
   B. Procedure

S 112-003

(1) In Table 201, find the applicable solvent.

General Cleaning of All Organic Coatings (Series 81)
Table 201

Material Name	Material Bulk Code	Other Specifications
Aerfluor 343		
CDG-110		
CDG-211		
Ethyl Alcohol, denatured	B00068	
Extra Solv		
Freon TES or Genesolve DES		
Freon TF or Genesolve D	B00143	
Isopropyl Alcohol (IPA)	B00130	
MIL-C-81302, Type I	B00143	

General Cleaning of All Organic Coatings (Series 81) Table 201		
Material Name	Material Bulk Code	Other Specifications
MIL-PRF-680, Type I, II, or III	B00074	
Shopmaster RTU		
TT-N-95, Type II	B00083	
TT-T-291, Type I, II, or III	B00762	
Turco 6226		

AIRPLANE STRUCTURE CLEANING SOLVENTS (SERIES 82) - MAINTENANCE PRACTICES

1. General
   A. This subject contains a list of solvents for general cleaning of solvent resistant organic coatings as given in BAC5750. This subject gives only the list of solvents. It does not tell you which solvent to use or how to use the solvents.

TASK 20-30-82-102-001

2. General Cleaning of Solvent Resistant Organic Coatings (Series 82)
   A. General
      (1) This selection of solvents uses BAC5750 as a guide. This list of solvents has the Series Bulk Code of B01002, but this code is only for reference, to identify this complete group. In your orders to get the solvents of this list, you must identify each individual solvent by its name, bulk code, or other specification, as shown. Do not use the Series Bulk Code. Refer to the U-File for the applicable vendors.
   B. Procedure

S 112-003

(1) In Table 201, find the applicable solvent.

General Cleaning of Solvent Resistant Organic Coatings (Series 82) Table 201

Material Name	Material Bulk Code	Other Specifications
1,1,1-Trichloroethane	B00090	
Acetone	B00062	JIS-K-1503
Aerfluor 343		
BMS 11-7	B00184	MIL-C-38736B
CDG-110		
CDG-211		
Citra Safe	B00634	
Citra Safe, Deodorized		

General Cleaning of Solvent Resistant Organic Coatings (Series 82) Table 201		
Material Name	Material Bulk Code	Other Specifications
d-Limonene		
DeSo Clean 45	B00647	
EP-921		
Ethyl alcohol, denatured	B00068	
Ethyl-3-Ethoxy propionate (EEP)		
Extra Solv		
FCC-55		
Freon TES or Genesolve DES		
Freon TF or Genesolve D	B00143	
Glidsafe Prepsolv		
Isopropyl Alcohol (IPA)	B00130	
MEK:1,1,1-Trichloroethane 1:1		
MEK:Sec-Butyl Alcohol 42:58 percent		
MEK:Toluene 1:1		
Methyl Ethyl Ketone (MEK)	B00148	
Methyl Isobutyl Ketone (MIBK)	B00151	JIS-K-8903
Methyl Propyl Ketone (MPK)	B00666	
MIBK:MEK 3:2		
MIL-C-81302, Type I	B00143	

General Cleaning of Solvent Resistant Organic Coatings (Series 82) Table 201		
Material Name	Material Bulk Code	Other Specifications
M0K or M0K*		
MIL-PRF-680, Type I, II, or III	B00074	
Shopmaster RTU		
Toluene	B00094	
TT-N-95, Type II	B00083	
TT-T-291, Type I, II, or III	B00762	
Turco 4460 BK		
Turco 6226		
Turco 6709		
Wedco 3500		

AIRPLANE STRUCTURE CLEANING SOLVENTS (SERIES 83) - MAINTENANCE PRACTICES

1. General
   A. This subject contains a list of solvents for general cleaning of composites as given in BAC5750. This subject gives only the list of solvents. It does not tell you which solvent to use or how to use the solvents.

TASK 20-30-83-102-001

2. General Cleaning of Composites (Series 83)
   A. General
      (1) This selection of solvents uses BAC5750 as a guide. This list of solvents has the Series Bulk Code of B01003, but this code is only for reference, to identify this complete group. In your orders to get the solvents of this list, you must identify each individual solvent by its name, bulk code, or other specification, as shown. Do not use the Series Bulk Code. Refer to the U-File for the applicable vendors.
   B. Procedure

S 112-003

(1) In Table 201, find the applicable solvent.

General Cleaning of Composites (Series 83)
Table 201

Material Name	Material Bulk Code	Other Specifications
Acetone	B00062	JIS-K-1503
Aerfluor 343		
BMS 11-7	B00184	MIL-C-38736B
CDG-110		
CDG-211		
Citra Safe	B00634	
Citra Safe, Deodorized		
d-Limonene		
Ethyl Alcohol, denatured	B00068	

General Cleaning of Composites (Series 83) Table 201		
Material Name	Material Bulk Code	Other Specifications
FCC-55		
Glidsafe Prepsolv		
Isopropyl Alcohol (IPA)	B00130	
MEK:1,1,1-Trichloroethane 1:1		
MEK:Sec-Butyl alcohol 42:58 percent		
MEK:Toluene 1:1		
Methyl Ethyl Ketone (MEK)	B00148	
Methyl Propyl Ketone (MPK)	B00666	
MIBK:MEK 3:2		
TT-N-95, Type II	B00083	
Turco 4460 BK		
Turco 6709		

AIRPLANE STRUCTURE CLEANING SOLVENTS (SERIES 84) - MAINTENANCE PRACTICES

1. General
   A. This subject contains a list of solvents for final cleaning of metal prior to painting as given in BAC5750. This subject gives only the list of solvents. It does not tell you which solvent to use or how to use the solvents.

TASK 20-30-84-102-001

2. Final Cleaning of Metal Prior to Painting (Series 84)
   A. General
      (1) This selection of solvents uses BAC5750 as a guide. This list of solvents has the Series Bulk Code of B01004, but this code is only for reference, to identify this complete group. In your orders to get the solvents of this list, you must identify each individual solvent by its name, bulk code, or other specification, as shown. Do not use the Series Bulk Code. Refer to the U-File for the applicable vendors.
   B. Procedure

S 112-002

      (1) In Table 201, find the applicable solvent.

Final Cleaning of Metal Prior to Painting (Series 84)
Table 201

Material Name	Material Bulk Code	Other Specifications
Acetone	B00062	JIS-K-1503
BMS 11-7	B00184	MIL-C-38736B
CDG-110		
CDG-211		
Citra Safe	B00634	
Citra Safe, Deodorized		
d-Limonene		
DeSo Clean 45	B00647	
FCC-55		

Final Cleaning of Metal Prior to Painting (Series 84) Table 201		
Material Name	Material Bulk Code	Other Specifications
Glidsafe Prepsolv		
Isopropyl Alcohol (IPA)	B00130	
MEK:1,1,1-Trichloroethane 1:1		
MEK:Sec-Butyl alcohol 42:58 percent		
MEK:Toluene 1:1		
Methyl Ethyl Ketone (MEK)	B00148	
Methyl Propyl Ketone (MPK)	B00666	
MIBK:MEK 3:2		
MIL-C-81302, Type I	B00143	
Toluene	B00094	
Turco 4460 BK		
Turco 6709		

AIRPLANE STRUCTURE CLEANING SOLVENTS (SERIES 85) - MAINTENANCE PRACTICES

1. General
   A. This subject contains a list of solvents for final cleaning of all organic coatings prior to painting as given in BAC5750. This subject gives only the list of solvents. It does not tell you which solvent to use or how to use the solvents.

TASK 20-30-85-102-001

2. Final Cleaning of All Organic Coatings Prior to Painting (Series 85)
   A. General
      (1) This selection of solvents uses BAC5750 as a guide. This list of solvents has the Series Bulk Code of B01005, but this code is only for reference, to identify this complete group. In your orders to get the solvents of this list, you must identify each individual solvent by its name, bulk code, or other specification, as shown. Do not use the Series Bulk Code. Refer to the U-File for the applicable vendors.
   B. Procedure

S 112-002

(1) In Table 201, find the applicable solvent.

Final Cleaning of All Organic Coatings Prior to Painting (Series 85) Table 201

Material Name	Material Bulk Code	Other Specifications
BMS 11-7	B00184	MIL-C-38736B
CDG-110		
CDG-211		
FCC-55		
Isopropyl Alcohol (IPA)	B00130	
MEK:Sec-Butyl Alcohol 42:58 percent		
MEK:Toluene 1:1		
Methyl Ethyl Ketone (MEK)	B00148	

Final Cleaning of All Organic Coatings Prior to Painting (Series 85) Table 201		
Material Name	Material Bulk Code	Other Specifications
Methyl Propyl Ketone (MPK)	B00666	
MIBK:MEK 3:2		
MIL-C-81302, Type I	B00143	
Toluene	B00094	
Turco 4460 BK		
Turco 6709		

AIRPLANE STRUCTURE CLEANING SOLVENTS (SERIES 86) - MAINTENANCE PRACTICES

1. General
   A. This subject contains a list of solvents for final cleaning of solvent resistant coatings prior to painting as given in BAC5750. This subject gives only the list of solvents. It does not tell you which solvent to use or how to use the solvents.

TASK 20-30-86-102-001

2. Final Cleaning of Solvent Resistant Coatings Prior to Painting (Series 86)
   A. General
      (1) This selection of solvents uses BAC5750 as a guide. This list of solvents has the Series Bulk Code of B01006, but this code is only for reference, to identify this complete group. In your orders to get the solvents of this list, you must identify each individual solvent by its name, bulk code, or other specification, as shown. Do not use the Series Bulk Code. Refer to the U-File for the applicable vendors.
   B. Procedure

S 112-002

(1) In Table 201, find the applicable solvent.

Final Cleaning of Solvent Resistant Organic Coatings Prior to Painting (Series 86)
Table 201

Material Name	Material Bulk Code	Other Specifications
Acetone	B00062	JIS-K-1503
BMS 11-7	B00184	MIL-C-38736B
CDG-110		
CDG-211		
Citra Safe	B00634	
Citra Safe, Deodorized		
d-Limonene		
DeSo Clean 45	B00647	

Final Cleaning of Solvent Resistant Organic Coatings Prior to Painting (Series 86) Table 201		
Material Name	Material Bulk Code	Other Specifications
FCC-55		
Glidsafe Prepsolv		
Isopropyl Alcohol (IPA)	B00130	
MEK:1,1,1-Trichloroethane 1:1		
MEK:Sec-Butyl Alcohol 42:58 percent		
MEK:Toluene 1:1		
Methyl Ethyl Ketone (MEK)	B00148	
Methyl Propyl Ketone (MPK)	B00666	
MIBK:MEK 3:2		
MIL-C-81302, Type I	B00143	
Toluene	B00094	
Turco 4460 BK		
Turco 6709		

AIRPLANE STRUCTURE CLEANING SOLVENTS (SERIES 87) - MAINTENANCE PRACTICES

1. General
   A. This subject contains a list of solvents for final cleaning prior to painting composites as given in BAC5750. This subject gives only the list of solvents. It does not tell you which solvent to use or how to use the solvents.

TASK 20-30-87-102-001

2. Final Cleaning Prior to Painting Composites (Series 87)
   A. General
      (1) This selection of solvents uses BAC5750 as a guide. This list of solvents has the Series Bulk Code of B01007, but this code is only for reference, to identify this complete group. In your orders to get the solvents of this list, you must identify each individual solvent by its name, bulk code, or other specification, as shown. Do not use the Series Bulk Code. Refer to the U-File for the applicable vendors.
   B. Procedure

S 112-002

      (1) In Table 201, find the applicable solvent.

Final Cleaning Prior to Painting Composites (Series 87)
Table 201

Material Name	Material Bulk Code	Other Specifications
Acetone	B00062	JIS-K-1503
BMS 11-7	B00184	MIL-C-38736B
CDG-110		
CDG-211		
Citra Safe	B00634	
Citra Safe, Deodorized		
d-Limonene		
FCC-55		
Glidsafe Prepsolv		

Final Cleaning Prior to Painting Composites (Series 87) Table 201		
Material Name	Material Bulk Code	Other Specifications
MEK:1,1,1-Trichloroethane 1:1		
MEK:sec-Butyl alcohol 42:58 percent		
MEK:Toluene 1:1		
Methyl Ethyl Ketone (MEK)	B00148	
Methyl Propyl Ketone (MPK)		
MIBK:MEK 3:2		
Turco 4460 BK		
Turco 6709		

AIRPLANE STRUCTURE CLEANING SOLVENTS (SERIES 88) - MAINTENANCE PRACTICES

1. General
   A. This subject contains a list of solvents for final cleaning of metal prior to non-structural bonding as given in BAC5750. This subject gives only the list of solvents. It does not tell you which solvent to use or how to use the solvents.

TASK 20-30-88-102-001

2. Final Cleaning of Metal Prior to Non-structural Bonding (Series 88)
   A. General
      (1) This selection of solvents uses BAC5750 as a guide. This list of solvents has the Series Bulk Code of B01008, but this code is only for reference, to identify this complete group. In your orders to get the solvents of this list, you must identify each individual solvent by its name, bulk code, or other specification, as shown. Do not use the Series Bulk Code. Refer to the U-File for the applicable vendors.
   B. Procedure

S 112-002

(1) In Table 201, find the applicable solvent.

Final Cleaning of Metal Prior to Non-structural Bonding (Series 88) Table 201

Material Name	Material Bulk Code	Other Specifications
Acetone	B00062	JIS-K-1503
BMS 11-7	B00184	MIL-C-38736B
CDG-110		
CDG-211		
Ethyl alcohol, denatured	B00068	
FCC-55		
Isopropyl Alcohol (IPA)	B00130	
MEK:1,1,1-Trichloroethane 1:1		

Final Cleaning of Metal Prior to Non-structural Bonding (Series 88) Table 201		
Material Name	Material Bulk Code	Other Specifications
MEK:Sec-Butyl Alcohol 42:58 percent		
Methyl Ethyl Ketone (MEK)	B00148	
Methyl Propyl Ketone (MPK)	B00666	
MIBK:MEK 3:2		
MIL-C-81302, Type I	B00143	
Turco 6709		

AIRPLANE STRUCTURE CLEANING SOLVENTS (SERIES 89) - MAINTENANCE PRACTICES

1. General
   A. This subject contains a list of solvents for final cleaning of all organic coatings prior to non-structural bonding as given in BAC5750. This subject gives only the list of solvents. It does not tell you which solvent to use or how to use the solvents.

TASK 20-30-89-102-001

2. Final Cleaning of All Organic Coatings Prior to Non-structural Bonding (Series 89)
   A. General
      (1) This selection of solvents uses BAC5750 as a guide. This list of solvents has the Series Bulk Code of B01009, but this code is only for reference, to identify this complete group. In your orders to get the solvents of this list, you must identify each individual solvent by its name, bulk code, or other specification, as shown. Do not use the Series Bulk Code. Refer to the U-File for the applicable vendors.
   B. Procedure

S 112-002

(1) In Table 201, find the applicable solvent.

Final Cleaning of All Organic Coatings Prior to Non-structural Bonding (Series 89)
Table 201

Material Name	Material Bulk Code	Other Specifications
CDG-110		
CDG-211		
Ethyl Alcohol, denatured	B00068	
Isopropyl Alcohol (IPA)	B00130	
MIL-C-81302, Type I	B00143	

AIRPLANE STRUCTURE CLEANING SOLVENTS (SERIES 90) - MAINTENANCE PRACTICES

1. General
   A. This subject contains a list of solvents for final cleaning of solvent resistant organic coatings prior to non-structural bonding as given in BAC5750. This subject gives only the list of solvents. It does not tell you which solvent to use or how to use the solvents.

TASK 20-30-90-102-001

2. Final Cleaning of Solvent Resistant Organic Coatings Prior to Non-structural Bonding (Series 90)
   A. General
      (1) This selection of solvents uses BAC5750 as a guide. This list of solvents has the Series Bulk Code of B01010, but this code is only for reference, to identify this complete group. In your orders to get the solvents of this list, you must identify each individual solvent by its name, bulk code, or other specification, as shown. Do not use the Series Bulk Code. Refer to the U-File for the applicable vendors.
   B. Procedure

      S 112-002
      (1) In Table 201, find the applicable solvent.

Final Cleaning of Solvent Resistant Organic Coatings Prior to Non-structural Bonding (Series 90)
Table 201

Material Name	Material Bulk Code	Other Specifications
BMS 11-7	B00184	MIL-C-38736B
CDG-110		
CDG-211		
Ethyl Alcohol, denatured	B00068	
FCC-55		
Isopropyl Alcohol (IPA)	B00130	
MEK:1,1,1-Trichloroethane 1:1		

Final Cleaning of Solvent Resistant Organic Coatings Prior to Non-structural Bonding (Series 90)
Table 201

Material Name	Material Bulk Code	Other Specifications
MEK:Sec-Butyl Alcohol 42:58 percent		
Methyl Ethyl Ketone (MEK)	B00148	
Methyl Propyl Ketone (MPK)	B00666	
MIBK:MEK 3:2		
MIL-C-81302, Type I	B00143	
Turco 6709		

AIRPLANE STRUCTURE CLEANING SOLVENTS (SERIES 91) - MAINTENANCE PRACTICES

1. General
   A. This subject contains a list of solvents for final cleaning of composites prior to non-structural bonding as given in BAC5750. This subject gives only the list of solvents. It does not tell you which solvent to use or how to use the solvents.

TASK 20-30-91-102-001

2. Final Cleaning of Composites Prior to Non-structural Bonding (Series 91)
   A. General
      (1) This selection of solvents uses BAC5750 as a guide. This list of solvents has the Series Bulk Code of B01011, but this code is only for reference, to identify this complete group. In your orders to get the solvents of this list, you must identify each individual solvent by its name, bulk code, or other specification, as shown. Do not use the Series Bulk Code. Refer to the U-File for the applicable vendors.
   B. Procedure

S 112-002

(1) In Table 201, find the applicable solvent.

Final Cleaning of Composites Prior to Non-structural Bonding (Series 91)
Table 201

Material Name	Material Bulk Code	Other Specifications
Acetone	B00062	JIS-K-1503
BMS 11-7	B00184	MIL-C-38736B
CDG-110		
CDG-211		
Ethyl Alcohol, denatured	B00068	
FCC-55		
Isopropyl Alcohol (IPA)	B00130	
MEK:1,1,1-Trichloroethane 1:1		

Final Cleaning of Composites Prior to Non-structural Bonding (Series 91) Table 201		
Material Name	Material Bulk Code	Other Specifications
MEK:Sec-Butyl Alcohol 42:58 percent		
Methyl Ethyl Ketone (MEK)	B00148	
Methyl Propyl Ketone (MPK)	B00666	
MIBK:MEK 3:2		
Turco 6709		

AIRPLANE STRUCTURE CLEANING SOLVENTS (SERIES 92) - MAINTENANCE PRACTICES

1. General
   A. This subject contains a list of solvents for final cleaning prior to general sealing as given in BAC5000. This subject gives only the list of solvents. It does not tell you which solvent to use or how to use the solvents.

TASK 20-30-92-102-001

2. Final Cleaning Prior to General Sealing (Series 92)
   A. General
      (1) This selection of solvents uses BAC5000 as a guide and may be used on all surfaces except unpainted composite laminated surfaces. This list of solvents has the Series Bulk Code of B01012, but this code is only for reference, to identify this complete group. In your orders to get the solvents of this list, you must identify each individual solvent by its name, bulk code, or other specification, as shown. Do not use the Series Bulk Code. Refer to the U-File for the applicable vendors.
   B. Procedure

S 112-002

      (1) In Table 201, find the applicable solvent.

Final Cleaning Prior to General Sealing (Series 92)
Table 201

Material Name	Material Bulk Code	Other Specifications
1,1,1-Trichloroethane	B00090	
Aliphatic Naphtha (for acrylic surfaces only)	B00083	TT-N-95 (Type II)
BMS 11-7	B00184	
Citra Safe	B00634	
Dowclene DC		
FCC-55		
MEK:Sec-Butyl Alcohol 42:58 percent		

Final Cleaning Prior to General Sealing (Series 92) Table 201		
Material Name	Material Bulk Code	Other Specifications
Methyl Ethyl Ketone (MEK)	B00148	ASTM D740 JIS-K-1524
Methyl Propyl Ketone (MPK)	B00666	

AIRPLANE STRUCTURE CLEANING SOLVENTS (SERIES 93) - MAINTENANCE PRACTICES

1. General
   A. This subject contains a list of solvents for final cleaning prior to fuel tank sealing as given in BAC5504. This subject gives only the list of solvents. It does not tell you which solvent to use or how to use the solvents.

TASK 20-30-93-102-001

2. Final Cleaning Prior to Fuel Tank Sealing (Series 93)
   A. General
      (1) This selection of solvents uses BAC5504 as a guide. This list of solvents has the Series Bulk Code of B01013, but this code is only for reference, to identify this complete group. In your orders to get the solvents of this list, you must identify each individual solvent by its name, bulk code, or other specification, as shown. Do not use the Series Bulk Code. Refer to the U-File for the applicable vendors.
   B. Procedure

      S 112-002
      (1) In Table 201, find the applicable solvent.

Final Cleaning Prior to Fuel Tank Sealing (Series 93)
Table 201

Material Name	Material Bulk Code	Other Specifications
1,1,1-Trichloroethane	B00090	O-T-620
BMS 11-7	B00184	
Dowclene EC		
FCC-55		
MEK:Sec-Butyl Alcohol 42:58 percent		
Methyl Ethyl Ketone (MEK)	B00148	ASTM D740 JIS-K-1524

Final Cleaning Prior to Fuel Tank Sealing (Series 93) Table 201		
Material Name	Material Bulk Code	Other Specifications
Methyl Propyl Ketone (MPK)	B00666	

AIRPLANE STRUCTURE CLEANING SOLVENTS (SERIES 94) - MAINTENANCE PRACTICES

1. General
   A. This subject contains a list of solvents for final cleaning prior to application of rain erosion resistant coating as given in BAC5880. This subject gives only the list of solvents. It does not tell you which solvent to use or how to use the solvents.

TASK 20-30-94-102-001

2. Final Cleaning Prior to Application of Rain Erosion Resistant Coating (Series 94)
   A. General
      (1) This selection of solvents uses BAC5880 as a guide. This list of solvents has the Series Bulk Code of B01014, but this code is only for reference, to identify this complete group. In your orders to get the solvents of this list, you must identify each individual solvent by its name, bulk code, or other specification, as shown. Do not use the Series Bulk Code. Refer to the U-File for the applicable vendors.
   B. Procedure

S 112-002

(1) In Table 201, find the applicable solvent.

Final Cleaning Prior to Application of Rain Erosion Resistant Coating (Series 94)
Table 201

Material Name	Material Bulk Code	Other Specifications
Methyl Ethyl Ketone (MEK)	B00148	TT-M-261

AIRPLANE STRUCTURE CLEANING SOLVENTS (SERIES 95) - MAINTENANCE PRACTICES

1. General
   A. This subject contains a list of solvents for final cleaning prior to aerodynamic smoothing and fairing as given in BAC5030. This subject gives only the list of solvents. It does not tell you which solvent to use or how to use the solvents.

TASK 20-30-95-102-001

2. Final Cleaning Prior to Aerodynamic Smoothing and Fairing (Series 95)
   A. General
      (1) This selection of solvents uses BAC5030 as a guide. This list of solvents has the Series Bulk Code of B01015, but this code is only for reference, to identify this complete group. In your orders to get the solvents of this list, you must identify each individual solvent by its name, bulk code, or other specification, as shown. Do not use the Series Bulk Code. Refer to the U-File for the applicable vendors.
   B. Procedure

S 112-002

      (1) In Table 201, find the applicable solvent.

Final Cleaning Prior to Aerodynamic Smoothing and Fairing (Series 95) Table 201

Material Name	Material Bulk Code	Other Specifications
1,1,1-Trichloroethane	B00090	O-T-620
Aliphatic Naphtha (for acrylic surfaces only)	B00083	TT-N-95, (Type 11)
BMS 11-7	B00184	MIL-C-38736B
Citra Safe	B00634	
FCC-55		
Methyl Ethyl Ketone (MEK)	B00148	ASTM D740
Methyl Propyl Ketone (MPK)	B00666	

AIRPLANE STRUCTURE CLEANING SOLVENTS (SERIES 96) - MAINTENANCE PRACTICES

1. General
   A. This subject contains a list of solvents for final cleaning of oxygen components exposed to oxygen as given in BAC5402. This subject gives only the list of solvents. It does not tell you which solvent to use or how to use the solvents.

TASK 20-30-96-102-001

2. Final Cleaning of Oxygen Components Exposed to Oxygen (Series 96)
   A. General
      (1) This selection of solvents uses BAC5402 as a guide. This list of solvents has the Series Bulk Code of B01016, but this code is only for reference, to identify this complete group. In your orders to get the solvents of this list, you must identify each individual solvent by its name, bulk code, or other specification, as shown. Do not use the Series Bulk Code. Refer to the U-File for the applicable vendors.
   B. Procedure

S 112-002

(1) In Table 201, find the applicable solvent.

Final Cleaning of Oxygen Components Exposed to Oxygen (Series 96)
Table 201

Material Name	Material Bulk Code	Other Specifications
Freon TF	B00143	
Trichloroethylene	B00081	ASTM D 4080
Tetrachloroethylene	B00093	O-T-236

Final Cleaning of Oxygen Components Exposed to Oxygen (Series 96) Table 201		
Material Name	Material Bulk Code	Other Specifications
Isopropyl Alcohol	B00130	TT-I-735
HFE 7100	B50002	
HFE 71DE	B50003	
Vertrel XF	B50004	
Vertrel MCA	B50005	

AIRPLANE STRUCTURE CLEANING SOLVENTS (SERIES 97) - MAINTENANCE PRACTICES

1. General
   A. This subject contains a list of solvents for final cleaning prior to structural bonding as given in BAC5514. This subject gives only the list of solvents. It does not tell you which solvent to use or how to use the solvents.

TASK 20-30-97-102-001

2. Final Cleaning Prior to Structural Bonding (Series 97)
   A. General
      (1) This selection of solvents uses BAC5514 as a guide. This list of solvents has the Series Bulk Code of B01017, but this code is only for reference, to identify this complete group. In your orders to get the solvents of this list, you must identify each individual solvent by its name, bulk code, or other specification, as shown. Do not use the Series Bulk Code. Refer to the U-File for the applicable vendors.
   B. Procedure

S 112-002

      (1) In Table 201, find the applicable solvent.

Final Cleaning Prior to Structural Bonding (Series 97)
Table 201

Material Name	Material Bulk Code	Other Specifications
MEK:Sec-Butyl Alcohol 42:58 percent		
Methyl Ethyl Ketone (MEK)	B00148	ASTM D740
Methyl Isobutyl Ketone (MIBK)	B00151	ASTM D1153
Methyl Propyl Ketone (MPK)	B00666	
MIBK:MEK 3:2		
Sec-Butyl Alcohol		ASTM D1007

AIRPLANE STRUCTURE CLEANING SOLVENTS (SERIES 98 & 98-1) - MAINTENANCE PRACTICES

1. General
   A. This subject contains a list of solvents for cleaning of specific polymerics as given in BAC5750. This subject gives only the list of solvents. It does not tell you which solvent to use or how to use the solvents.

TASK 20-30-98-102-001

2. Cleaning of Specific Polymerics (Series 98)
   A. General
      (1) This selection of solvents uses BAC5750 as a guide. This list of solvents has the Series Bulk Code of B01018, but this code is only for reference, to identify this complete group. In your orders to get the solvents of this list, you must identify each individual solvent by its name, bulk code, or other specification, as shown. Do not use the Series Bulk Code. Refer to the U-File for the applicable vendors.
      (2) The solvents in this list may be used for:
         (a) The general cleaning of:
            1) Polyester (Vibrin, Mylar, Dacron)
            2) Polytetrafluoroethylene (Teflon)
            3) Polyvinyl fluoride (Tedlar)
         (b) Or, the final cleaning of the following prior to painting:
            1) Polyester (Vibrin, Mylar, Dacron)
            2) Polytetrafluoroethylene (Teflon)
            3) Polyvinyl fluoride (Tedlar)
         (c) Or, the final cleaning of the following prior to non-structural bonding:
            1) Polyester (Vibrin, Mylar, Dacron)
            2) Polytetrafluoroethylene (Teflon)
            3) Polyvinyl fluoride (Tedlar)
   B. Procedure

      S 112-002
      (1) In Table 201, find the applicable solvent.

Cleaning of Specific Polymerics (Series 98)
Table 201

Material Name	Material Bulk Code	Other Specifications
Acetone	B00062	JIS-K-1503
BMS 11-7	B00184	MIL-C-38736B

Cleaning of Specific Polymerics (Series 98) Table 201		
Material Name	Material Bulk Code	Other Specifications
CDG-110		
CDG-211		
Ethyl Alcohol, denatured	B00068	
Ethyl-3-Ethoxy Propionate (EEP)		
FCC-55		
Isopropyl Alcohol (IPA)	B00130	
MEK:Sec-Butyl alcohol 42:58 percent		
Methyl Ethyl Ketone (MEK)	B00148	
Methyl Isobutyl Ketone (MIBK)	B00151	JIS-K-8903
Methyl Propyl Ketone (MPK)	B00666	
MOK or MOK*		
TT-N-95, Type II	B00083	
Turco 6709		

TASK 20-30-98-102-003

3. Cleaning of Phenolics or Nylon (Series 98-1)

A. General

(1) This selection of solvents uses BAC 5750 as a guide. This list of solvents has the Series Bulk Code of B01051, but this code is only for reference, to identify this complete group. In your orders to get the solvents of this list, you must identify each individual solvent by its name, bulk code, or other specification, as shown. Do not use the Series Bulk Code. Refer to the U-File for the applicable vendors.

B. Procedure

S 112-004

(1) When your procedure refers to this subject (Table 202), use a solvent from this list.

Cleaning of Phenolics or Nylon (Series 98-1) Table 202		
Material Name	Material Bulk Code	Other Specifications
Acetone (Nylon only)	B00062	JIS-K-1503
CDG-110		
CDG-211		
Ethyl alcohol, denatured	B00068	
FCC-55		
Isopropyl alcohol (IPA)	B00130	
MEK:sec-Butyl alcohol 42:58 percent		
Methyl ethyl ketone (MEK)	B00148	
Methyl Isobutyl Ketone (MIBK) (Nylon only)	B00151	JIS-K-8903
Methyl propyl ketone (MPK)	B00666	
Toluene (Nylon only)	B00084	
TT-N-95, Type II	B00083	
Turco 6709		

AIRPLANE STRUCTURE CLEANING SOLVENTS (SERIES 99) - MAINTENANCE PRACTICES

1. General
   A. This procedure contains a list of solvents for final cleaning of composites prior to structural bonding as given in BAC5578. This procedure gives only the list of solvents. It does not tell you which solvent to use or how to use the solvents.

TASK 20-30-99-912-001

2. Final Cleaning of Composites Prior to Structural Bonding (Series 99)
   A. General
      (1) This selection of solvents uses BAC5578 and D6-53900 as a guide. This list of solvents has the Series Bulk Code of B01019, but this code is only for reference to identify this complete group. In your orders to get the solvents of this list, you must identify each individual solvent by its name, bulk code, or other specification, as shown. Do not use the Series Bulk Code. Refer to the U-File for the applicable vendors.
   B. Procedure

      S 802-002
      (1) When your procedure refers to this subject (Table 201), use a solvent from this list.

Final Cleaning of Composites Prior to Structural Bonding
Table 201

Material Name	Material Bulk Code	Other Specifications
1,1,1-Trichloroethane (Non-Metallic core only)	B00090	
Acetone	B00062	O-A-51
BMS 11-7 (non-Metallic core only)	B00184	
Isopropyl Alcohol (IPA) (Non-Metallic core only)	B00130	
MEK: Toluene 1:1		ASTM D 740 TT-T-548
Methyl Ethyl Ketone (MEK)	B00148	ASTM D 780

Final Cleaning of Composites Prior to Structural Bonding Table 201		
Material Name	Material Bulk Code	Other Specifications
Methyl Propyl Ketone (MPK) (High purity)	B00666	
Naphtha (Non-Metallic core only)	B00083	TT-N-95 TII or Type II

STATIC GROUNDING - MAINTENANCE PRACTICES

1. General
   A. This procedure contains these tasks:
      (1) Static Ground procedure
         (a) Grounding (Static Grounding) is the process of connecting one or more metal objects and ground conductors to ground electrodes (an electrical path to earth).
      (2) Bonding procedure
         (a) Bonding is the process of connecting two or more metal objects together with a conductor.
      (3) Measure Airplane Electrical Resistance to Ground
   B. Static grounding is not necessary if the airplane is parked for a turnaround flight and no maintenance is to be done.
   C. During normal pressure refueling the airplane:
      (1) An electrical bond is necessary between the airplane and the refueling vehicle.
      (2) Static grounding is not necessary as long as the conductivity of the airplane and the parking site are adequate (AMM task Measure Airplane Electrical Resistance to Ground within this procedure).
         (a) The operator must ensure the adequacy of airplane and parking area conductivity and may need to establish local procedures in areas where inadequate parking site conductivity is seasonal or permanent.
         (b) Parking site conductivity may be inadequate on dry snow, dry sand, or in areas of low moisture.
   D. Static grounding is necessary:
      (1) During over wing refueling.
      (2) When performing maintenance task using following devices:
         (a) Power Tools
         (b) Electrical Power Sources
         (c) Lights
         (d) Powered Instruments
   E. When static grounding is recommended in a detailed procedure, the airplane must be statically grounded to a common, approved, identified ground. Where a grid system is used, any number of individual grounds will provide a common ground, since all grounds are interconnected. If an area does not have a grid system, a single approved and identified ground must be used as the common ground for all grounding cables used.
   F. Stop ground servicing operations, external to the airplane, during electrical storms.
   G. Electrostatic Grounding - Parked Airplane
      (1) The airplane is normally electrostatically grounded through conductive tires. (AMM task Measuring Electrical Resistance to Ground within this procedure). However, static grounding is necessary for:
         (a) Airplanes having inadequate conductivity to ground through the tires.

(b) Airplanes on parking sites that have inadequate conductivity.
1) The operator must ensure the adequacy of airplane and parking area conductivity and may need to establish local procedures in areas where inadequate parking site conductivity is seasonal or permanent.
2) Parking site conductivity may be inadequate on dry snow, dry sand, or in areas of low moisture.

H. Should operators elect not to follow this recommended procedure, they should develop alternate procedures or establish conditions adequately protecting the personnel and equipment involved. Local fire codes and customs may require alternative or additional procedures to those defined here.

I. When the airplane is on jacks and grounding cables interfere use this location.
(1) A different grounding location is through an unpainted bolt head common to the jack pad fittings.

TASK 20-41-00-862-023

2. Static Ground Procedure (Fig. 201)

A. Access
(1) Location Zones
711 Nose Landing Gear
731 Left Main Landing Gear
741 Right Main Landing Gear

B. Grounding Procedure:

S 422-034

WARNING: DO NOT CONNECT A HEADSET AND DO NOT TOUCH CONNECTIONS TO THE AIRPLANE DURING ATMOSPHERIC ELECTRICAL ACTIVITY OR IN STRONG ELECTROMAGNETIC FIELDS. LIGHTNING STRIKE AND HIGH DISCHARGE CURRENTS CAN CAUSE SEVERE INJURY.

WARNING: ALWAYS ATTACH THE GROUNDING CABLE TO THE GROUND CONNECTION FIRST. NEVER ATTACH THE CABLE TO THE AIRPLANE AND THEN TO THE GROUND CONNECTION.

WARNING: ALL WORK AROUND THE AIRPLANE MUST STOP WHEN LIGHTNING OCCURS AT A DISTANCE OF 6 MILES OR LESS. ALL PERSONNEL MUST GO IN A BUILDING OR THE AIRPLANE. LIGHTNING CAN KILL PERSONNEL OR CAUSE INJURY.

CAUTION: ATTACH GROUNDING CABLES ONLY TO SPECIFIED POINTS ON THE AIRPLANE. INCORRECTLY ATTACHED GROUNDING CABLES CAN CAUSE SCRATCHES WHICH CAN CAUSE CORROSION AND CRACKS ON STRESSED PARTS. GROUND WIRES ATTACHED TO DOORS OR FAIRINGS MADE FROM COMPOSITE MATERIALS DO NOT PROVIDE A GROUND.

(1) Attach grounding cable to a static ground and to the airplane in the following sequence:
   (a) Connect the grounding cable to an approved, identified static ground point. These points may be located in the parking surface or in another fixed location.
   (b) Connect the grounding cable to approved grounding attach point on the airplane. These points are identified in Fig. 201.
   (c) Attach ground cables to the jack pad during landing gear retraction tests. Jack pads must be completely installed and the grounding stud on the jack pad must be unpainted and free from oil and grease to act as an approved grounding point.

S 022-025

(2) Before the airplane is moved, remove the ground cables from the approved grounding attach point on the airplane.

TASK 20-41-00-762-026

3. Bonding Procedure

A. Procedure:

S 422-035

WARNING: DO NOT CONNECT A HEADSET AND DO NOT TOUCH CONNECTIONS TO THE AIRPLANE DURING ATMOSPHERIC ELECTRICAL ACTIVITY OR IN STRONG ELECTROMAGNETIC FIELDS. LIGHTNING STRIKE AND HIGH DISCHARGE CURRENTS CAN CAUSE SEVERE INJURY.

CAUTION: ATTACH BONDING CABLES ONLY TO SPECIFIED POINTS ON THE AIRPLANE. INCORRECTLY ATTACHED BONDING CABLES CAN CAUSE SCRATCHES WHICH CAN CAUSE CORROSION AND CRACKS ON STRESSED PARTS. BOND WIRES ATTACH TO DOORS OR FAIRINGS MADE FROM COMPOSITE MATERIALS DO NOT PROVIDE A BOND.

(1) Connect a bonding cable to a recognized bonding or grounding point on the airplane and a recognized grounding or bonding point on the support equipment in use.

S 022-028
(2) Before the airplane is moved, remove the bonding cables from the airplane.

TASK 20-41-00-762-029

4. Measure Airplane Electrical Resistance to Ground
   A. Equipment
      (1) Ohmmeter - Multimeter (Commercially Available)
   B. Reference
      (1) AMM 24-22-00/201, Supply Power Control
      (2) AMM 24-41-02/201, External Power Receptacle
   C. Prepare to Check

S 042-030
(1) Remove electrical power from the airplane (AMM 24-22-00/201).

S 042-038
(2) Remove or De-energize any External Powered devices.

S 762-040
(3) Do a continuity check from the neutral pin of the external power receptacle to the Grounding stud (AMM 24-41-02/201).

S 042-039
(4) Disconnect airplane static ground cables if connected.

S 422-031
(5) Connect a ohmmeter between the recognized bonding/grounding point on one of the Primary Landing gear of the airplane and an identified ground point on the ramp or the surface of the ramp on which the airplane is parked.

S 422-044
(6) Set the ohmmeter to the 50 Vdc range.

S 762-032
(7) Measure the resistance to ground and record in the maintenance log. Resistance should be less than 1.0 megohms.

S 762-041

(8) If the resistance exceeds 1.0 megohms this may be the result of inadequate grounding point or exceptional high surface resistance. Do the followings:

NOTE: If the resistance to ground is greater than 1.0 megohms, record this fact in the airplane log book and advise the flight crews of subsequent flights of this airplane that insufficient conductivity to ground is established through the tires to electrostatically ground this airplane on a parking surface and that static ground procedures may apply.

(a) Make sure the airplane is not parked over painted surfaces and that the tires provide adequate conductivity.

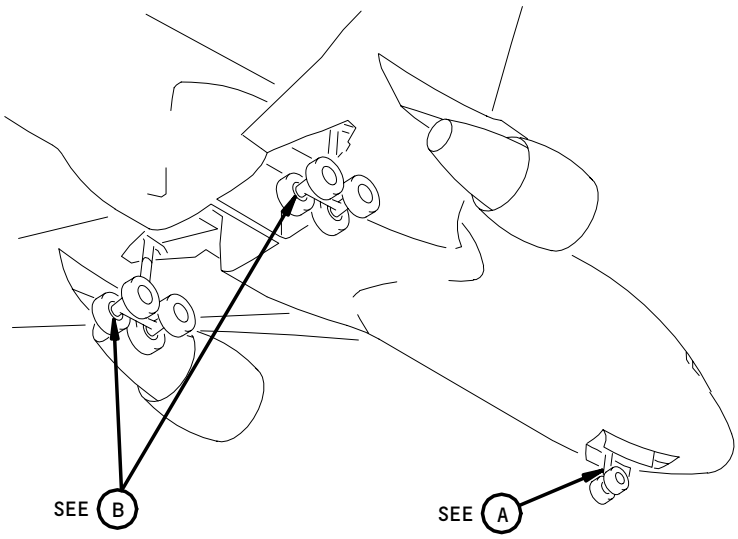
(b) Repeat the measurement at other parking site locations where successful measurements have been made to make sure the airplane has adequate conductivity.

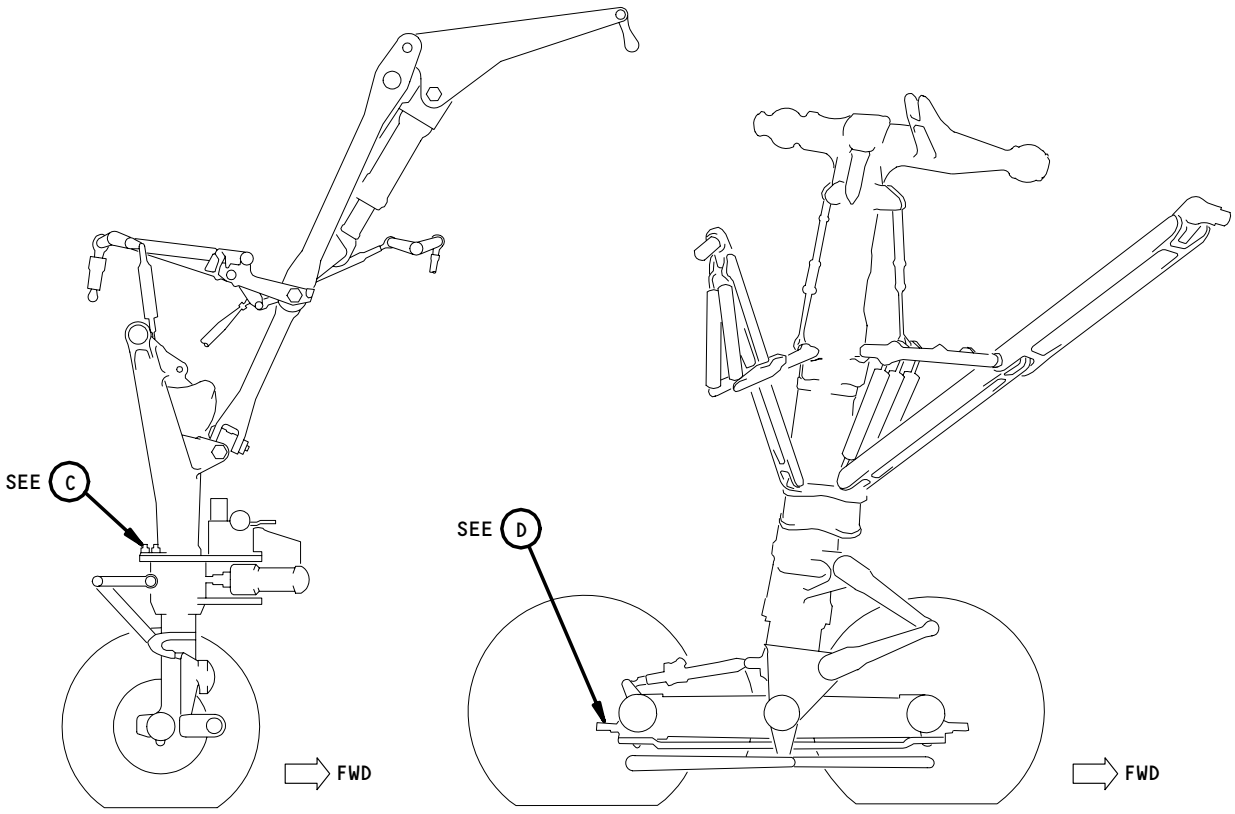
S 422-037

(9) Connect airplane static ground cables if necessary.

S 862-042

(10) Put the Airplane Back to Its Usual Condition

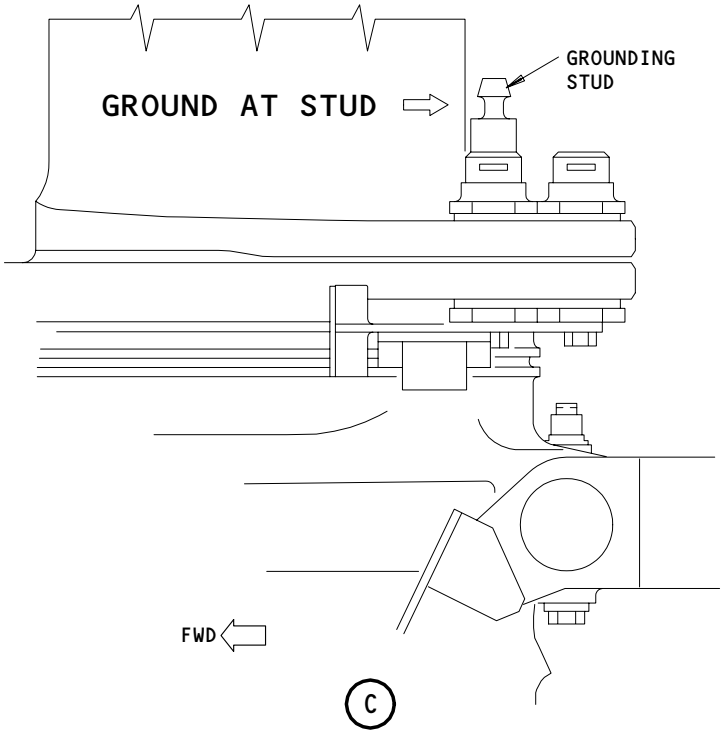




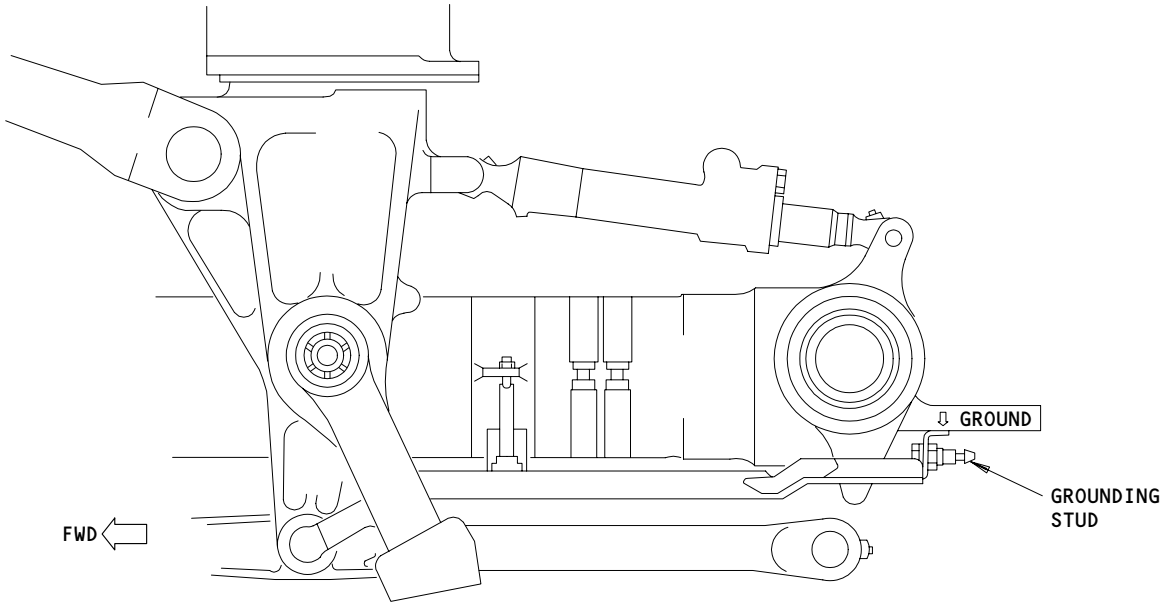
NOSE LANDING GEAR
A

MAIN LANDING GEAR
B

Static Ground – Maintenance Practices
Figure 201 (Sheet 1)



C



MAIN LANDING GEAR TRUCK

D

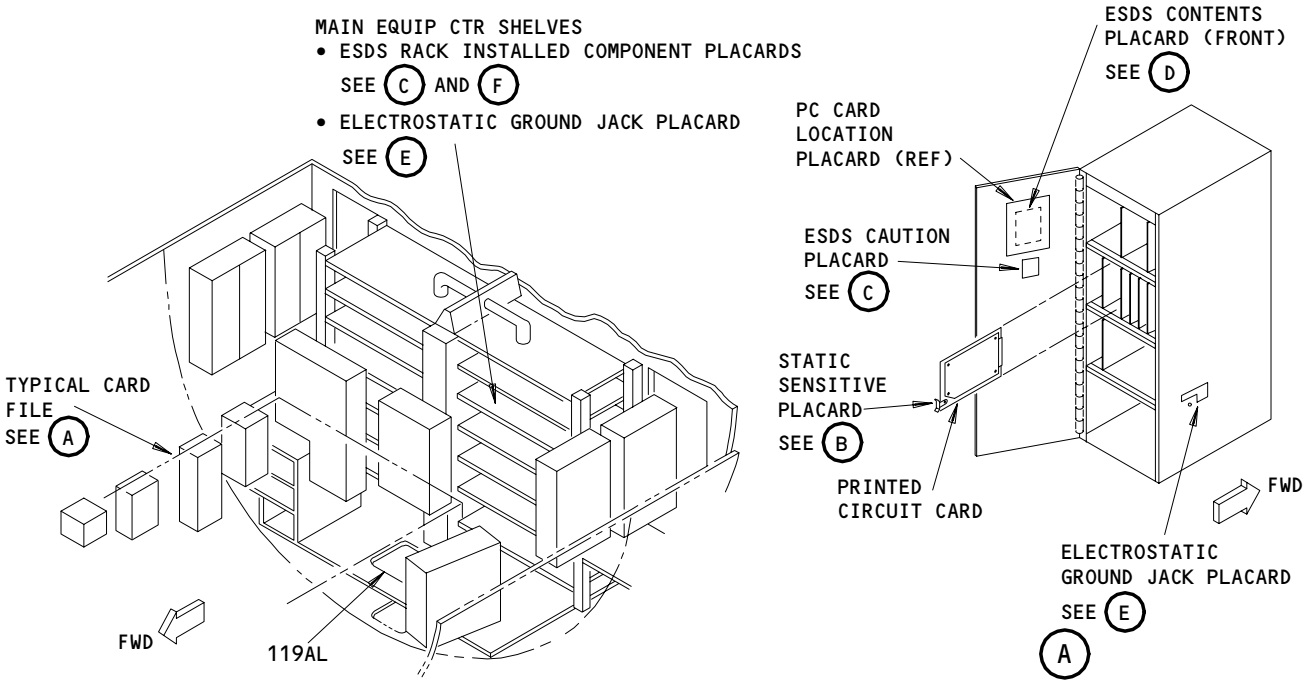
Static Ground - Maintenance Practices
Figure 201 (Sheet 2)

ELECTROSTATIC DISCHARGE SENSITIVE DEVICES - MAINTENANCE PRACTICES

1. General (Fig. 201)
   A. This procedure contains four tasks:
      (1) The first task is the removal of the ESDS printed circuit boards.
      (2) The second task is the installation of the ESDS printed circuit boards.
      (3) The third task is the removal of the ESDS metal encased units.
      (4) The fourth task is the installation of the ESDS metal encased units.
   B. Many electronic line replaceable units (referred to as LRUs) contain micro-circuits and other sensitive devices which can be damaged internally by electrostatic discharges. These LRUs are identified as Electrostatic Discharge Sensitive (referred to as ESDS). The placards installed on the ESDS LRUs show that you must be careful. The persons who remove, install, and move the ESDS LRUs must know about static electricity and the protection from static discharges that is necessary.
   C. Electrostatic charges can be caused by these: human bodies, hair, clothing, floors, equipment racks, and equipment units. An electrostatic discharge is electrostatic energy transmitted between substances of different electrical potentials. Electrostatic discharges from nylon clothing or human hair onto polyethylene or steel can damage ESDS components. Damage to the internal components of an ESDS LRU can cause failure with one static discharge. System properties can change with time because of many static discharges.
   D. The function of these procedures is to show the maintenance persons how to know and touch the ESDS LRUs. These procedures contain the precautions that are necessary to safely touch the units that are identified by the ESDS placard. Three types of decals are in used to identify the units with ESDS sensitive circuits. The military and commercial symbols are used on some units, while the international (JEDEC) symbol is used on most ESDS placard (Fig. 201). The ESDS printed circuit boards that are LRU's are identified with a "STATIC SENSITIVE" placard (Fig. 201).

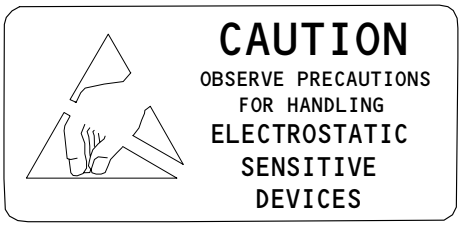
TASK 20-41-01-002-001

2. ESDS Printed Circuit Boards - Removal
   A. Equipment
      (1) Conductive Bags - 3M type 2100



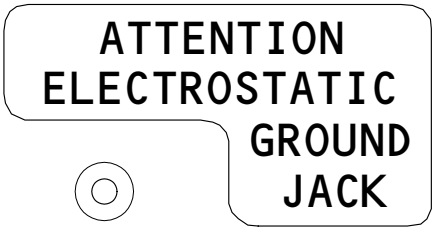
MAIN EQUIP CTR

B

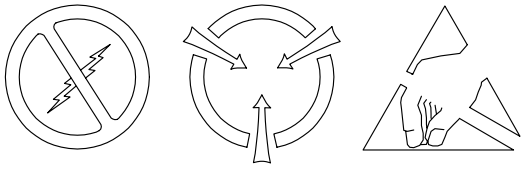


C

D



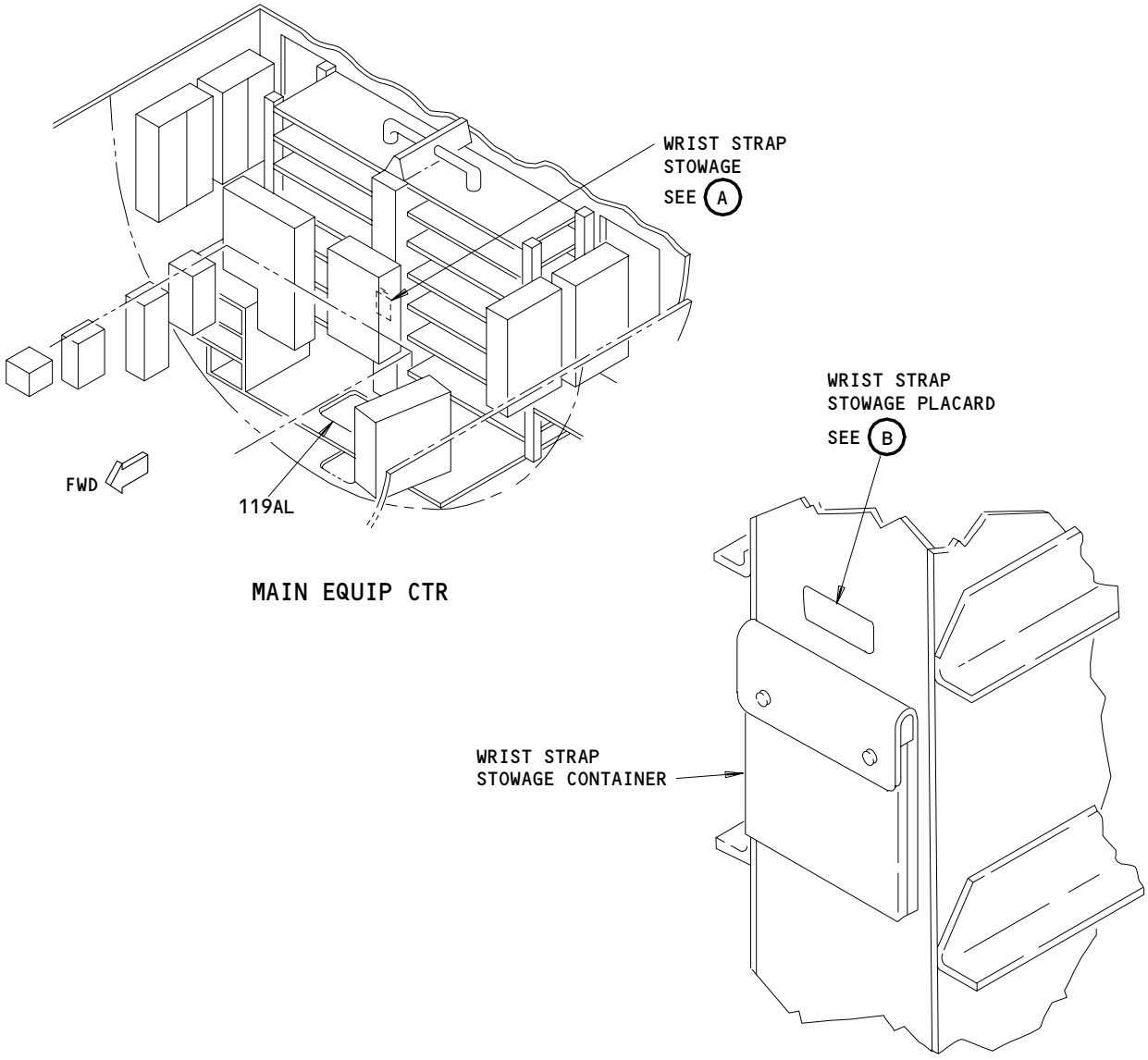
E



F

ESDS Devices Placards
Figure 201

31691



Wrist Strap Stowage
Figure 202

(2) Conductive Plastic Carrier - Electrical Insulation Suppliers PCC-700
(3) Ohmmeter
(4) Wrist Straps - 3M 2066, 2067, 2211, 2212, 2213, or 2214.

NOTE: A wrist strap is kept on the plenum of the racks E1-E2 in the main equipment center (Fig. 202).

(5) 100% Cotton Twine - Commercially Available
(6) ESDS Labels
(a) JEDEC International Label - multi-source
(b) 3M - No. 7102

B. Procedure - Printed Circuit Boards with the STATIC SENSITIVE placards - Removal

NOTE: The placards on the outer area of the card files show the cards that contain the ESDS printed circuit boards that are LRU's.

S 862-006

CAUTION: MAKE SURE YOU KEEP CONTAMINATION OR UNWANTED MATERIAL AWAY FROM THE SENSITIVE DEVICE. CONTAMINATION OR UNWANTED MATERIAL NEAR THE SENSITIVE DEVICE CAN CAUSE A MALFUNCTION IN THE SENSITIVE DEVICE.

(1) Remove the system electrical power with the applicable Removal/Installation procedure.

S 712-003

WARNING: USE A WRIST STRAP WITH A MINIMUM GROUNDING LEAD RESISTANCE OF 250 KILOHMS AND A MAXIMUM OF 1.5 MEGOHMS. USE OF A LOW RESISTANCE WRIST STRAP CAN CAUSE INJURY TO PERSONS IF A HIGH VOLTAGE SOURCE IS TOUCHED.

(2) Do these steps to do a test of the wrist strap resistance:
(a) Use an ohmmeter to make sure the wrist strap assembly has a minimum resistance of 250 kilohms and a maximum of 1.5 megohms.
(b) Put the wrist strap on your wrist.
(c) Use an ohmmeter to make sure the resistance is less than 10 megohm.

S 422-002
(3) Connect the wrist strap into the ELECTROSTATIC GROUND JACK of the card file.

S 862-005

CAUTION: THE GROUNDING LEAD ON THE WRIST STRAP MUST TOUCH THE SKIN TO GIVE THE PROTECTION THAT IS NECESSARY. FAILURE TO USE THE WRIST STRAP CORRECTLY CAN CAUSE DAMAGE TO THE ESDS PRINTED CIRCUIT BOARDS.

(4) Attach the wrist strap correctly on the person that will remove the printed circuit board.

S 012-006

(5) Open the access door on the card file.

S 032-007

(6) From the location decal, find the printed circuit board to be removed.

S 022-008

(7) Use the top and bottom (or left and right) extractors on the printed circuit board to remove it from the card file.

S 862-034

(8) Put the printed circuit board in the conductive bag or the container with the ESDS placard.

S 862-035

CAUTION: DO NOT USE STAPLES OR ADHESIVE TAPES TO CLOSE THE CONDUCTIVE BAGS. FAILURE TO CLOSE THE CONDUCTIVE BAGS CORRECTLY CAN CAUSE DAMAGE TO THE PRINTED CIRCUIT BOARD.

(9) Use an ESDS or a 100% cotton twine to close the conductive bag.

NOTE: The printed circuit boards in a conductive bag must be put in a rigid container to make sure the conductive bag stays in a satisfactory condition.

S 862-036

(10) Close the access door to the card file.

S 862-012

(11) Remove the wrist strap.

TASK 20-41-01-402-013

3. ESDS Printed Circuit Boards - Installation

A. Equipment

(1) Conductive Bags - 3M type 2100

(2) Conductive Plastic Carrier - Electrical Insulation Suppliers PCC-700

(3) Ohmmeter
(4) Wrist Straps - 3M 2066, 2067, 2211, 2212, 2213, or 2214.

NOTE: A wrist strap is kept on the plenum of the racks E1-E2 in the main equipment center (Fig. 202).

(5) 100% Cotton Twine - Commercially Available
(6) ESDS Labels
(a) JEDEC International Label - multi-source
(b) 3M - No. 7102

B. Procedure - Printed Circuit Boards with a STATIC SENSITIVE Placard - Installation

S 862-007

CAUTION: MAKE SURE YOU KEEP CONTAMINATION OR UNWANTED MATERIAL AWAY FROM THE SENSITIVE DEVICE. CONTAMINATION OR UNWANTED MATERIAL NEAR THE SENSITIVE DEVICE CAN CAUSE A MALFUNCTION IN THE SENSITIVE DEVICE.

(1) Remove the system electrical power with the applicable Removal/Installation procedure.

S 712-004

WARNING: USE A WRIST STRAP WITH A MINIMUM GROUNDING LEAD RESISTANCE OF 250 KILOHMS AND A MAXIMUM OF 1.5 MEGOHMS. USE OF A LOW RESISTANCE WRIST STRAP CAN CAUSE INJURY TO PERSONS IF A HIGH VOLTAGE SOURCE IS TOUCHED.

(2) Do these steps to do a test of the wrist strap resistance:
(a) Use an ohmmeter to make sure the wrist strap assembly has a minimum resistance of 250 kilohms and a maximum of 1.5 megohms.
(b) Put the wrist strap on your wrist.
(c) Use an ohmmeter to make sure the resistance is less than 10 megohm.

S 422-005
(3) Connect the wrist strap into the ELECTROSTATIC GROUND JACK of the card file.

S 862-016

CAUTION: THE GROUNDING LEAD ON THE WRIST STRAP MUST TOUCH THE SKIN TO GIVE THE PROTECTION THAT IS NECESSARY. FAILURE TO USE THE WRIST STRAP CORRECTLY CAN CAUSE DAMAGE TO THE ESDS PRINTED CIRCUIT BOARDS.

(4) Attach the wrist strap correctly on the person that will remove the printed circuit board.

S 862-017
(5) Open the access door on the card file.

S 862-018
(6) From the location decal, find the printed circuit board to be installed.

S 862-019
(7) Remove the ESDS printed circuit board from the conductive bag or the carrier.

S 422-020
(8) With the top and bottom (or left and right) extractors, put the printed circuit board into the card file.

S 432-021
(9) Attach the printed circuit card with the extractors.

S 862-022
(10) Close the access door for the card file.

S 862-023
(11) Remove the wrist strap.

TASK 20-41-01-002-024

4. ESDS Metal Encased Units - Removal

A. General

(1) This task provides intructions to touch an ESDS metal encased unit during removal.

B. Equipment

(1) Conductive dust caps and connector covers must be installed on the connectors of ESDS units when the units are removed.

(a) ITT Cannon - as applicable (stamped "CONDUCTIVE")

PART NUMBER	MARKING ON CAP	CONNECTOR
025-1155-001	BKAD1-A&B-R	BKAD1-A-R BKAD1-B-R
025-1156-001	BKAD1-C-R	BKAD1-C-R
025-1157-001	BKAD2&3-A&B-R	BKAD2-A-R BKAD2-B-R BKAD3-A-R BKAD3-B-R
025-1158-001	BKAD2&3-C-R	BKAD2-C-R BKAD3-C-R

(b) Souriau - as applicable

PART NUMBER	TYPE CONNECTOR	SHELL SIZE
8660-1404	Power	1
8660-1405	Signal	1
8660-1406	Power	2 & 3
8660-1407	Signal	2 & 3

(2) Anti-static dust caps and connector covers (alternate when conductive caps and covers not available)

(a) Plastic dust caps and connector covers that have an anti-static solution applied and they are dated.

(3) Ohmmeter - Resistance Measuring Bridge (commercially available)
(4) Wrist Straps - 3M 2066, 2067, 2211, 2212, 2213, or 2214.

C. Procedure - Metal Encased Units with the ESDS Placards-Removal

S 862-008

CAUTION: MAKE SURE YOU KEEP CONTAMINATION OR UNWANTED MATERIAL AWAY FROM THE SENSITIVE DEVICE. CONTAMINATION OR UNWANTED MATERIAL NEAR THE SENSITIVE DEVICE CAN CAUSE A MALFUNCTION IN THE SENSITIVE DEVICE.

(1) Remove the system electrical power with the applicable Removal/Installation procedure.

S 202-039

WARNING: USE A WRIST STRAP WITH A MINIMUM GROUNDING LEAD RESISTANCE OF 250 KILOHMS AND A MAXIMUM OF 1.5 MEGOHMS. USE OF A LOW RESISTANCE WRIST STRAP CAN CAUSE INJURY TO PERSONS IF A HIGH VOLTAGE SOURCE IS TOUCHED.

(2) Do these steps to do a resistance test of the strap:
(a) Use an ohmmeter to make sure the strap assembly has a minimum resistance of of 250 kilohms and a maximum of 1.5 megohms.

CAUTION: THE GROUNDING LEAD ON THE WRIST STRAP MUST TOUCH THE SKIN TO GIVE THE PROTECTION THAT IS NECESSARY. FAILURE TO USE THE WRIST STRAP CORRECTLY CAN CAUSE DAMAGE TO THE ESDS METAL ENCASED UNIT.

(b) Put the strap on the wrist of the person that will remove the metal encased unit.
(c) Use an ohmmeter to make sure the resistance is less than 10 megohms.

S 702-042
(3) Connect the strap to an applicable electrostatic ground jack.

S 022-026
(4) Remove the unit with the ESDS placard from the equipment rack, the airframe, or the panel as shown in the applicable Removal/Installation procedure.

NOTE: Make sure you do not touch the pins in the electrical connector. Make sure a static sensitive placard is installed adjacent to the electrical connector(s). This static sensitive placard, or an equivalent, will be shown:

CAUTION
ELECTROSTATIC SENSITIVE
DEVICE. CONDUCTIVE CONNECTOR
DUST COVER REQUIRED.

This placard show that the unit can be damaged by an electrostatic discharge through the connector pins.

S 032-027
(5) Install a conductive dust cover with a static sensitive placard on the connectors, and standard dust covers on the connectors that do not have the placard.

NOTE: The conductive dust caps and the connector covers are black in color.

NOTE: The conductive dust caps and the connector covers from the installed unit can be used on the removed unit.

S 002-045
(6) Remove the strap.

S 862-028

(7) Move the unit, as shown in the standard practices, with the conductive dust caps and connector covers installed.

TASK 20-41-01-402-029

5. ESDS Metal Encased Units - Installation

A. General

(1) This task provides instructions to touch an ESDS metal encased unit during installation.

B. Equipment

(1) Conductive dust caps and connector covers must be installed on the connectors of ESDS units when the units are removed.

(a) ITT Cannon - as applicable (stamped "CONDUCTIVE")

PART NUMBER	MARKING ON CAP	CONNECTOR
025-1155-001	BKAD1-A&B-R	BKAD1-A-R BKAD1-B-R
025-1156-001	BKAD1-C-R	BKAD1-C-R
025-1157-001	BKAD2&3-A&B-R	BKAD2-A-R BKAD2-B-R BKAD3-A-R BKAD3-B-R
025-1158-001	BKAD2&3-C-R	BKAD2-C-R BKAD3-C-R

(b) Souriau - as applicable

PART NUMBER	TYPE CONNECTOR	SHELL SIZE
8660-1404	Power	1
8660-1405	Signal	1
8660-1406	Power	2 & 3
8660-1407	Signal	2 & 3

(2) Anti-static dust caps and connector covers (alternate when conductive caps and covers not available)
  (a) Plastic dust caps and connector covers that have an anti-static solution applied and are dated.
(3) Ohmmeter - Resistance Measuring Bridge (commercially available)
(4) Wrist Straps - 3M 2066, 2067, 2211, 2212, 2213, or 2214.

C. Procedure - Metal Encased Units with ESDS Placards-Installation

S 862-037

CAUTION: MAKE SURE YOU KEEP CONTAMINATION OR UNWANTED MATERIAL AWAY FROM THE SENSITIVE DEVICE. CONTAMINATION OR UNWANTED MATERIAL NEAR THE SENSITIVE DEVICE CAN CAUSE A MALFUNCTION IN THE SENSITIVE DEVICE.

(1) Remove the system electrical power with the applicable Removal/Installation procedure.

S 702-050

WARNING: USE A WRIST STRAP WITH A MINIMUM GROUNDING LEAD RESISTANCE OF 250 KILOHMS AND A MAXIMUM OF 1.5 MEGOHMS. USE OF A LOW RESISTANCE WRIST STRAP CAN CAUSE INJURY TO PERSONS IF A HIGH VOLTAGE SOURCE IS TOUCHED.

(2) Do the steps to do a resistance test of the strap:
  (a) Use an ohmmeter to make sure the strap assembly has a minimum resistance of 250 kilohms and a maximum of 1.5 megohms.

  CAUTION: THE GROUNDING LEAD ON THE WRIST STRAP MUST TOUCH THE SKIN TO GIVE THE PROTECTION THAT IS NECESSARY. FAILURE TO USE THE WRIST STRAP CORRECTLY CAN CAUSE DAMAGE TO THE ESDS METAL ENCASED UNIT.

  (b) Put the strap on the wrist of the person that will install the metal encased unit

(c) Use an ohmmeter to make sure the resistance is less than 10 megohms.

S 422-047

(3) Connect the strap to an applicable electrostatic ground jack.

S 432-031

(4) Remove all of the conductive dust caps and the connector covers from the unit to be installed.

NOTE: Make sure you do not touch the electrical pins.

S 422-032

(5) Install the ESDS unit with the applicable Removal/Installation procedure.

S 082-049

(6) Remove the strap.

HIRF/LIGHTNING PROTECTION - FQIS WIRING AND BONDING - INSPECTION/CHECK

1. General
   A. This procedure has tasks for the inspection of the bonding of the fuel quantity indicating system (FQIS) wiring connectors with the fuel quantity processor units (FQPU).
   B. These are the tasks:
      (1) FQIS Wiring and Bonding - Inspection
          (a) This resistance check is for these areas:
              1) Loop resistance of the wire bundles and connector bonding for the FQIS out-tank wire bundle shieldings where they go into the spar
      (2) FQIS Wiring and Bonding - Fault Isolation

          NOTE: Use this task when the loop resistance values are not in the limits during the FQIS Wiring and Bonding - Check.

TASK 20-55-54-206-002

2. FQIS Wiring and Bonding - Inspection
   A. General
      (1) ALI - Refer to the task: Airworthiness Limitation Precautions (AMM 20-00-00/201), for important information on airworthiness limitation instructions (ALIs).
      (2) Do this task to do the requirements of 28-AWL-18 and 28-AWL-26.
   B. References
      (1) AMM 20-56-02/201, Loop Resistance Measurement
      (2) AMM 20-56-03/201, Joint Resistance Measurement
      (3) AMM 06-44-00/201, Finding an Access Door or Panel on the Wings
      (4) AMM 28-41-00/501, Fuel Quantity Indicating System (FQIS) Tank Units - Operational Check
      (5) AMM 32-00-20/201, Landing Gear Downlocks - Maintenance Practices.
      (6) SWPM Chapter 20, Standard Wiring Practices Manual.
   C. Equipment
      (1) 906-10246-2 or 906-10246-3 - Loop Resistance Tester (LRT)
   D. Access
      (1) Location Zones
          552 Inboard Wing Trailing Edge - Left Wing
          652 Inboard Wing Trailing Edge - Right Wing

(2) Panels
552HB Left Inboard Wing Trailing Edge Panel
652HB Right Inboard Wing Trailing Edge Panel

E. Prepare for the Procedure

S 846-027
(1) To inspect the FQIS out-tank wire bundle shieldings at the fuel tank spar penetrations, a man-lift or ladder and safety equipment is necessary.

S 846-020
(2) Send copies of all data recorded while doing this procedure to the Boeing Company for engineering analysis. Send the data to this address:
Boeing Commercial Airplane Group
P.O. Box 3707
Seattle, WA 98124-2207, USA
Attention: Manager, ELECTROMAGNETICS EFFECTS, MC OL-67.
Or this email address:
"EME AMM Task Card Data Group
EMEAMMTaskCardData@boeing.com."

S 846-001
(3) Make copies of the applicable data sheet (Fig. 602).

S 416-022
(4) Do this task: Install the Downlocks on the Landing Gear.

S 016-003
(5) Open the applicable panels for the applicable FQIS wire bundle:
552HB, Left Inboard Wing Trailing Edge Panel
652HB, Right Inboard Wing Trailing Edge Panel

F. Fuel Tank FQIS Connector Bonding Check

S 766-004
(1) Measure the loop resistance of a wire bundle using the LRT.

NOTE: Typical LRT connections for the FQIS wire bundles are shown on Fig. 601.

(a) Do this task: Loop Resistance Measurement (AMM 20-56-02/201) on each FQIS wire bundle listed in the applicable FQIS WIRE BUNDLE LOOP RESISTANCE table below:
1) Record the measured loop resistance value on the data sheet.

2) If the measured loop resistance value is within the MIN-MAX limits listed in the data sheet, go to the next wire bundle in the table.
3) If the values are out of the MIN-MAX limits, do the FQIS Wiring and Bonding - Fault Isolation.
4) After you measure the resistance, do a check of the connector and backshell for the wire bundle at the point of measurement and make sure that they are hand-tight.

NOTE: A loose connector or backshell can cause an out-of-limits resistance reading.

5) If a loose connector or backshell is found and tightened, do the Loop Resistance Measurement (AMM 20-56-02/201) on this wire bundle again.

S 216-023

(2) After you measure all wire bundles resistances, do this inspection check:
(a) AIRPLANE WITH BF GOODRICH FQPU;
For the connector backshell, look for corrosion in the area where the lightning shield connects to the backshell.
(b) For the ground jumper, look for corrosion and worn or broken strands.
(c) If a problem is found, repair in accordance to (SWPM 20-20-00).
(d) After any repair, do the Loop Resistance Measurement (AMM 20-56-02/2 01) on that wire bundle again.

FQIS WIRE BUNDLE LOOP RESISTANCE 767-200 BF GOODRICH FQPU					
Location	Part # Boeing S283T025-CN1156-	Rear Spar Connector	Loop Resistance Min-Max (mOhms)	Rear Spar Ground	W/D
Left Main Tank	-126 or -926	M1947	18-44	GD4148-S	28-41-21
Left Main Dens. Tank	-122 or -922	M1945	11-40	GD5980-S	28-41-21
Left Aux Tank	-127 or -927	M1948	9-40	GD4132-S	28-41-23
Right Main Tank	-136 or -936	M1957	18-43	GD4156-S	28-41-22
Right Main Dens. Tank	-132 or -932	M1950	10-40	GD5978-S	28-41-22
Right Aux Tank	-137 or -937	M1958	11-47	GD5974-S	28-41-23
Right Aux Dens. Tank	-135 or -935	M1952	11-40	GD5976-S	28-41-23

FQIS WIRE BUNDLE LOOP RESISTANCE 767-300 BF GOODRICH FQPU					
Location	Part # Boeing S283T025- CN1156-	Rear Spar Connector	Loop Resistance Min-Max (mOhms)	Rear Spar Ground	W/D
Left Main Tank	-121 or -921	M1944	18-44	GD4148-S	28-41-21
Left Main Dens. Tank	-122 or -922	M1945	11-40	GD5980-S	28-41-21
Left Aux Tank	-123 or -923	M1946	9-40	GD4132-S	28-41-23
Right Main Tank	-131 or -931	M1949	18-43	GD4156-S	28-41-22
Right Main Dens. Tank	-132 or -932	M1950	10-40	GD5978-S	28-41-22
Right Aux Tank	-134 or -934	M1951	11-47	GD5974-S	28-41-23
Right Aux Dens. Tank	-135 or -935	M1952	11-40	GD5976-S	28-41-23

FQIS WIRE BUNDLE LOOP RESISTANCE 767-200,300 BOEING BUNDLE-HONEYWELL FQPU					
Location	Boeing Part #	Rear Spar Connector	Loop Resistance Min-Max (mOhms)	Rear Spar Ground	W/D
Left Main Tank Lo-Z	286T0446	DO1582	51-121	GD4148-S	28-41-21
Left Main Tank Hi-Z	286T0446	DO1552	172-284	GD4148-S	28-41-21
Left Aux Tank Lo-Z	286T0454	DO2816	45-150	GD4132-S	28-41-23
Left Aux Tank Hi-Z	286T0454	DO2812	105-175	GD4132-S	28-41-23
Right Main Tank Lo-Z	286T0448	DO1584	51-122	GD4156-S	28-41-22
Right Main Tank Hi-Z	286T0448	DO1560	172-284	GD4156-S	28-41-22
Right Aux Tank Lo-Z	286T0448	DO2818	51-152	GD4142-S	28-41-23
Right Aux Tank Hi-Z	286T0448	DO2814	111-184	GD4142-S	28-41-23

G. Put the Airplane Back to its Usual Condition

S 716-005

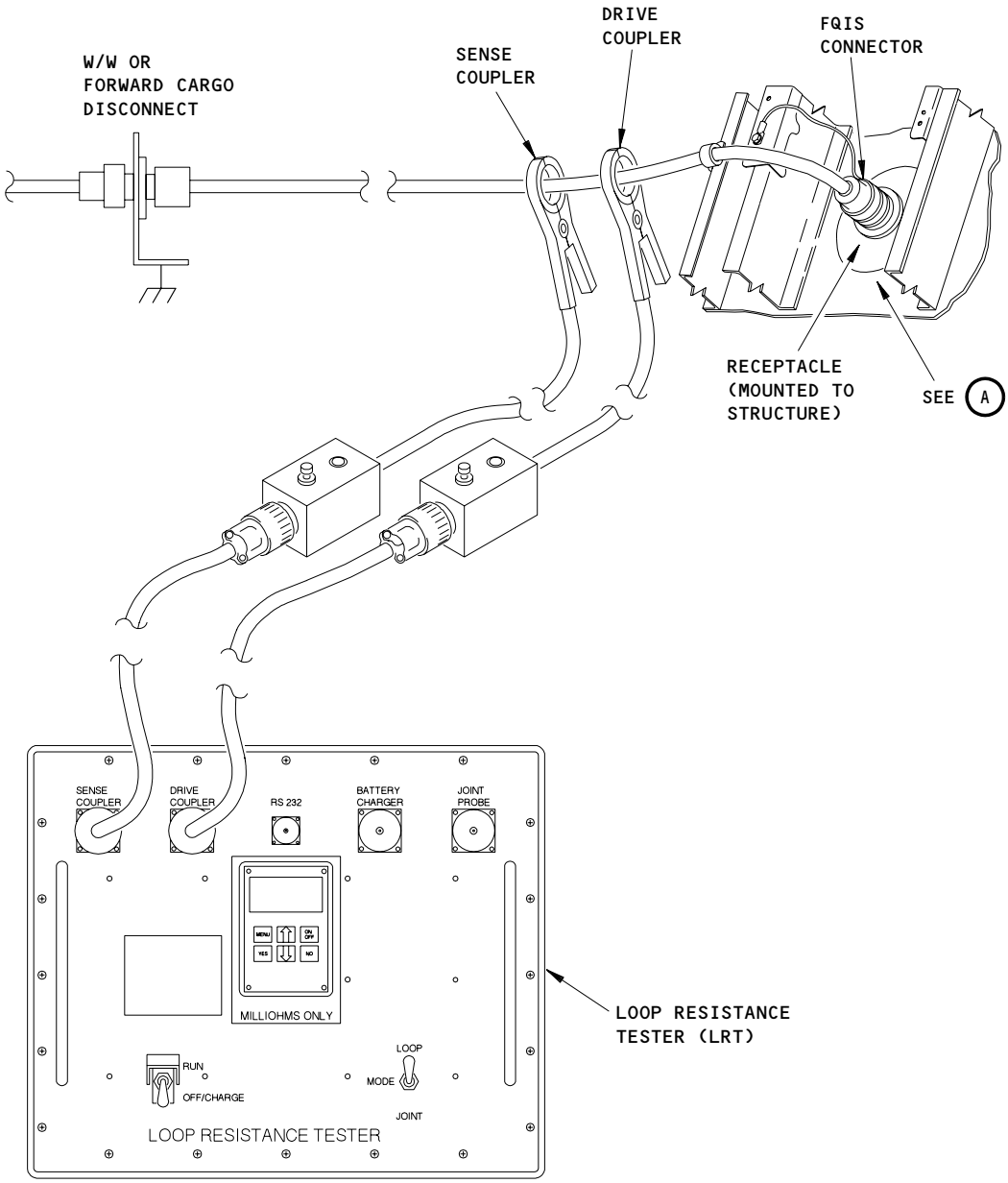
(1) If any FQIS wire bundles were disturbed during the accomplishment of this procedure, do this task: Operational Check - Fuel Quantity Indicating System (FQIS) (AMM 28-41-00/501).

S 416-006

(2) Close these access panels:
(a) 552HB, Left Inboard Wing Trailing Edge Panel
(b) 652HB, Right Inboard Wing Trailing Edge Panel

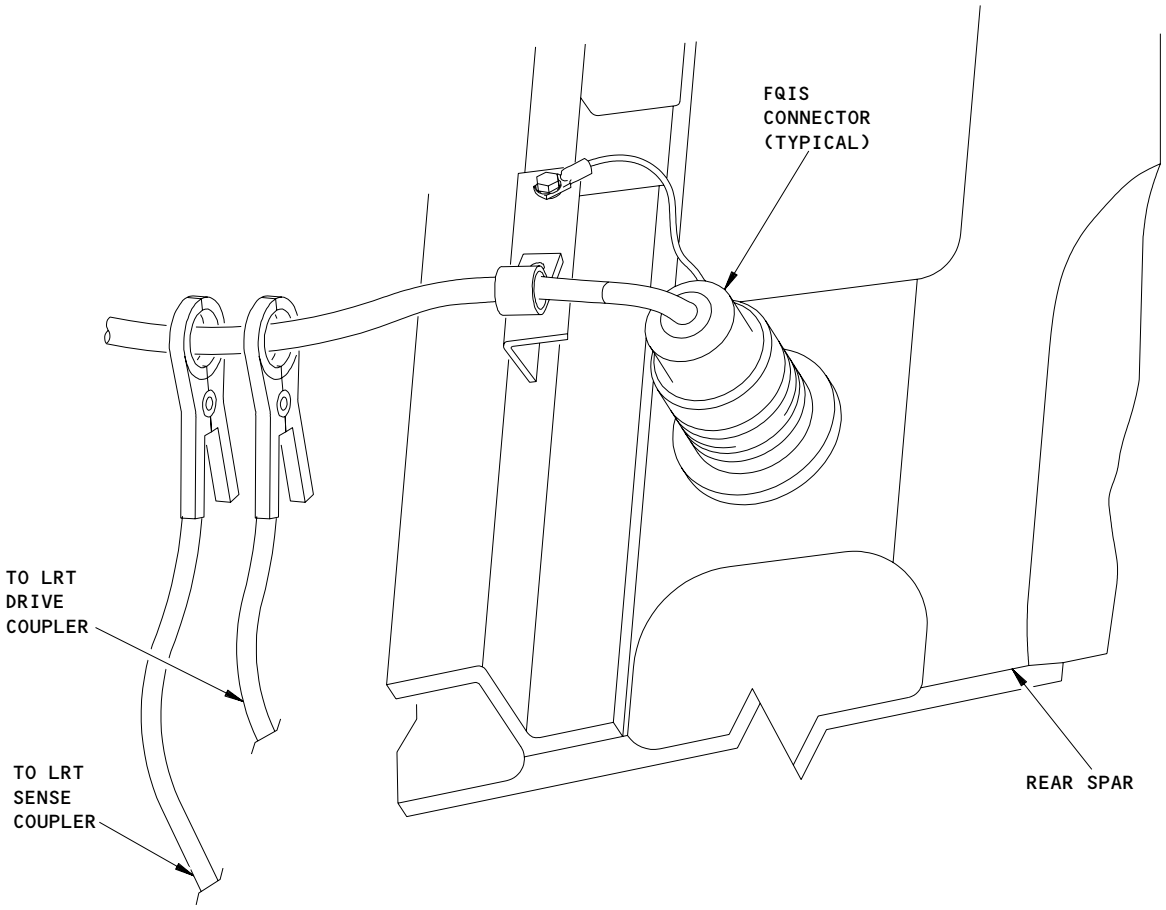
S 026-021

(3) Do this task: Remove the Downlocks on the Landing Gear.



FQIS TEST CONNECTIONS

High Intensity Radiated Fields (HIRF) Inspection
(Fuel Quantity Indicating System Bundles)
Figure 601 (Sheet 1)



LOOP TEST CONNECTIONS

(A)

High Intensity Radiated Fields (HIRF) Inspection
(Test Connections)
Figure 601 (Sheet 2)

PLANE:	
DATE:	
TECHNICIAN:	

REAR SPAR CONNECTOR	MEASURED LOOP RESISTANCE	LOOP RESISTANCE MIN-MAX (milliohms)	REAR SPAR GROUND	COMMENTS
M1944		18-44	GD4148-S	
M1945		11-40	GD5980-S	
M1946		9-40	GD4132-S	
M1949		18-43	GD4156-S	
M1950		10-40	GD5978-S	
M1951		11-47	GD5974-S	
M1952		11-40	GD5976-S	

767-300/300F FQIS CONNECTORS (BF GOODRICH FQPU)

High Intensity Radiated Fields (HIRF) Inspection
(Data Sheet)
Figure 602 (Sheet 1)

PLANE:	
DATE:	
TECHNICIAN:	

REAR SPAR CONNECTOR	MEASURED LOOP RESISTANCE	LOOP RESISTANCE MIN-MAX (milliohms)	REAR SPAR GROUND	COMMENTS
DO1582		51-121	GD4148-S	
DO1552		172-284	GD4148-S	
DO2816		45-150	GD4132-S	
DO2812		105-175	GD4132-S	
DO1584		51-122	GD4156-S	
DO1560		172-284	GD4156-S	
DO2818		51-152	GD4142-S	
DO2814		111-184	GD4142-S	

767-200, -300 FQIS CONNECTORS (BOEING BUNDLE - HONEYWELL FQPU)

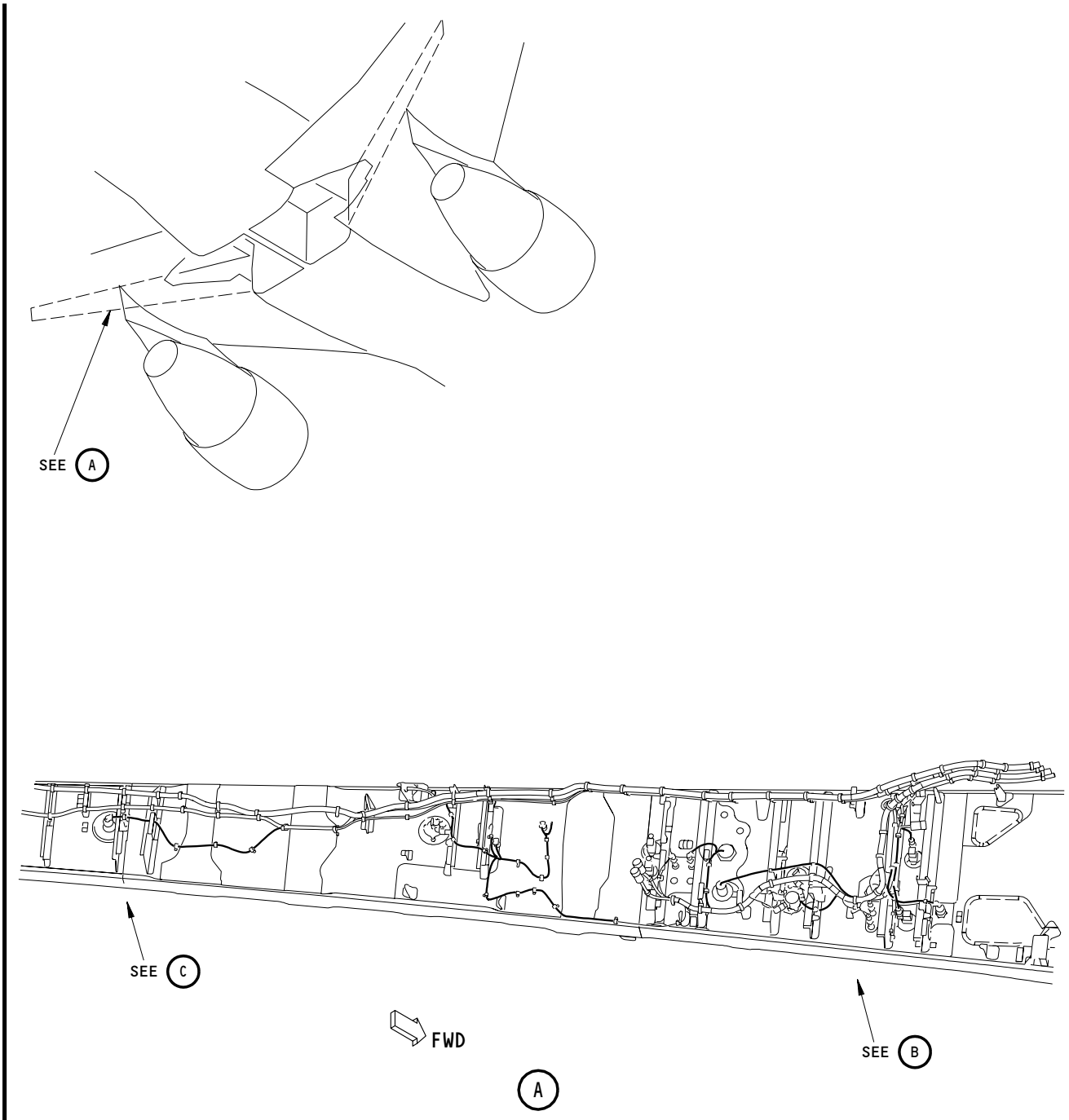
High Intensity Radiated Fields (HIRF) Inspection
(Data Sheet)
Figure 602 (Sheet 2)

PLANE:	
DATE:	
TECHNICIAN:	

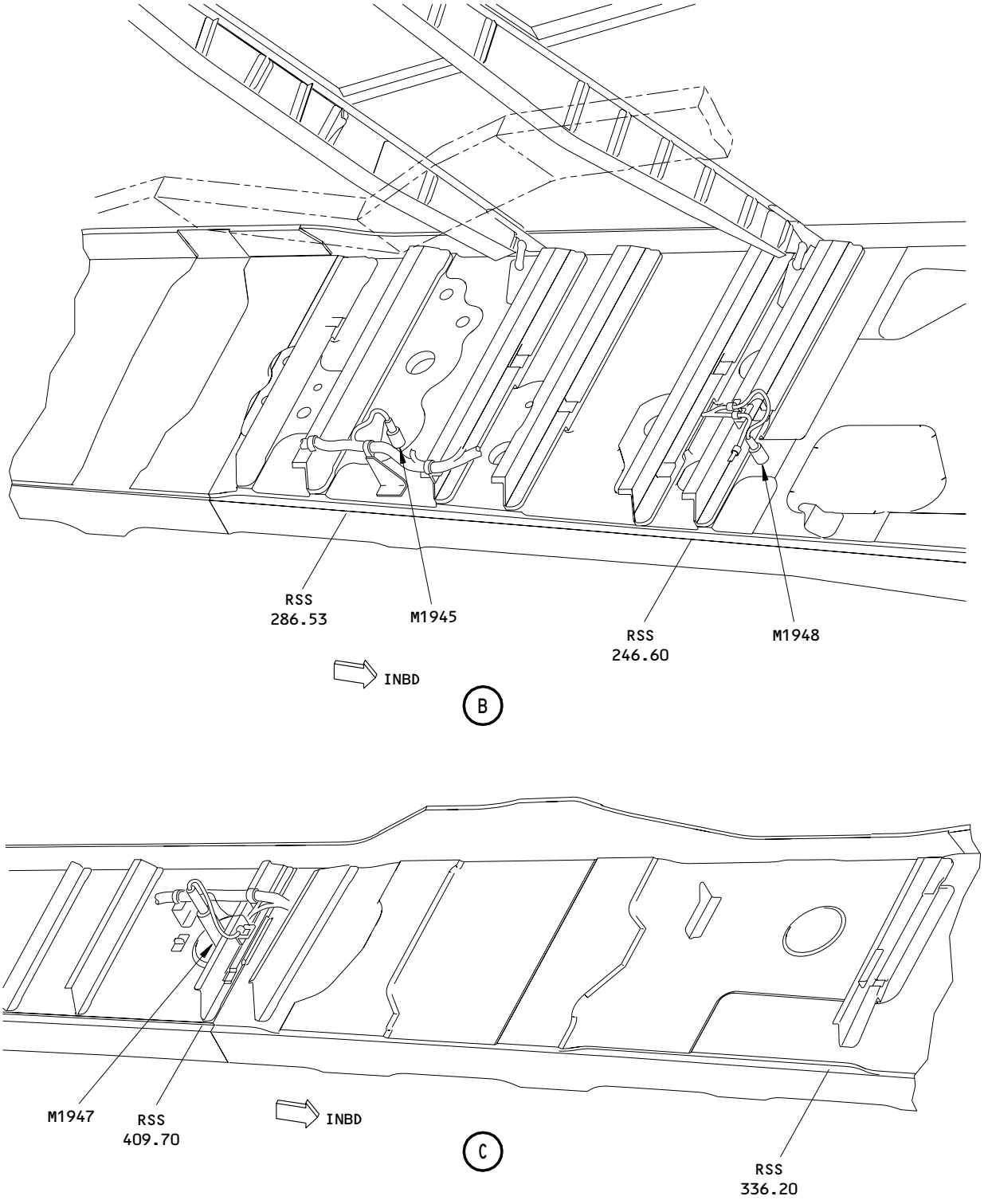
REAR SPAR CONNECTOR	MEASURED LOOP RESISTANCE	LOOP RESISTANCE MIN-MAX (milliohms)	REAR SPAR GROUND	COMMENTS
M1947		18-44	GD4148-S	
M1945		11-40	GD5980-S	
M1948		9-40	GD4132-S	
M1957		18-43	GD4156-S	
M1950		10-40	GD5978-S	
M1958		11-47	GD5974-S	
M1952		11-40	GD5976-S	

767-200 FQIS CONNECTORS (BF GOODRICH FQPU)

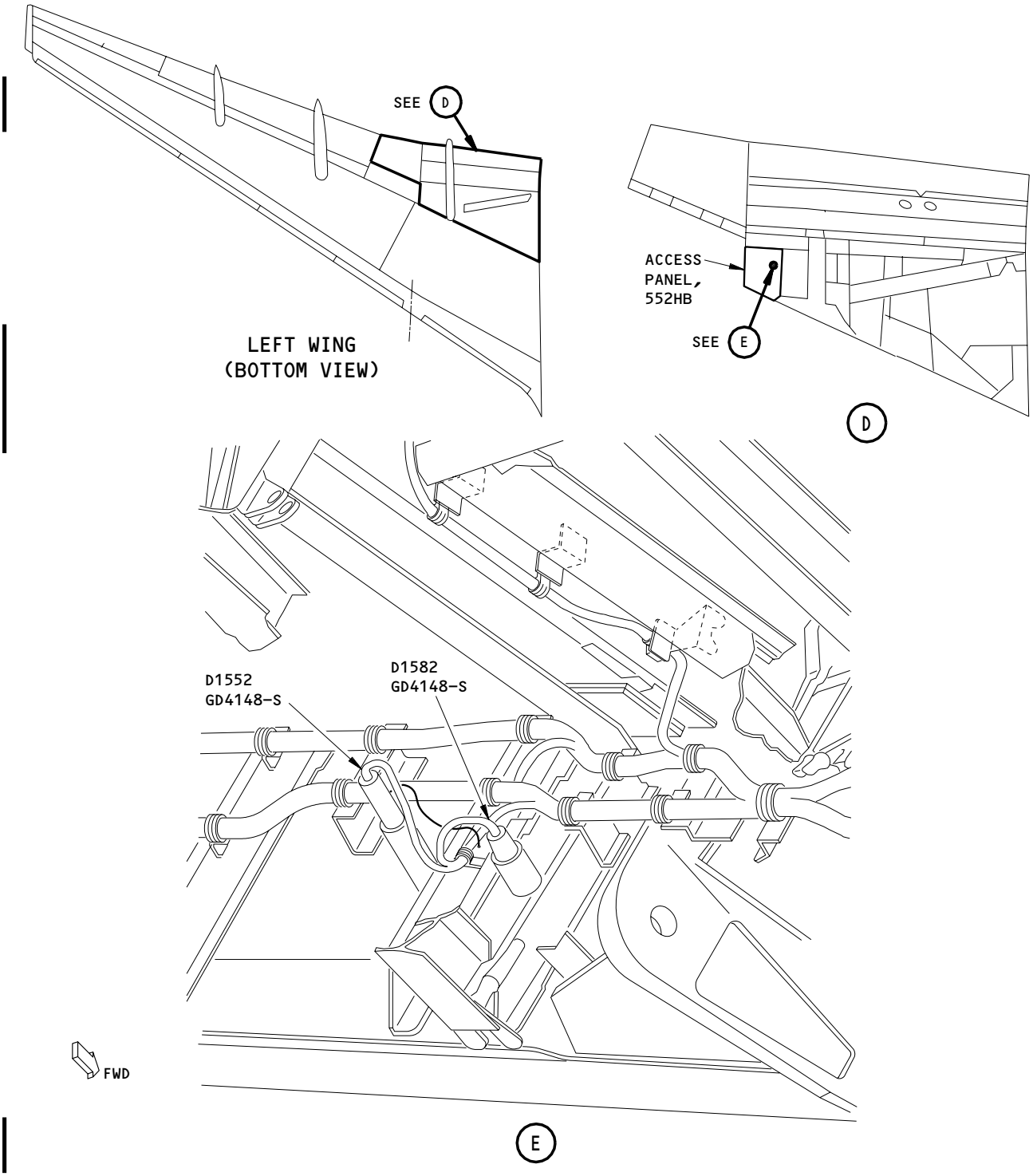
High Intensity Radiated Fields (HIRF) Inspection
(Data Sheet)
Figure 602 (Sheet 3)



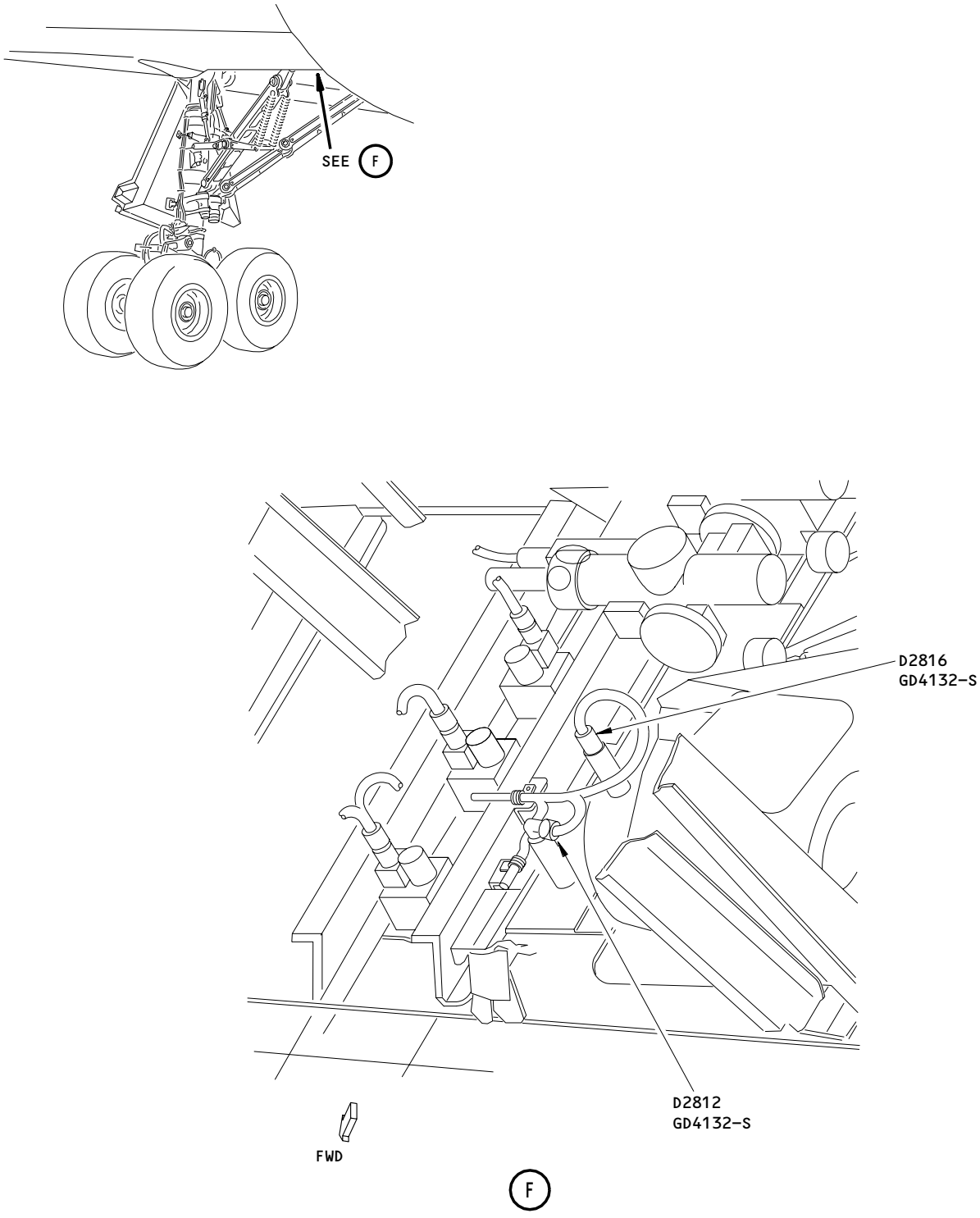
Fuel Quantity Indicating System (FQIS) Lightning Shield Inspection
(767-200 BF Goodrich FQPU)
Figure 603 (Sheet 1)



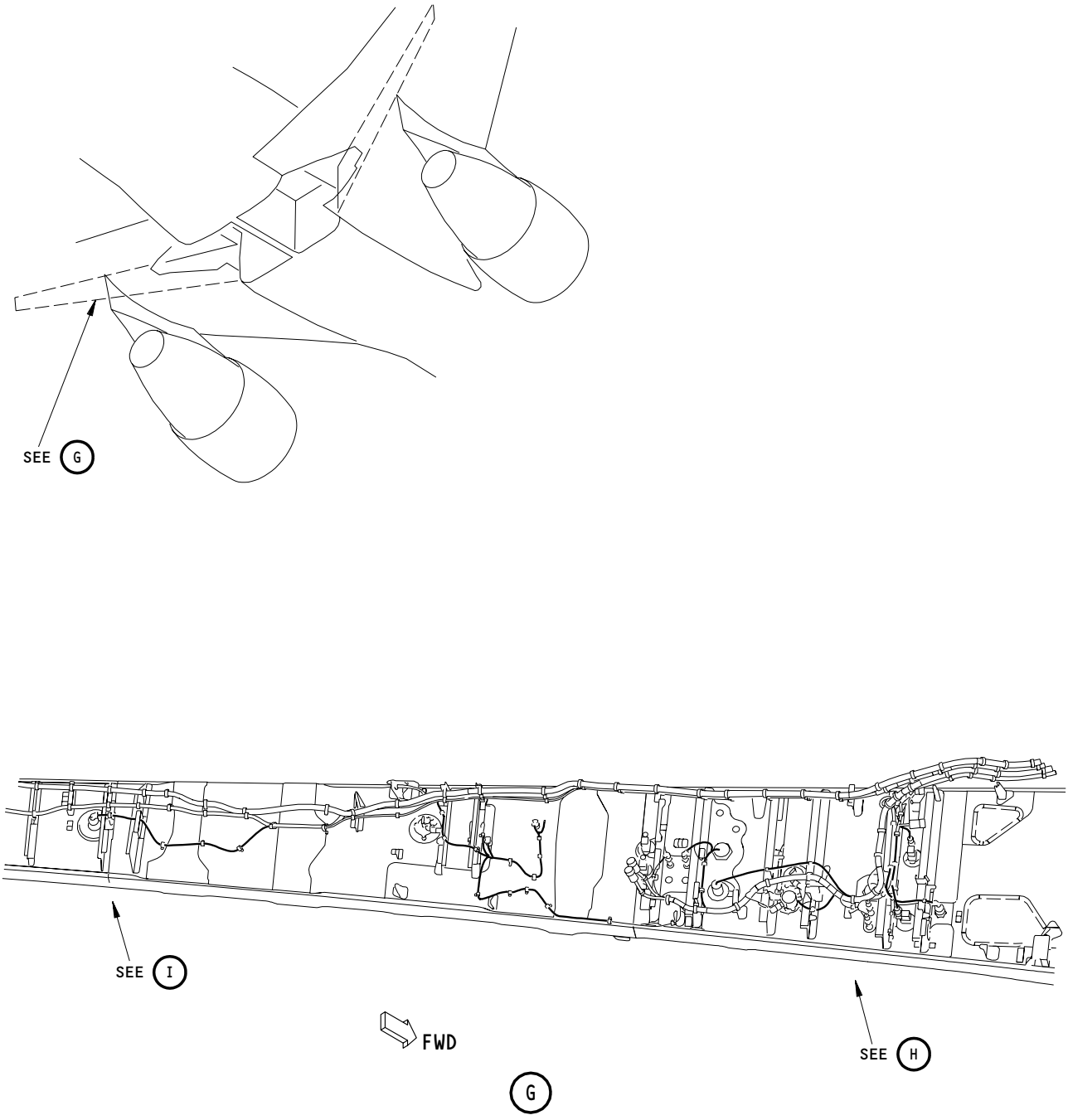
Fuel Quantity Indicating System (FQIS) Lightning Shield Inspection
(767-200 BF Goodrich FQPU)
Figure 603 (Sheet 2)



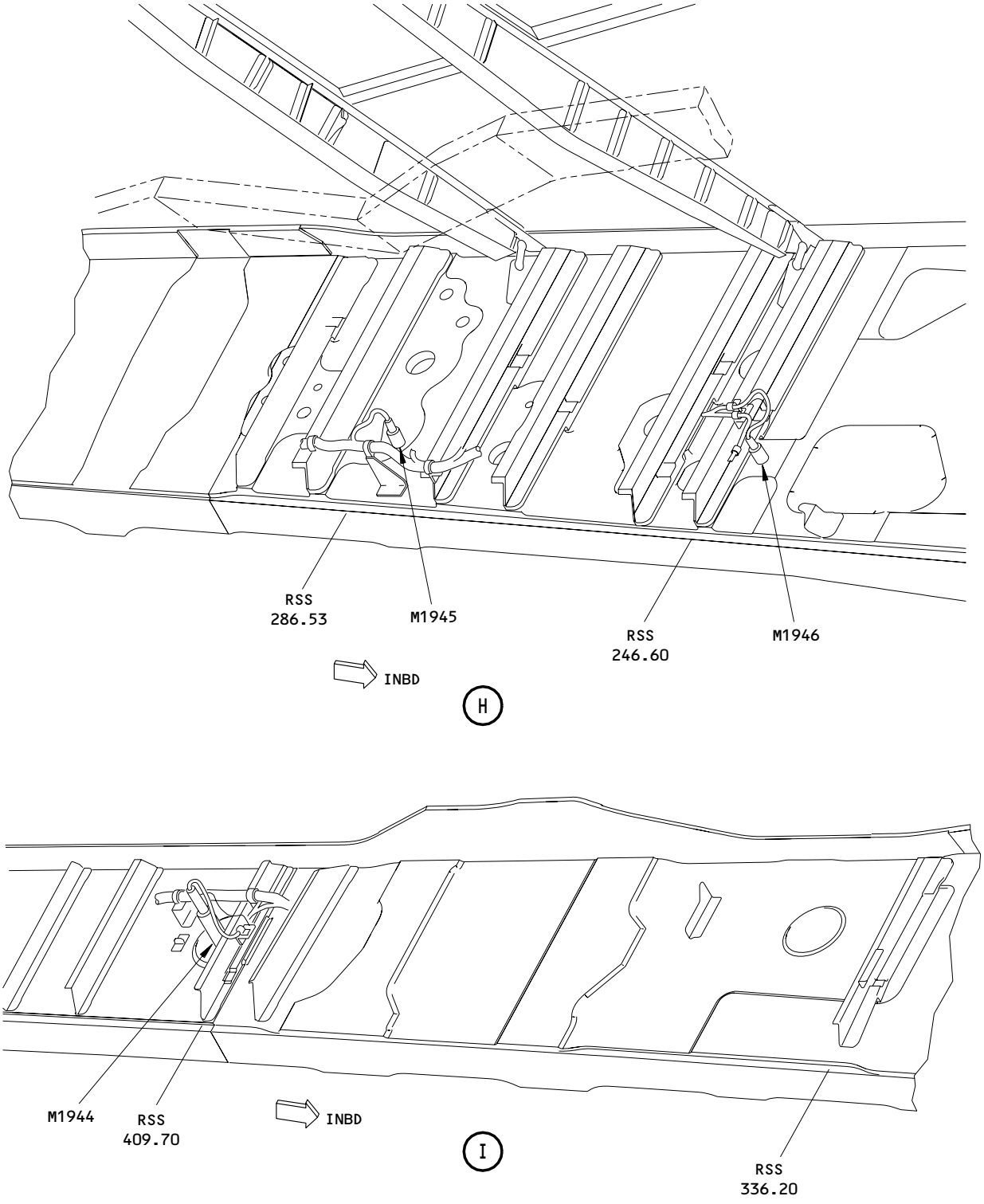
Fuel Quantity Indicating System (FQIS) Lightning Shield Inspection
(767-200/300 Honeywell FQPU)
Figure 603 (Sheet 3)



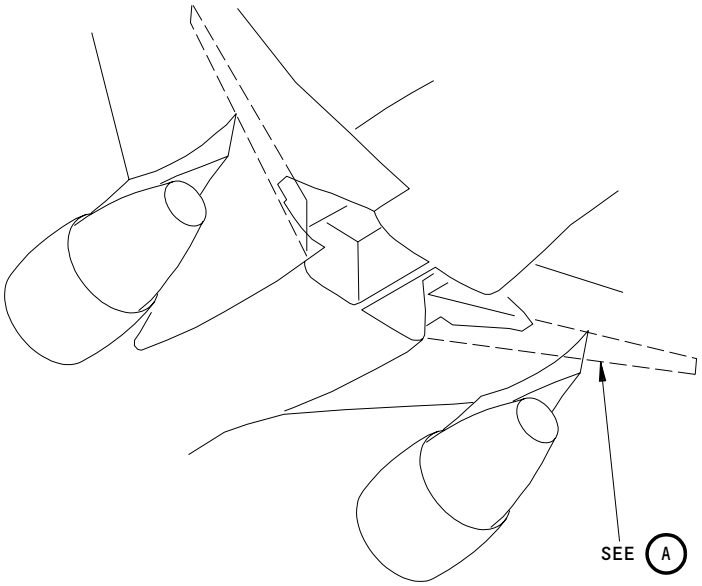
Fuel Quantity Indicating System (FQIS) Lightning Shield Inspection
(767-200/300 Honeywell FQPU)
Figure 603 (Sheet 4)

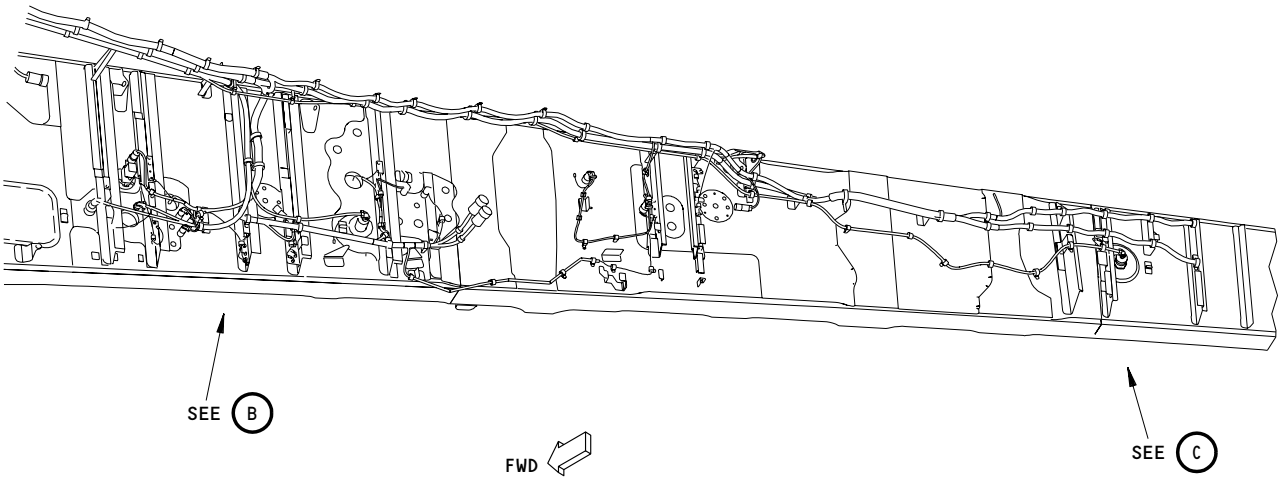


Fuel Quantity Indicating System (FQIS) Lightning Shield Inspection
(767-300/300F/400 BF Goodrich FQPU)
Figure 603 (Sheet 5)



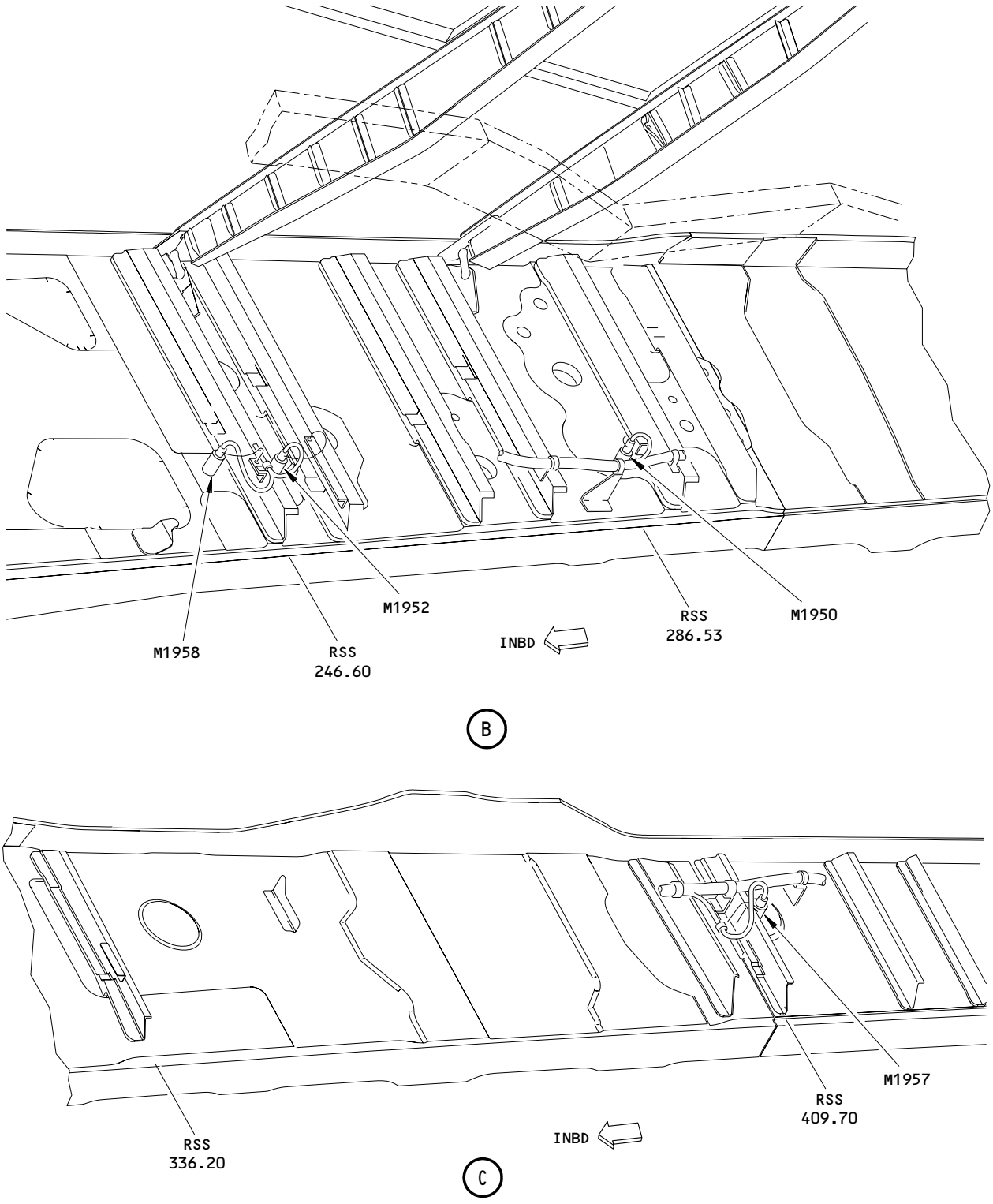
Fuel Quantity Indicating System (FQIS) Lightning Shield Inspection
(767-300/300F/400 BF Goodrich FQPU)
Figure 603 (Sheet 6)



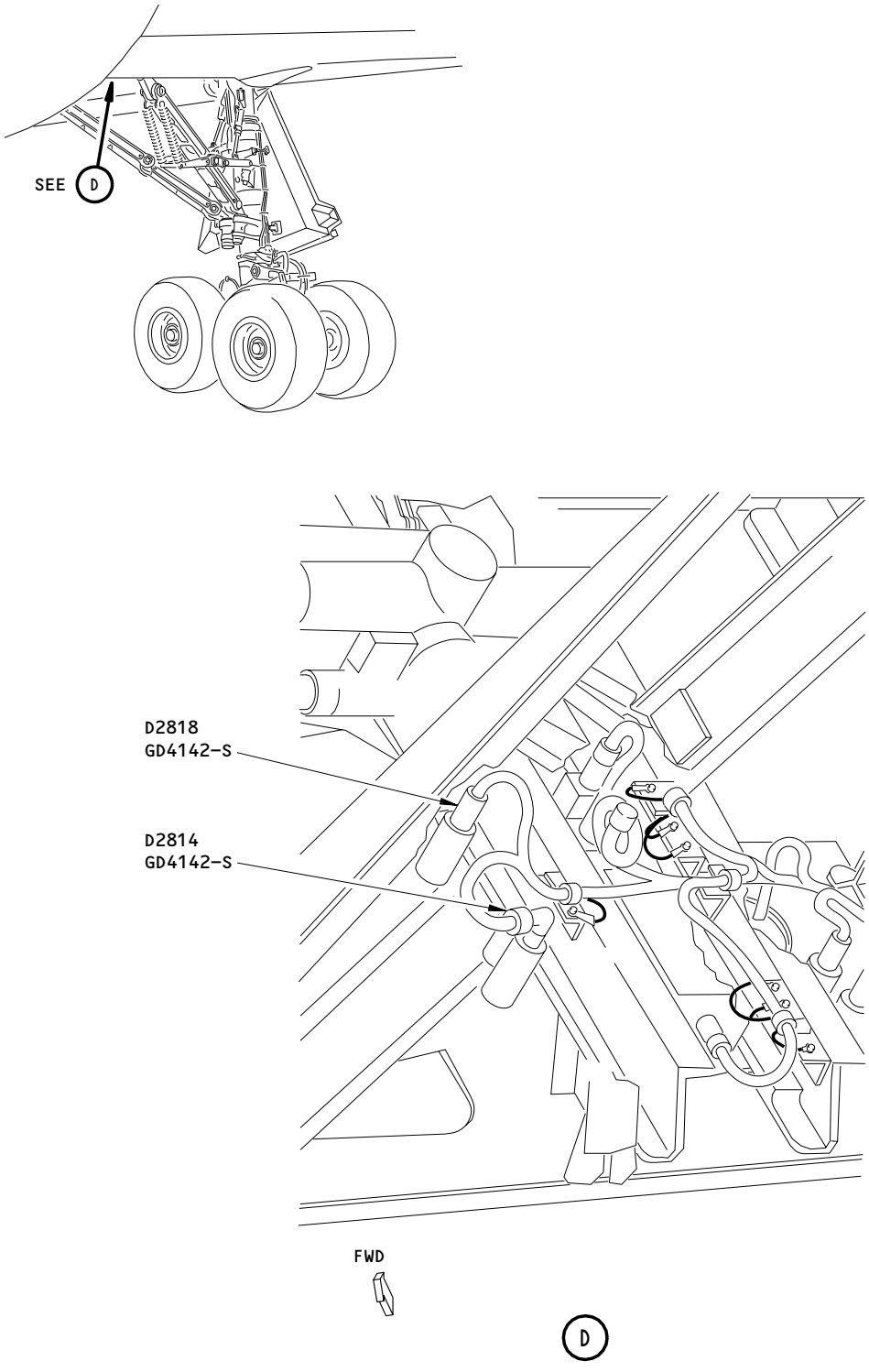


A

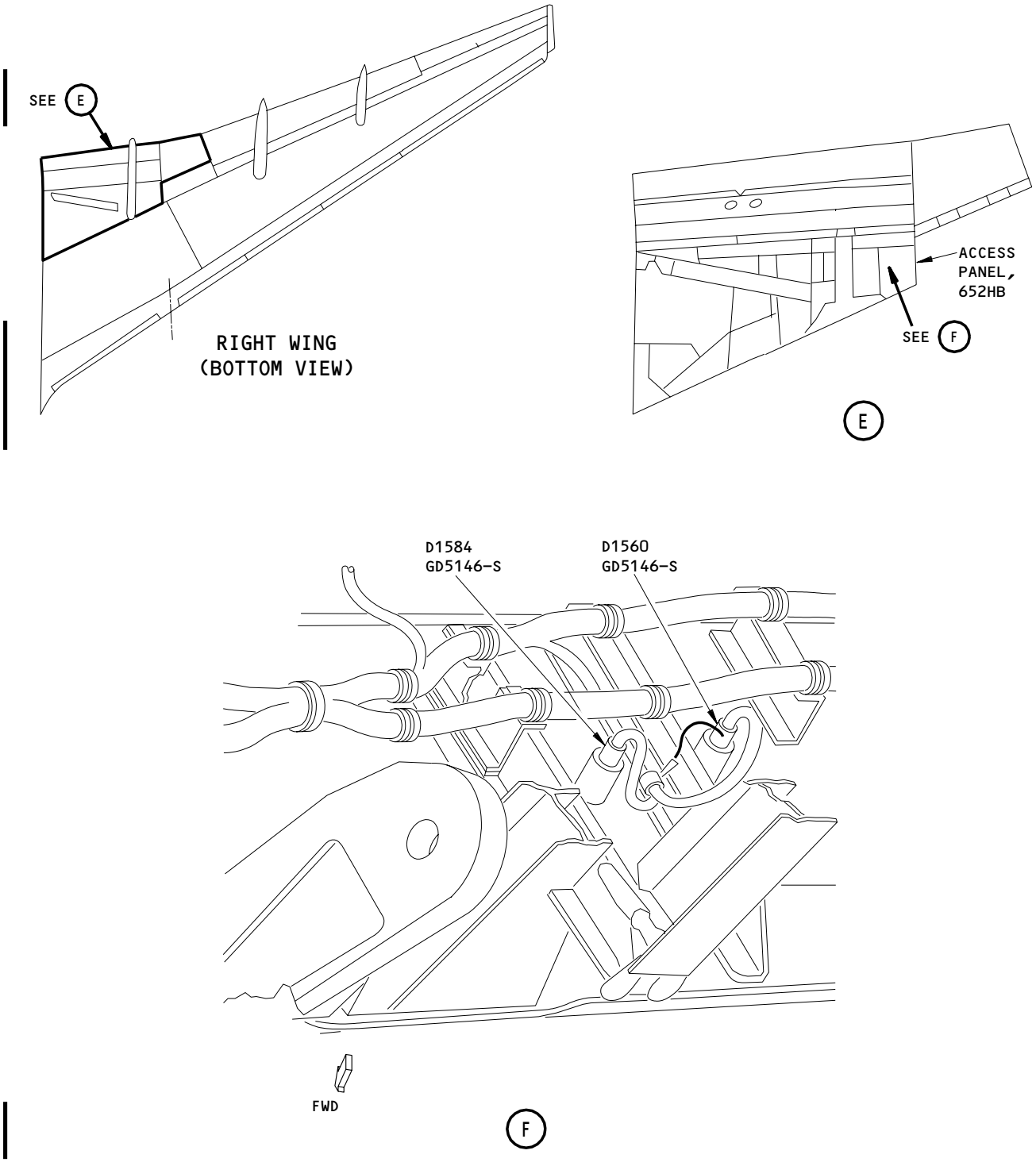
Fuel Quantity Indicating System (FQIS) Lightning Shield Inspection
(767-200 BF Goodrich FQPU)
Figure 604 (Sheet 1)



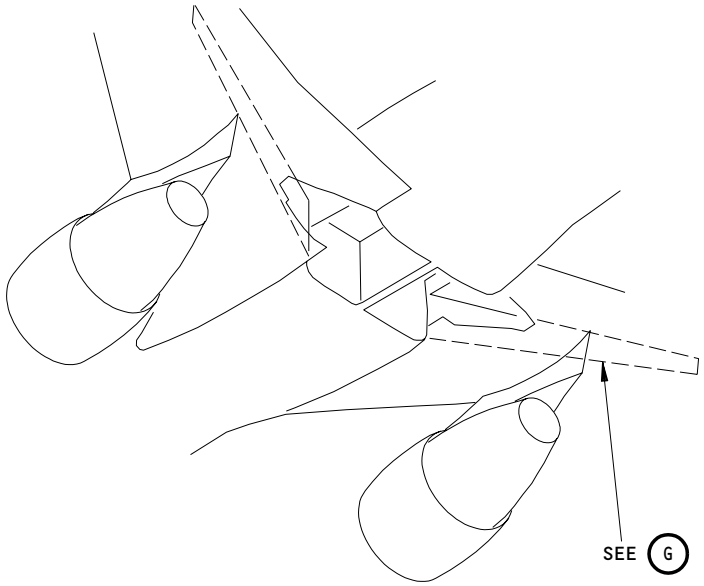
Fuel Quantity Indicating System (FQIS) Lightning Shield Inspection
(767-200 BF Goodrich FQPU)
Figure 604 (Sheet 2)

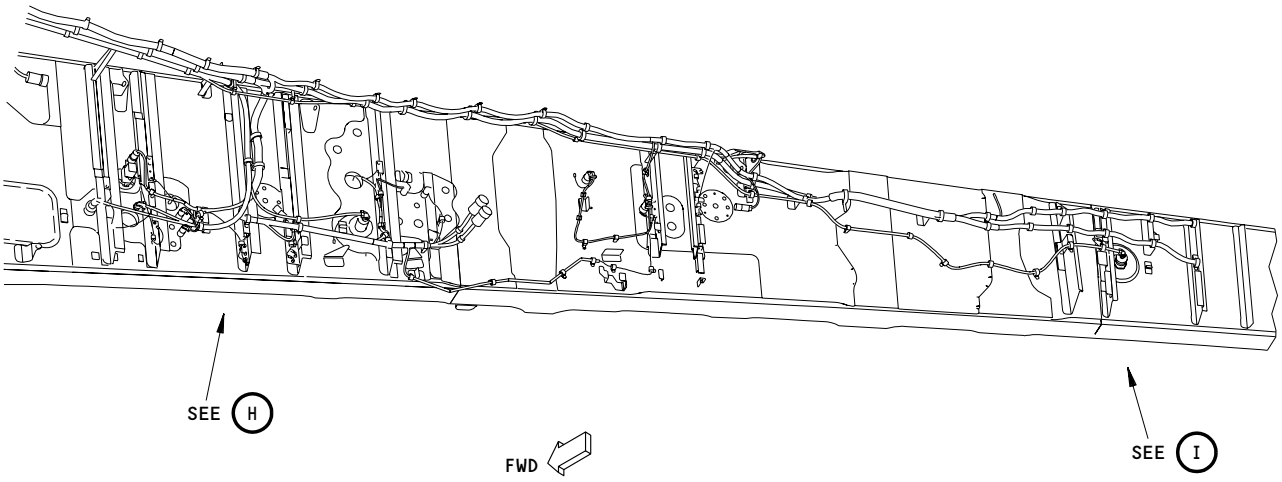


Fuel Quantity Indicating System (FQIS) Lightning Shield Inspection
(767–200/300 Honeywell FQPU)
Figure 604 (Sheet 3)



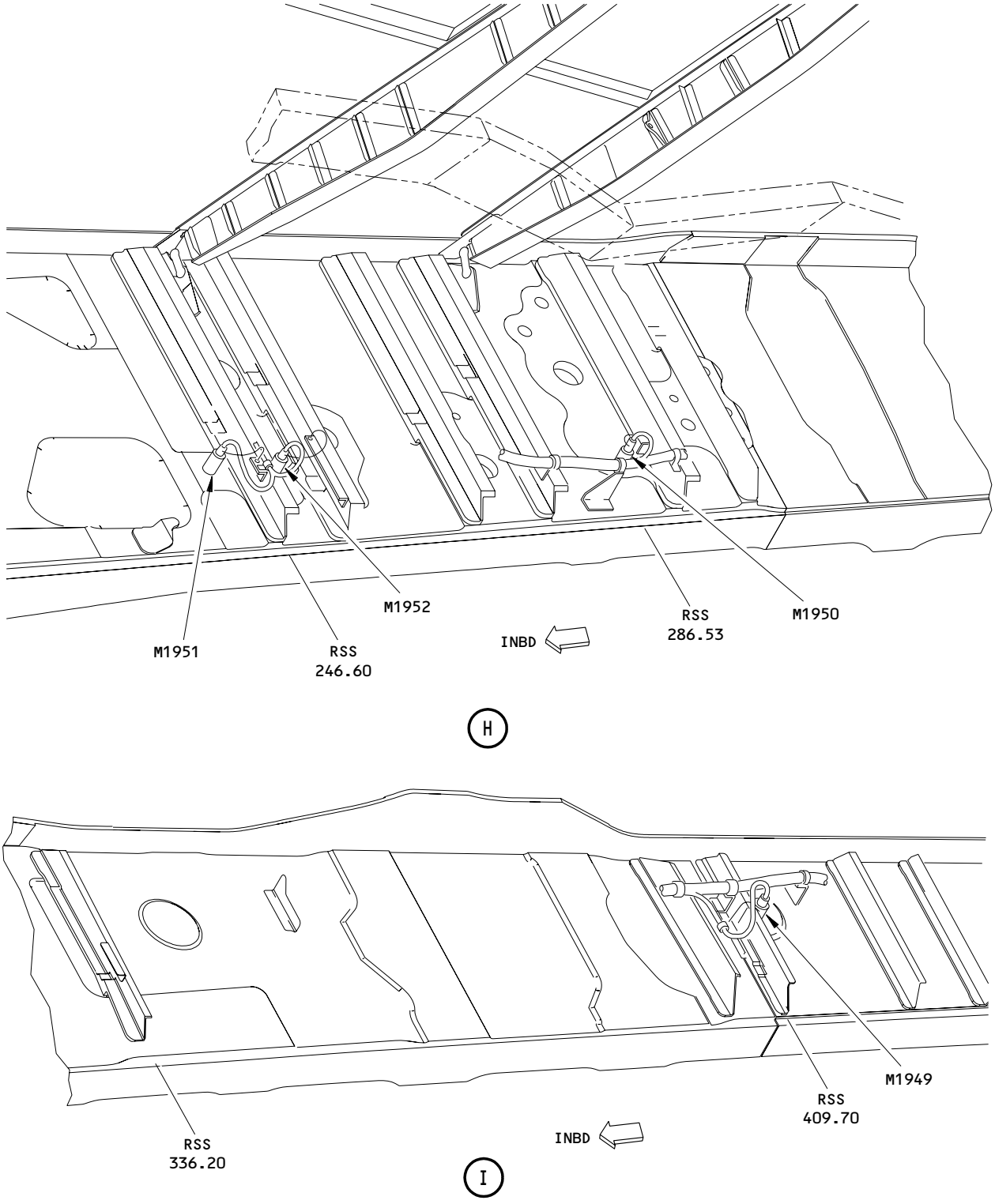
Fuel Quantity Indicating System (FQIS) Lightning Shield Inspection
(767-200/300 Honeywell FQPU)
Figure 604 (Sheet 4)





G

Fuel Quantity Indicating System (FQIS) Lightning Shield Inspection
(767-300/300F/400 BF Goodrich FQPU)
Figure 604 (Sheet 5)



Fuel Quantity Indicating System (FQIS) Lightning Shield Inspection
(767-300/300F/400 BF Goodrich FQPU)
Figure 604 (Sheet 6)

TASK 20-55-54-816-016

3. FQIS Wiring and Bonding - Fault Isolation

A. References

(1) AMM 20-56-01/201, LRT Lid Standard Measurement
(2) AMM 20-56-02/201, Loop Resistance Measurement
(3) AMM 20-56-03/201, Joint Resistance Measurement
(4) AMM 32-00-40/201, Landing Gear Ground Door Release System Operation (Open the Doors)
(5) SWPM Chapter 20, Standard Wiring Practices Manual

B. Access

(1) Location Zones

732 Main Landing Gear Door - Left
742 Main Landing Gear Door - Right
552 Inboard Wing Trailing Edge - Left Wing
652 Inboard Wing Trailing Edge - Right Wing

C. Procedure

S 816-011

(1) If the wire bundle loop resistance is less than the MIN value shown in data sheet (Fig. 602), then check the operation of the LRT. To check the LRT operation, do this task: LRT Lid Standard Measurement (AMM 20-56-01/201).

(a) If no problem is found with the LRT, check the test setup: check the LRT coupler connections to the wire bundle and attempt another loop measurement. The couplers should only be clamped around the wire bundle being measured and mustbe closed properly.

(b) If no problem is found with the LRT and the test setup, do a inspection on the wire bundle around the connector being measured. Look for any physical damage, corrrosion for the connector, corrrosion, worn or broken strand for the ground jumper, and any sign of damage or degrade for the wire bundle. Repair or replace in accordance to (SWPM Chapter 20).

NOTE: An example might be an area where bundle insulation has degraded and a portion of the shield is exposed and making contact with structure at an intermediate point in the bundle length. Another might be some metallic object penetrating the insulation and making contact between the shield and structure.

1) If a problem was found and repaired, do the Loop Resistance Measurement (AMM 20-56-02/201) on this bundle.
2) If no defects are found with the wire bundle, then record the below-minimum resistance reading. Contact Boeing for support.

S 816-010

(2) If the wire bundle loop resistance is greater than the MAX value resistance, do these steps:

(a) AIRPLANE WITH BF GOODRICH FQPU;

Measure the joint resistance (AMM 20-56-03/201) from the FQIS backshell to primary structure at the spar penetration for connectors in applicable tables below:

1) If the joint value measured is more than the maximum value in the applicable table, do the joint resistance test on that connector breakdown according to Table. 601 (AMM 20-56-03/201).

a) If a joint value measured is more than the maximum value, repair in accordance to (SWPM Chapter 20).

(b) AIRPLANE WITH BOEING - HONEYWELL FQPU;

Measure the joint resistance (AMM 20-56-03/201) from the ground terminal to primary structure at the spar penetration for connectors in applicable tables below:

1) If the joint value measured is more than the maximum value in the applicable table, do these tasks:

a) Measure the joint resistance from the ground terminal to bracket. Make sure the joint value is not greater than 1.0 milliohms.

b) Measure the joint resistance from the bracket to structure. Make sure the joint value is not greater than 0.5 milliohms.

c) If a joint value measured is greater than the maximum value, repair in accordance to (SWPM Chapter 20).

FQIS WIRE BUNDLE JOINT RESISTANCE 767-200 BF GOODRICH FQPU					
Location	Part # Boeing S283T025-CN1156-	Rear Spar Connector	Joint Resistance Min-Max (mOhms)	Rear Spar Ground	W/D
Left Main Tank	-126 or -926	M1947	0-5.5	GD4148-S	28-41-21
Left Main Dens. Tank	-122 or -922	M1945	0-5.5	GD5980-S	28-41-21
Left Aux Tank	-127 or -927	M1948	0-5.5	GD4132-S	28-41-23
Right Main Tank	-136 or -936	M1957	0-5.5	GD4156-S	28-41-22
Right Main Dens. Tank	-132 or -932	M1950	0-5.5	GD5978-S	28-41-22
Right Aux Tank	-137 or -937	M1958	0-5.5	GD5974-S	28-41-23
Right Aux Dens. Tank	-135 or -935	M1952	0-5.5	GD5976-S	28-41-23

FQIS WIRE BUNDLE JOINT RESISTANCE 767-300 BF GOODRICH FQPU					
Location	Part # Boeing S283T025-CN1156-	Rear Spar Connector	Joint Resistance Min-Max (mOhms)	Rear Spar Ground	W/D
Left Main Tank	-121 or -921	M1944	0-5.5	GD4148-S	28-41-21
Left Main Dens. Tank	-122 or -922	M1945	0-5.5	GD5980-S	28-41-21
Left Aux Tank	-123 or -923	M1946	0-5.5	GD4132-S	28-41-23
Right Main Tank	-131 or -931	M1949	0-5.5	GD4156-S	28-41-22
Right Main Dens. Tank	-132 or -932	M1950	0-5.5	GD5978-S	28-41-22
Right Aux Tank	-134 or -934	M1951	0-5.5	GD5974-S	28-41-23
Right Aux Dens. Tank	-135 or -935	M1952	0-5.5	GD5976-S	28-41-23

FQIS WIRE BUNDLE JOINT RESISTANCE 767-200,300 BOEING BUNDLE-HONEYWELL FQPU					
Location	Boeing Part #	Rear Spar Connector	Joint Resistance Min-Max (mOhms)	Rear Spar Ground	W/D
Left Main Tank Lo-Z	286T0446	D01582	0-1.5	GD4148-S	28-41-21
Left Main Tank Hi-Z	286T0446	D01552	0-1.5	GD4148-S	28-41-21
Left Aux Tank Lo-Z	286T0454	D02816	0-1.5	GD4132-S	28-41-23
Left Aux Tank Hi-Z	286T0454	D02812	0-1.5	GD4132-S	28-41-23
Right Main Tank Lo-Z	286T0448	D01584	0-1.5	GD4156-S	28-41-22
Right Main Tank Hi-Z	286T0448	D01560	0-1.5	GD4156-S	28-41-22
Right Aux Tank Lo-Z	286T0448	D02818	0-1.5	GD4142-S	28-41-23
Right Aux Tank Hi-Z	286T0448	D02814	0-1.5	GD4142-S	28-41-23

S 816-012

(3) If the joint resistance at the spar penetration was within limits, and the loop resistance value is still greater than the maximum, move to the inboard end of the wire bundle at the wheel well.
   (a) Do this task: Joint Resistance Measurement (AMM 20-56-03/201) from the FQIS ground terminal to primary structure according to tables below:
      1) If the joint value measured is more than the maximum value in the tables, repair in accordance to (SWPM Chapter 20).

S 816-024

(4) If repair is required and completed, return to the FQIS Wiring and Bonding - Check.
   (a) If you found and corrected the problem, record that on the data sheet in the Comments column.

S 816-026

(5) If the joint resistance values at both ends of the wire bundle are OK, and the loop resistance stays greater than the maximum permitted resistance, then the problem is in the wire bundle.

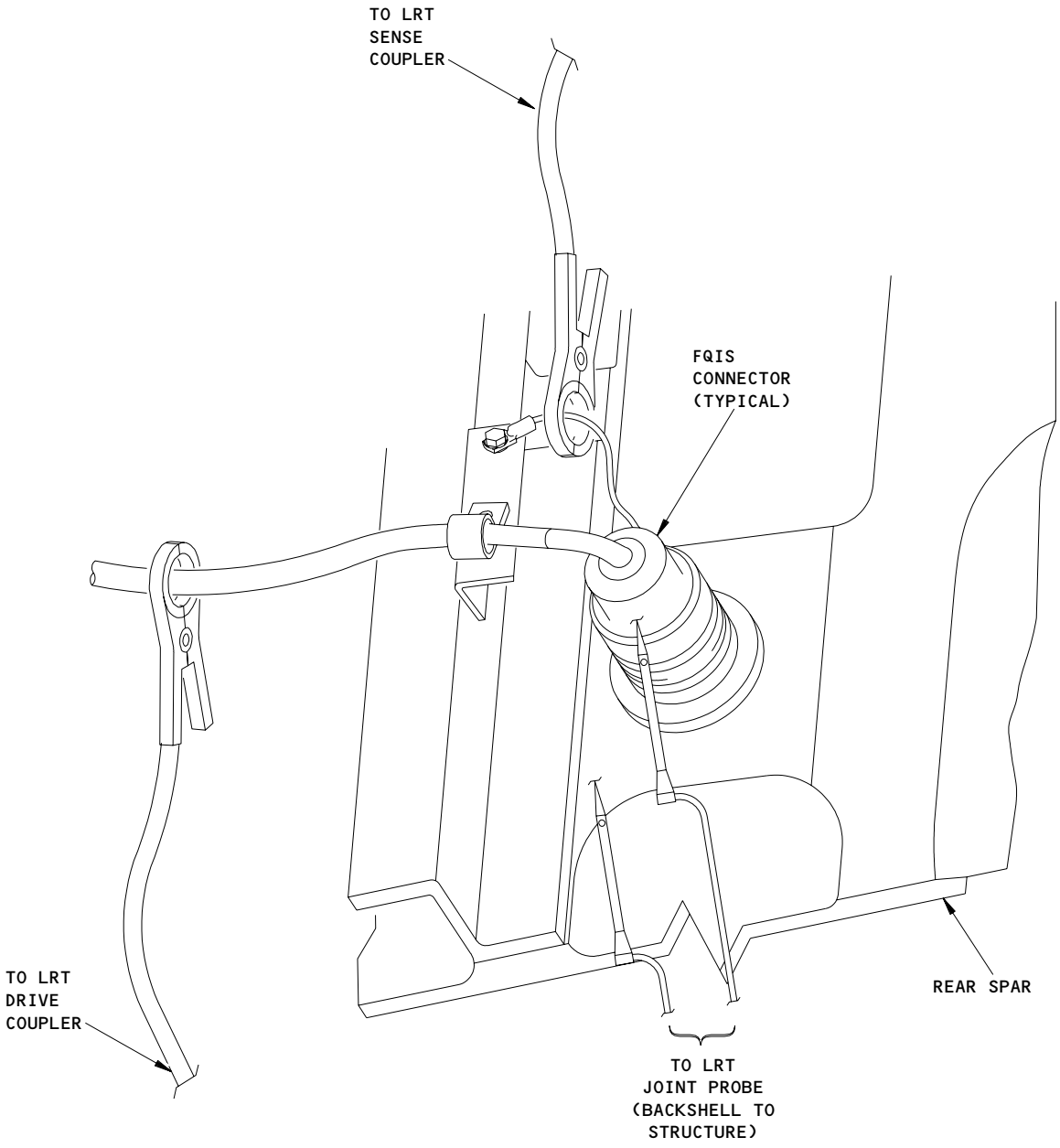
(a) Repair or replace the wire bundle in accordance to (SWPM Chapter 20).

1) If repair is required and completed, do the FQIS Wiring and Bonding - Check to re-test this wire bundle.

FQIS WIRE BUNDLE JOINT RESISTANCE AT INBOARD END

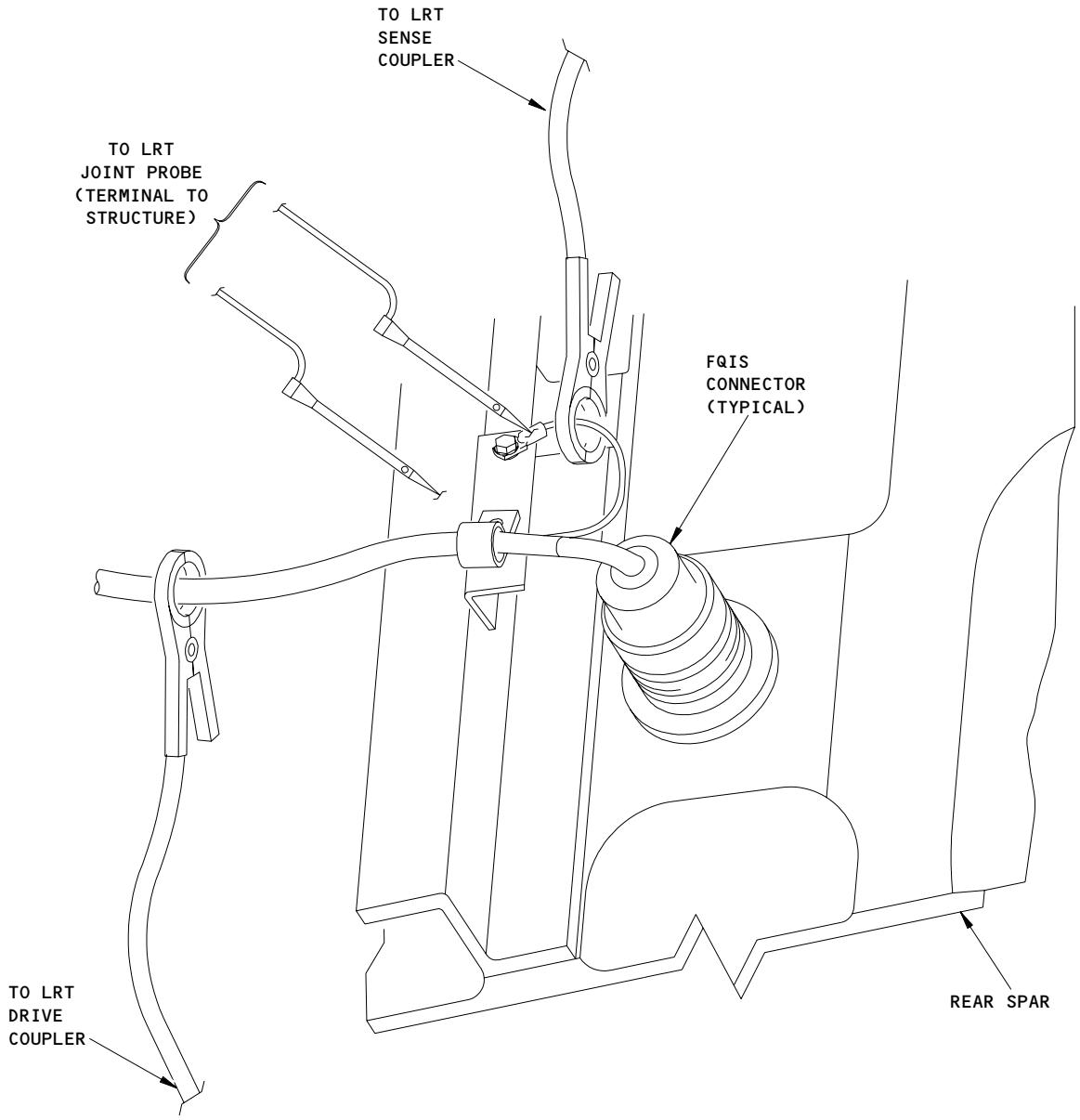
Location	Model	Boeing Part Number S283T025- (Cinch CN1156)	Wheel Well Ground	Max Joint Resistance Terminal to Bracket (milliohms)	Max Joint Resistance Bracket to Structure (milliohms)	Wiring Diagrams
Left Main Tank	200 300 300F	-126 (-926) -121 (-921) -321 (-971)	GD5926-S, GD5928-S	1.0	0.5	28-41-21
Left Main Dens Tank	200 300 300F	-122 (-922)	GD4034-S, GD4134-S	1.0	0.5	28-41-21
Left Aux Tank	200 300 300F	-127 (-927) -123 (-923) -323 (-973)	GD5926-S, GD5928-S	1.0	0.5	28-41-23
Right Main Tank	200 300 300F	-136 (-936) -131 (-931) -331 (-981)	GD5922-S, GD5924-S	1.0	0.5	28-41-22
Right Main Dens Tank	200 300 300F	-132 (-932)	GD3946-S, GD4140-S	1.0	0.5	28-41-22
Right Aux Tank	200 300 300F	-137 (-937) -134 (-934) -334 (-984)	GD5922-S, GD5924-S	1.0	0.5	28-41-23
Right Aux Dens Tank	200 300 300F	-135 (-935)	GD3946-S, GD4098-S	1.0	0.5	28-41-23

FQIS WIRE BUNDLE JOINT RESISTANCE AT INBOARD END					
Location	Boeing Part Number	Rear Spar Ground	Max Joint Resistance Terminal to Bracket (milliohms)	Max Joint Resistance Bracket to Structure (milliohms)	Wiring Diagrams
Left Main Tank Lo-Z	286T0446-101	GD4148-S	1.0	0.5	28-41-21
Left Main Tank Hi-Z	286T0446-101	GD4148-S	1.0	0.5	28-41-21
Left Aux Tank Lo-Z	286T0454-005	GD4132-S	1.0	0.5	28-41-23
Left Aux Tank Hi-Z	286T0454-005	GD4132-S	1.0	0.5	28-41-23
Right Main Tank Lo-Z	286T0448-101	GD4156-S	1.0	0.5	28-41-22
Right Main Tank Hi-Z	286T0448-101	GD4156-S	1.0	0.5	28-41-22
Right Aux Tank Lo-Z	286T0448-101	GD4142-S	1.0	0.5	28-41-23
Right Aux Tank Hi-Z	286T0448-101	GD4142-S	1.0	0.5	28-41-23



JOINT TEST CONNECTIONS

High Intensity Radiated Fields (HIRF) Fault Isolation
(BF Goodrich FQPU Test Connections)
Figure 605



JOINT TEST CONNECTIONS

High Intensity Radiated Fields (HIRF) Fault Isolation
(Honeywell FQPU Test Connections)
Figure 606

PLANE:	
DATE:	
TECHNICIAN:	

REAR SPAR CONNECTOR	REAR SPAR GROUND	MEASURED JOINT RESISTANCE (milliohms)	MAX JOINT RESISTANCE (milliohms)	COMMENTS
M1944	GD4148-S		5.5	
M1945	GD5980-S			
M1946	GD4132-S			
M1959	GD4156-S			
M1950	GD5978-S			
M1951	GD5974-S			
M1952	GD5976-S			

767-300/300F FQIS CONNECTORS (BF GOODRICH FQPU)

High Intensity Radiated Fields (HIRF) Fault Isolation
(Data Sheet)
Figure 607 (Sheet 1)

PLANE:	
DATE:	
TECHNICIAN:	

REAR SPAR CONNECTOR	REAR SPAR GROUND	MEASURED JOINT RESISTANCE (milliohms)	MAX JOINT RESISTANCE (milliohms)	COMMENTS
DO1582	GD4148-S		1.5	
DO1552	GD4148-S			
DO2816	GD4132-S			
DO2812	GD4132-S			
DO1584	GD4156-S			
DO1560	GD4156-S			
DO2818	GD4142-S			
DO2814	GD4142-S			

767-200, -300 FQIS CONNECTORS (BOEING BUNDLE - HONEYWELL FQPU)

High Intensity Radiated Fields (HIRF) Fault Isolation
(Data Sheet)
Figure 607 (Sheet 2)

PLANE:	
DATE:	
TECHNICIAN:	

REAR SPAR CONNECTOR	REAR SPAR GROUND	MEASURED JOINT RESISTANCE (milliohms)	MAX JOINT RESISTANCE (milliohms)	COMMENTS
M1947	GD4148-S		5.5	
M1945	GD5980-S			
M1948	GD4132-S			
M1957	GD4156-S			
M1950	GD5978-S			
M1958	GD5974-S			
M1952	GD5976-S			

767-200 FQIS CONNECTORS (BF GOODRICH FQPU)

High Intensity Radiated Fields (HIRF) Fault Isolation
(Data Sheet)
Figure 607 (Sheet 3)

LOCATION	MODEL	PART # BOEING S283T025- (CINCH CN1156-)	WHEEL WELL GROUND	MAX JOINT RESISTANCE TERMINAL TO BRACKET (milliohms)	MAX JOINT RESISTANCE BRACKET TO STRUCTURE (milliohms)	W/D
LEFT MAIN TANK	767-200	-126 (-926)	GD5926-S, GD5928-S	1	0.5	28-41-21
	767-300	-121 (-921)				
	767-300F	-321 (-971)				
LEFT MAIN DENS TANK	767-200	-122 (-922)	GD4034-S, GD4134-S	1		
	767-300					
	767-300F					
LEFT AUX TANK	767-200	-127 (-927)	GD5926-S, GD5928-S	1		28-41-23
	767-300	-123 (-923)				
	767-300F	-323 (-973)				
RIGHT MAIN TANK	767-200	-136 (-936)	GD5922-S, GD5924-S	1		28-41-22
	767-300	-131 (-931)				
	767-300F	-331 (-981)				
RIGHT MAIN DENS TANK	767-200	-132 (-932)	GD3946-S, GD4140-S	1		
	767-300					
	767-300F					
RIGHT AUX TANK	767-200	-137 (-937)	GD5922-S, GD5924-S	1		28-41-23
	767-300	-134 (-934)				
	767-300F	-334 (-984)				
RIGHT AUX DENS TANK	767-200	-135 (-935)	GD3946-S, GD4098-S	1		
	767-300					
	767-300F					

767-200, -300, -300F, CINCH (BF GOODRICH FQPU ONLY)

High Intensity Radiated Fields (HIRF) Joint Resistance Values
Figure 608 (Sheet 1)

LOCATION	BOEING PART NUMBER	REAR SPAR GROUND	MAX JOINT RESISTANCE TERMINAL TO BRACKET (MILLIOHMS)	MAX JOINT RESISTANCE BRACKET TO STRUCTURE (MILLIOHMS)	WIRING DIAGRAM
LEFT MAIN TANK LO-Z	286T0446-101	GD4148-S	1	0.5	28-41-21
LEFT MAIN TANK HI-Z		GD4148-S			
LEFT AUX TANK LO-Z	286T0454-005	GD4132-S			28-41-23
LEFT AUX TANK HI-Z		GD4132-S			
RIGHT MAIN TANK LO-Z	286T0448-101	GD4156-S			28-41-22
RIGHT MAIN TANK HI-Z		GD4156-S			
RIGHT AUX TANK LO-Z		GD4142-S			28-41-23
RIGHT AUX TANK HI-Z		GD4142-S			

767-200, 300 BOEING BUNDLE

High Intensity Radiated Fields (HIRF)
Joint Resistance Values
Figure 608 (Sheet 2)

HIRF/LIGHTNING - LOOP RESISTANCE TESTER (LRT) - MAINTENANCE PRACTICES

1. General
   A. The Loop Resistance Tester (LRT) is a specialized piece of test equipment which is used to make non-intrusive wire bundle and coax cable shield resistance measurements. The LRT can also be used to make resistance measurements across a built-up joint or individual electrical connections/joints.
      (1) This task contains the procedure for performing a Lid Standard Measurement with the LRT. The Lid Standard Measurement is a check of the Loop Resistance Tester (LRT) that should be performed whenever the LRT does not appear to be operating correctly. Measurement of the standard resistances on the LRT storage lid provides a quick indication of proper LRT operation. The Lid Standard Measurement consists of the following two parts:
         (a) Loop Mode, which makes a check of the loop resistance measurement function.
         (b) Joint Mode, which makes a check of the joint resistance measurement function.

TASK 20-56-01-822-001

2. LRT Lid Standard Measurement
   A. Procedure

      S 752-002

      (1) Loop Mode
         (a) The various components of the LRT are illustrated in Fig. 201.
         (b) Open the LRT assembly and slide the lid aside to separate it from the base.
         (c) Open the lid and remove the Sense/Drive couplers and the Joint Probe assembly.
         (d) Connect the blue-coded Sense coupler cable to the blue-coded Sense Coupler connector on the LRT.
         (e) Connect the red-coded Drive coupler cable to the red-coded Drive Coupler connector on the LRT.
         (f) Connect the Joint Probe assembly to the Joint Probe connector on the LRT.
         (g) Lift the safety cover and set the RUN-OFF/CHARGE switch to the RUN position.
         (h) Set the MODE switch to the LOOP position.

(i) Push and hold the ON/OFF pushbutton switch on the BITE module until "Testing Hardware" shows on the BITE display, then release the ON/OFF switch. A four-character symbol will move around the BITE display during the hardware self-test.

NOTE: To conserve the battery, the LRT will automatically power down after 10 minutes of inactivity. To re-apply power, do the above steps again.

(j) When the "Press Start" indication shows on the BITE display, make sure the LED on each Sense/Drive coupler control box is red.

(k) Connect the Sense/Drive couplers to the cutout in the Reference Standard, built into the storage lid of the LRT.
1) Position the couplers at each end of the cutout, near the Sense/Drive coupler alignment marks (Fig. 201).

(l) Begin the Lid Standard Test by pushing the START pushbutton switch on either of the Sense/Drive coupler control boxes.

(m) Make sure the LED on each of the Sense/Drive coupler control boxes is green.
1) If either LED is red and a "DRV Coup is Open" or "SNS Coup Is Open" message shows on the BITE display, then the couplers should be checked for proper connection.
a) Gently squeeze and release the coupler handles to improve the connection of the couplers to the Lid Standard. If adjusting the couplers does not change the LEDs to green, replace the LRT.
b) If "Press Start" shows on the BITE display, then push the START pushbutton on either of the Sense/Drive coupler control boxes and begin the Lid Standard Test again.
2) If either LED is red and a "DRV Coup Is Open" or "SNS Coup Is Open" message does not show on the BITE display, replace the LRT.
3) If the LED on one or both couplers flashes red, then re-connect the couplers to the lid after the "Press Start" message shows on the BITE display.
a) Push the START pushbutton on either of the Sense/Drive coupler control boxes and begin the Lid Standard Test again.
4) If the message "UNSTABLE" shows on the BITE display and does not clear, set the MODE switch to the JOINT position.
a) When the message "CONNECT PROBES" shows on the BITE display, set the MODE switch back to the LOOP position.

b) Push the START pushbutton on either of the Sense/Drive coupler control boxes and begin the Lid Standard Test again.
c) If the "UNSTABLE" message continues to show, replace the LRT.

(n) When the Sense/Drive coupler control box LEDs flash green, note the measured resistance value which shows on the BITE display.
1) Make sure the displayed resistance value is 0.5 - 1.0 milliohm.
2) If the displayed resistance value is not 0.5 - 1.0 milliohm, replace the LRT.

S 752-003

(2) Joint Mode
(a) With the Sense/Drive couplers still connected to the Lid Reference Standard, change the MODE switch to the JOINT position.
(b) Make sure the Joint Probe LEDs are red (Fig. 201).
(c) Place the tip of one Joint Probe on the first Joint Probe reference mark on the Lid Reference Standard (Fig. 201).
(d) Place the tip of the other Joint Probe on the second Joint Probe reference mark.

NOTE: The LRT will start the Joint Test when the LEDs on both Joint Probes are green.

(e) When the LED on either Joint Probe flashes green, the measurement shows, in milliohms, on the bottom line of the BITE display.

NOTE: The loop resistance from the previous loop measurement is displayed on the top line of the BITE display during a joint mode measurement.

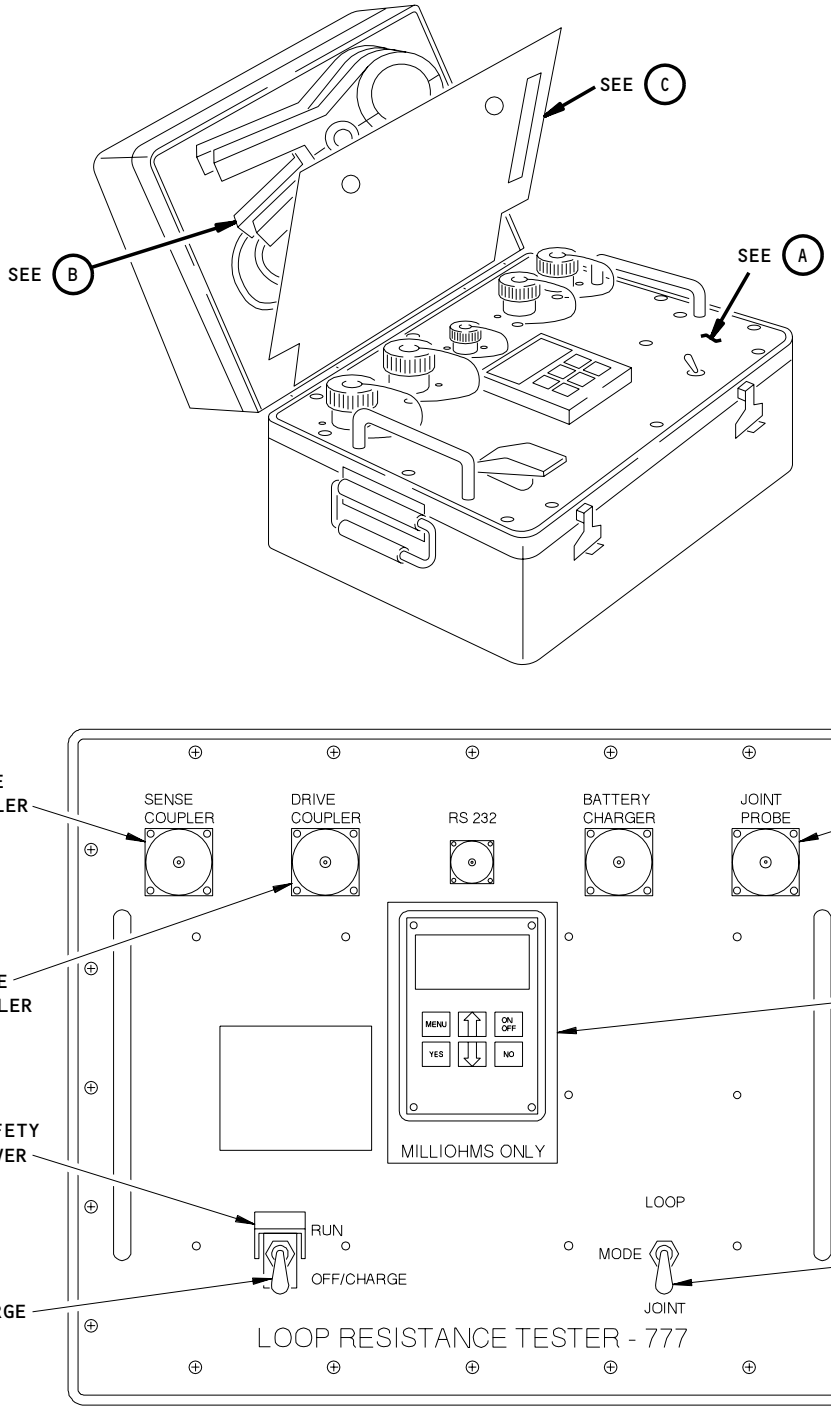
(f) Note the joint resistance value.
(g) Keep the first Joint Probe in place on the first Joint Probe reference mark and move the second Joint Probe to the next Joint Probe reference mark.
(h) Repeat the above steps until a resistance value has been measured for each Joint Probe reference mark, 2 through 6.

(i) Compare the measured resistance values with the acceptable resistance values listed below:

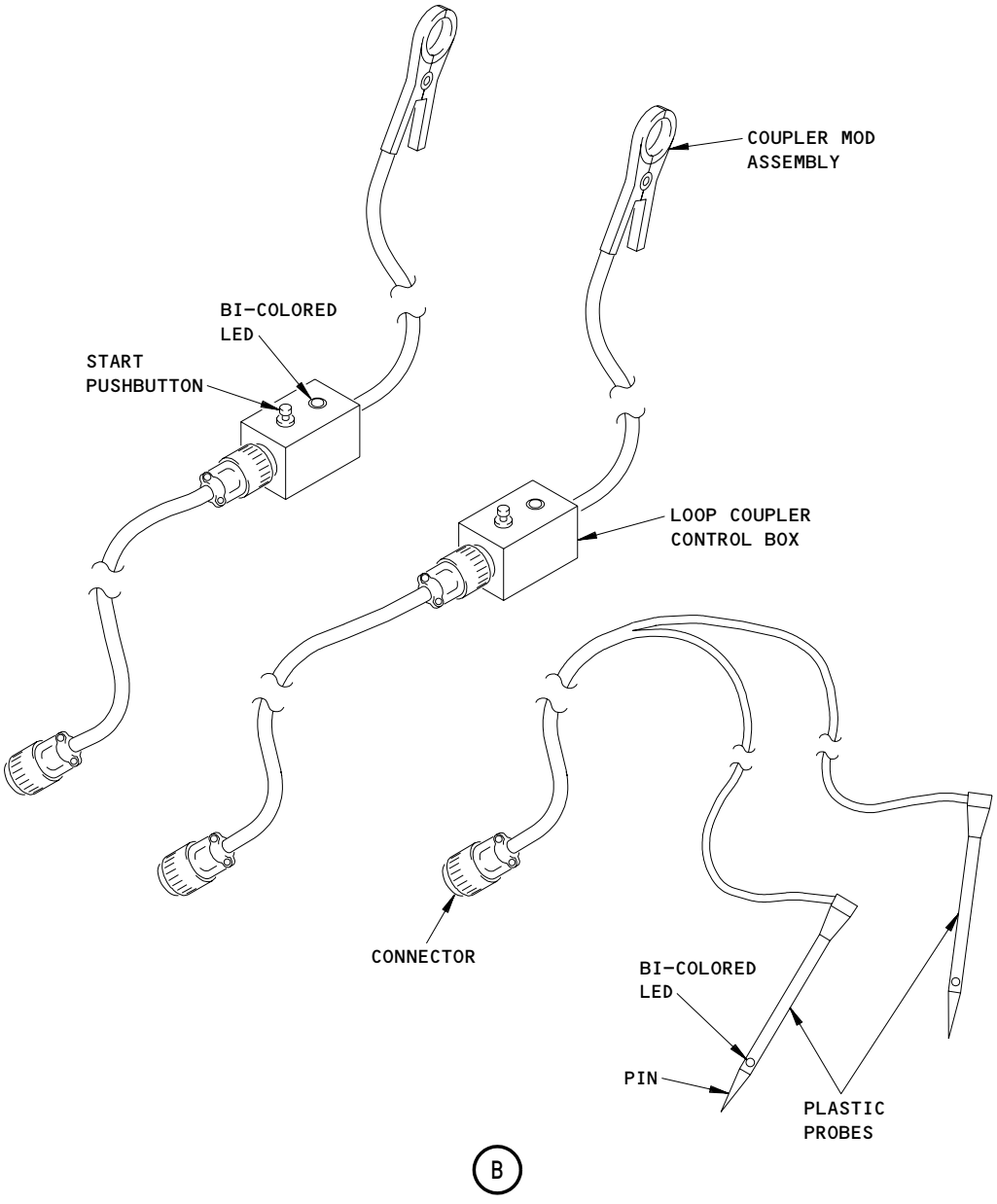
TABLE 201	
MEASUREMENT POINTS (REFERENCED TO FIRST JOINT PROBE MARK)	RESISTANCE MEASUREMENT ACCEPTABLE VALUES
Second Joint Probe Reference Mark	0.01 - 0.06 milliohms
Third Joint Probe Reference Mark	0.04 - 0.11 milliohms
Fourth Joint Probe Reference Mark	0.07 - 0.16 milliohms
Fifth Joint Probe Reference Mark	0.10 - 0.21 milliohms
Sixth Joint Probe Reference Mark	0.12 - 0.26 milliohms

1) If all five resistance measurements taken above are within the range of Acceptable Values from Table 201, then this task is complete and the LRT is operational.
2) If any of the five resistance measurements taken above are outside the range of Acceptable Values from Table 201, then replace the LRT.

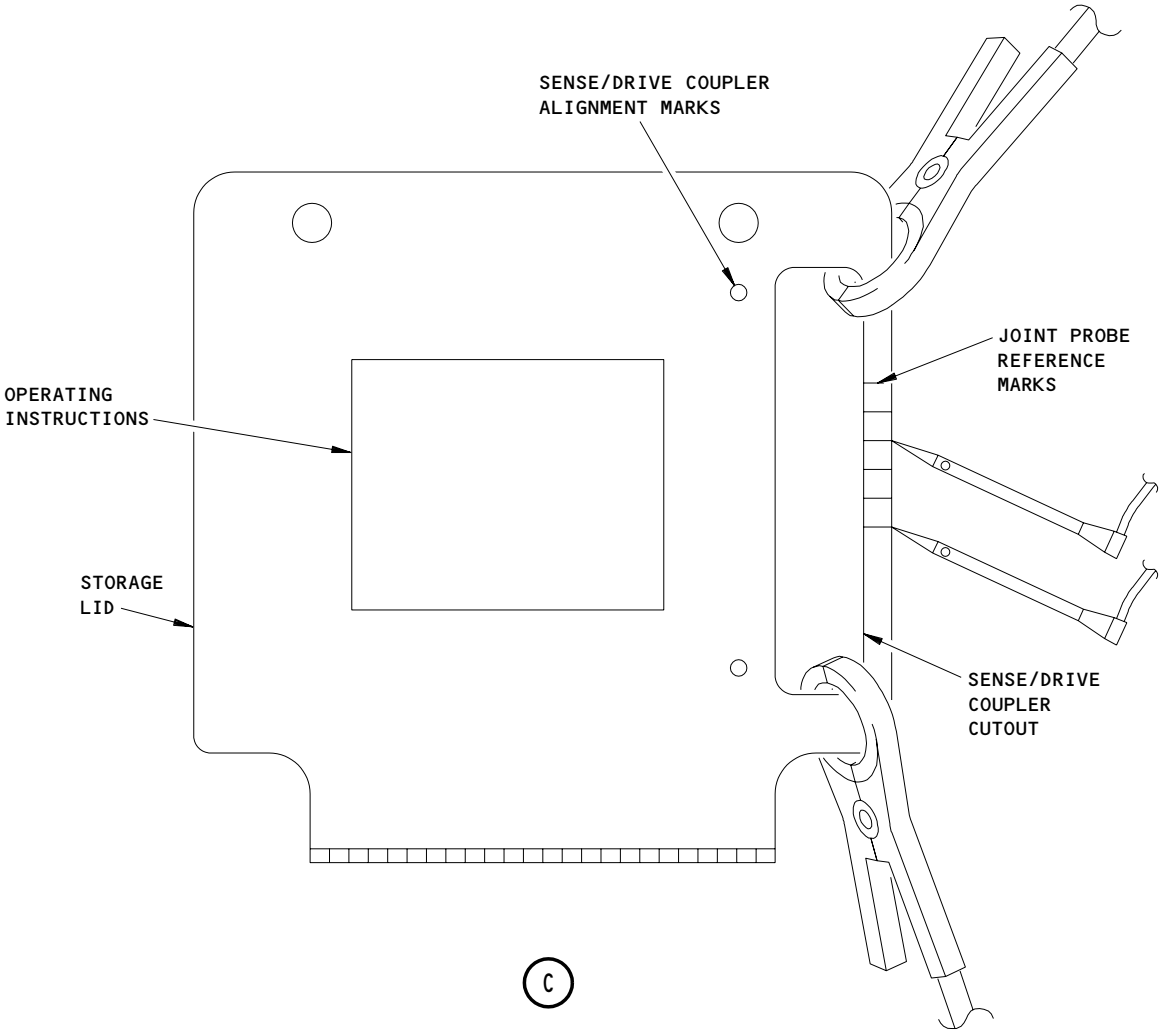
(j) Change the MODE switch to LOOP.
(k) Disconnect the Sense/Drive couplers from the Lid Reference Standard.
(l) This completes the LRT Lid Standard Measurement.



High Intensity Radiated Fields (HIRF) Inspection
Loop Resistance Tester Maintenance Practices
Figure 201 (Sheet 1)



High Intensity Radiated Fields (HIRF) Inspection
Loop Resistance Tester Maintenance Practices
Figure 201 (Sheet 2)



High Intensity Radiated Fields (HIRF) Inspection
Loop Resistance Tester Maintenance Practices
Figure 201 (Sheet 3)

HIRF/LIGHTNING - LOOP RESISTANCE MEASUREMENT - MAINTENANCE PRACTICES

1. General
   A. The comments and instructions contained herein apply to the Loop Resistance Tester (LRT), Boeing P/N 906-10246-X.
   B. The LRT is used to make non-intrusive wire bundle and coax cable shield resistance measurements by inductively coupling a low voltage into the shield and measuring the current flowing through the shield. The LRT can also be used to make resistance measurements across a built-up joint or individual electrical connections/joints after an electrical loop is first established.
   C. This procedure does the Loop Resistance Measurement task.
      (1) The Loop Resistance Measurement Task contains instructions on how to use the LRT to measure the shield resistance of a wire bundle or coaxial cable. The shield must be electrically connected to airplane structure at both ends in order to form an electrical loop for current to flow. In certain cases, a ground return jumper cable must be used to provide a ground return path because the wire bundle is not specifically connected to airplane structure at one end.

TASK 20-56-02-762-001

2. Loop Resistance Measurement
   A. References
      (1) AMM 20-56-01/201, LRT Lid Standard Measurement
      (2) AMM 20-56-03/201, Joint Resistance Measurement
   B. Preliminary

      S 752-002

      (1) Prepare the LRT for use (Fig. 201).
         (a) Open the LRT assembly and slide the lid aside to remove it from the base.
         (b) Open the lid and remove the Sense/Drive couplers and the joint probe assembly.
         (c) Connect the blue-coded Sense coupler cable to the blue-coded Sense Coupler connector on the LRT.
         (d) Connect the red-coded Drive coupler cable to the red-coded Drive Coupler connector on the LRT.
         (e) Connect the Joint Probe assembly to the Joint Probe connector on the LRT.
         (f) Lift the safety cover and set the RUN-OFF/CHARGE switch to the RUN position.
         (g) Set the LRT MODE switch to the LOOP position.

(h) Push and hold the ON/OFF pushbutton switch on the BITE module until "Testing Hardware" shows on the BITE display, then release the ON/OFF switch. A four-character symbol will move around the BITE display during the hardware self-test.

NOTE: To conserve the battery, the LRT will automatically power down after 10 minutes of inactivity. To re-apply power, do the above steps again.

(i) When the "Press Start" indication shows on the BITE display, make sure the LED on each Sense/Drive coupler control box is red.

C. Procedure

S 752-003

(1) Connect the couplers.

(a) For a normal Loop Resistance Measurement (Fig. 202):

1) Clamp both of the LRT couplers around the wire bundle to be measured.

a) If there are ground wires, such as shield pigtail connections, at the point of measurement on the measured bundle, make sure that such wiring is NOT included within either coupler.

b) Make sure there is at least 4 inches separation between the two couplers. If such separation is impossible to maintain, use the Mu-Metal shields (P/N 906-10249-9) provided with the LRT to obtain the necessary isolation.

NOTE: In the case of multiple wire bundles going to/from a connector, make sure the coupler is only around the desired bundle. This may require removing (and replacing) wire ties to separate the bundles enough for coupler connection.

(b) If a Modified Loop Resistance Measurement is required, (Fig. 203):

1) Clamp the Drive coupler around the ground return jumper cable.

2) Clamp the Sense coupler around the bundle to be tested.

NOTE: A minimum separation of 4 inches between the couplers should still be maintained.

a) If there are ground wires, such as shield pigtail connections, at the point of measurement on the bundle, make sure that such wiring is NOT included within the Sense coupler.

S 752-004

(2) Initiate a Loop Resistance Measurement by pushing the START pushbutton on either of the Sense/Drive Coupler Control boxes, causing the LEDs on both boxes to turn green.
(a) When the LEDs flash green, note the loop resistance value shown on the LRT BITE display.
(b) This completes the Loop Resistance Measurement.

S 752-005

(3) If you are unable to complete the Loop Resistance Measurement, do the following fault isolation steps:
(a) If either LED is red and a "DRV Coup Is Open" or "SNS Coup Is Open" message shows on the BITE display, then the couplers should be checked for proper connection.
1) Gently squeeze and release the coupler handles to improve the connection of the couplers around the wire bundle being measured.
a) If adjusting the couplers does not change the LEDs to green, replace the LRT.
2) If "Press Start" shows on the BITE display, then push the START pushbutton on either of the Sense/Drive coupler control boxes and begin the Loop Resistance Measurement again.
(b) If either LED is red and a "DRV Coup Is Open" or "SNS Coup Is Open" message does not show on the BITE display, replace the LRT.
(c) If the LED on one or both couplers flashes red, then re-connect the couplers to the wire bundle being measured after the "Press Start" message shows on the BITE display.
1) Push the START pushbutton on either coupler control box and begin the Loop Resistance Measurement again.
(d) If the message "UNSTABLE" is displayed and does not clear, set the MODE switch to the JOINT position.
1) When the message "Connect Probes" shows on the BITE display, set the MODE switch back to the LOOP position.

2) When the "Press Start" message appears, push the Start pushbutton on either of the coupler control boxes and begin the Loop Resistance Measurement again.
3) If this fails to clear the "UNSTABLE" message, then there is a problem with the wire bundle being measured or with the LRT.

NOTE: The "UNSTABLE" message is caused by the LRT detecting a varying resistance. This varying resistance can be caused by a loose connection, a corroded or intermittent electrical joint, a faulty Transorb adapter, or a faulty LRT.

a) Make sure the LRT is operating correctly (AMM 20-56-01/201).
b) If the LRT is operating correctly, then the wire bundle or a connection/joint is faulty and must be repaired or replaced before continuing the measurement. Check each electrical connection in the circuit being measured to isolate the faulty connection/joint. Check the electrical joint (AMM 20-56-03/201).

(e) If the BITE display shows "Joint V TooBig" (Dash-2 LRT only), "Loop I TooBig" or "Loop V TooBig", then stray currents may be circulating through the shield of the wire bundle being measured.
1) If power is applied to any of the equipment attached to this bundle, remove power from the equipment.
2) Any on-board electrical equipment that does not need to be ON should be turned OFF.
3) Make sure no other sources of current or voltage are connected on or near the bundle being tested.
4) In extreme cases, all power may need to be removed from the airplane.

S 752-006

(4) For a Dash-2 LRT, the following BITE display messages may also appear:
(a) Joint TooSmall:
1) This indication is displayed when the Joint Value is too small compared to the Loop Value to give an accurate Joint reading. This condition exceeds the operating capabilities of the LRT.

(b) LNoise V TooBig:

1) This indication is displayed when excessive noise voltage on the wire bundle shield interferes with the LRTs ability to read accurately during Loop Mode. Stray signals on the wire shield may be produced by motors, electronic equipment, or adjacent electronic circuits. This condition can be alleviated by de-energizing equipment in the vicinity of the circuit being tested.

(c) LNoise I TooBig:

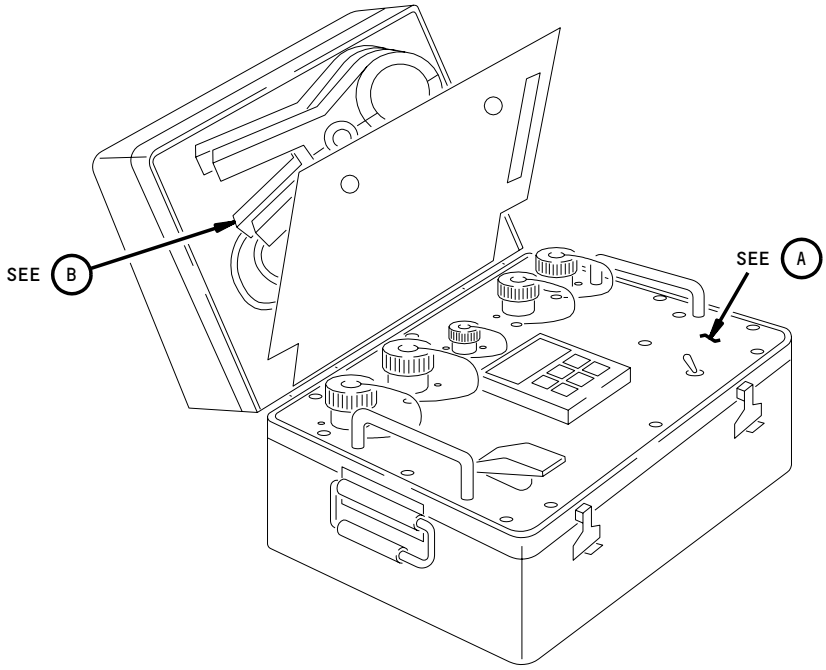
1) This indication is displayed when excessive noise current on the wire bundle shield interferes with the LRTs ability to read accurately during Loop Mode. Stray signals on the wire shield may be produced by motors, electronic equipment, or adjacent electronic circuits. This condition can be alleviated by de-energizing equipment in the vicinity of the circuit being tested.

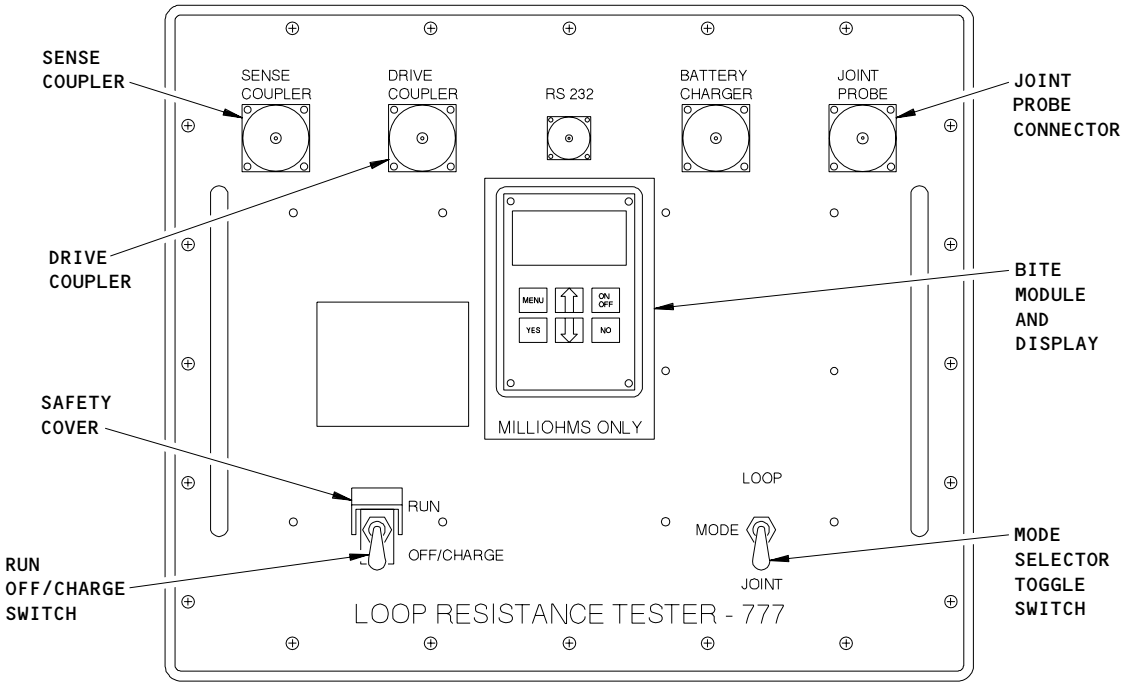
(d) JNoise V TooBig:

1) This indication is displayed when excessive noise voltage on the wire bundle shield interferes with the LRTs ability to read accurately during Joint Mode. Stray signals on the wire shield may be produced by motors, electronic equipment, or adjacent electronic circuits. This condition can be alleviated by de-energizing equipment in the vicinity of the circuit being tested.

(e) JNoise I TooBig:

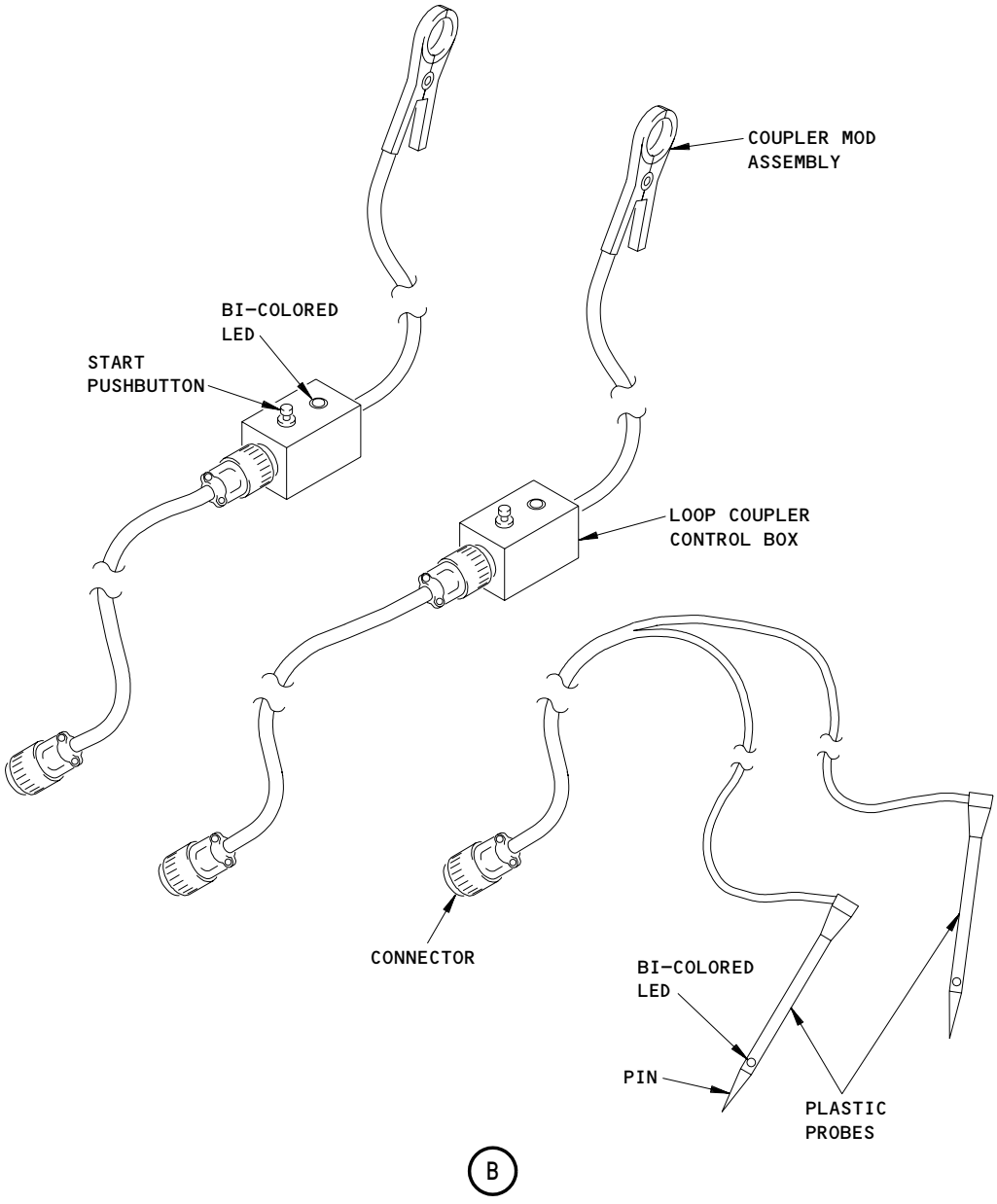
1) This indication is displayed when excessive noise current on the wire bundle shield interferes with the LRTs ability to read accurately during Joint Mode. Stray signals on the wire shield may be produced by motors, electronic equipment, or adjacent electronic circuits. This condition can be alleviated by de-energizing equipment in the vicinity of the circuit being tested.



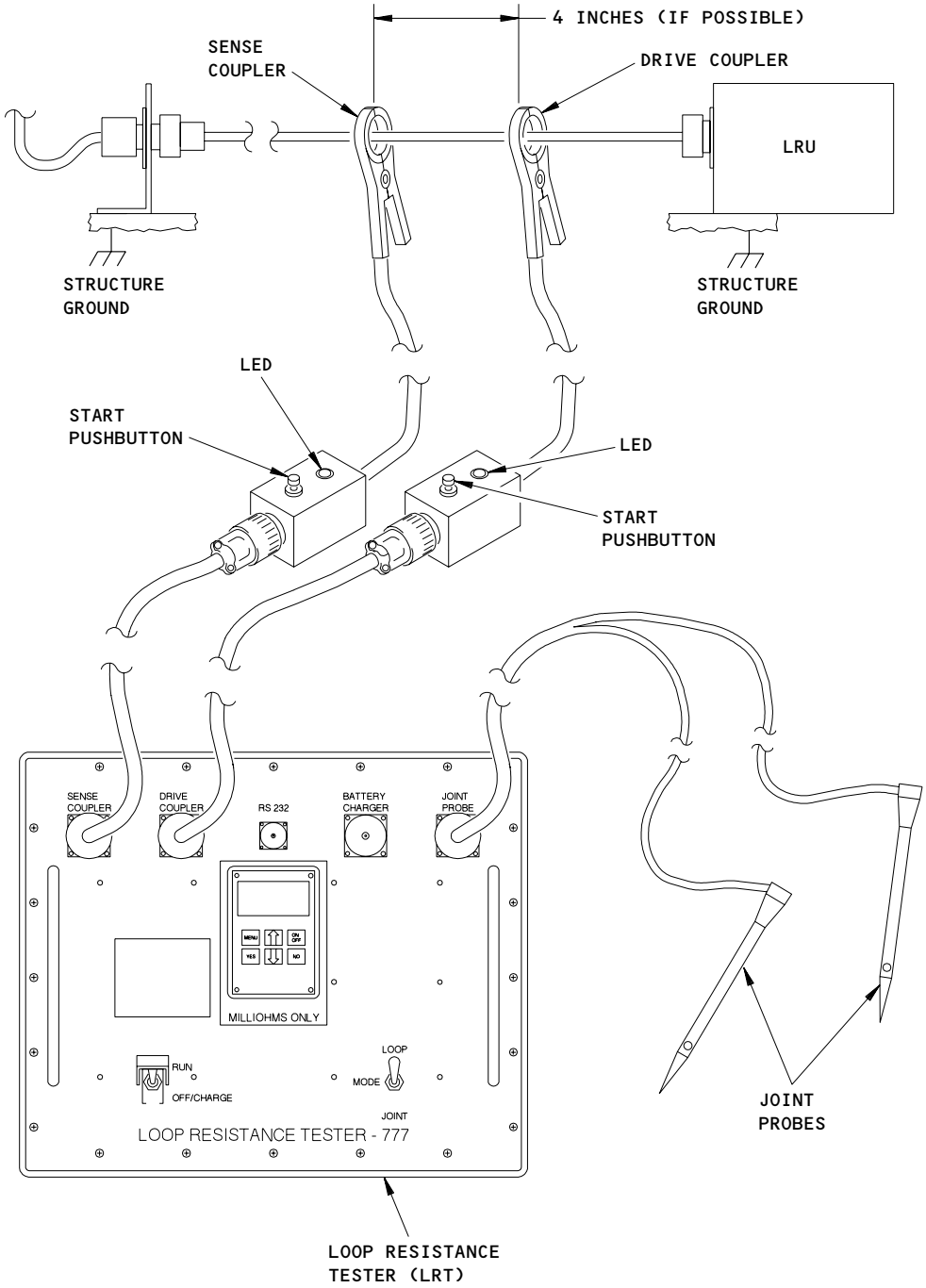


A

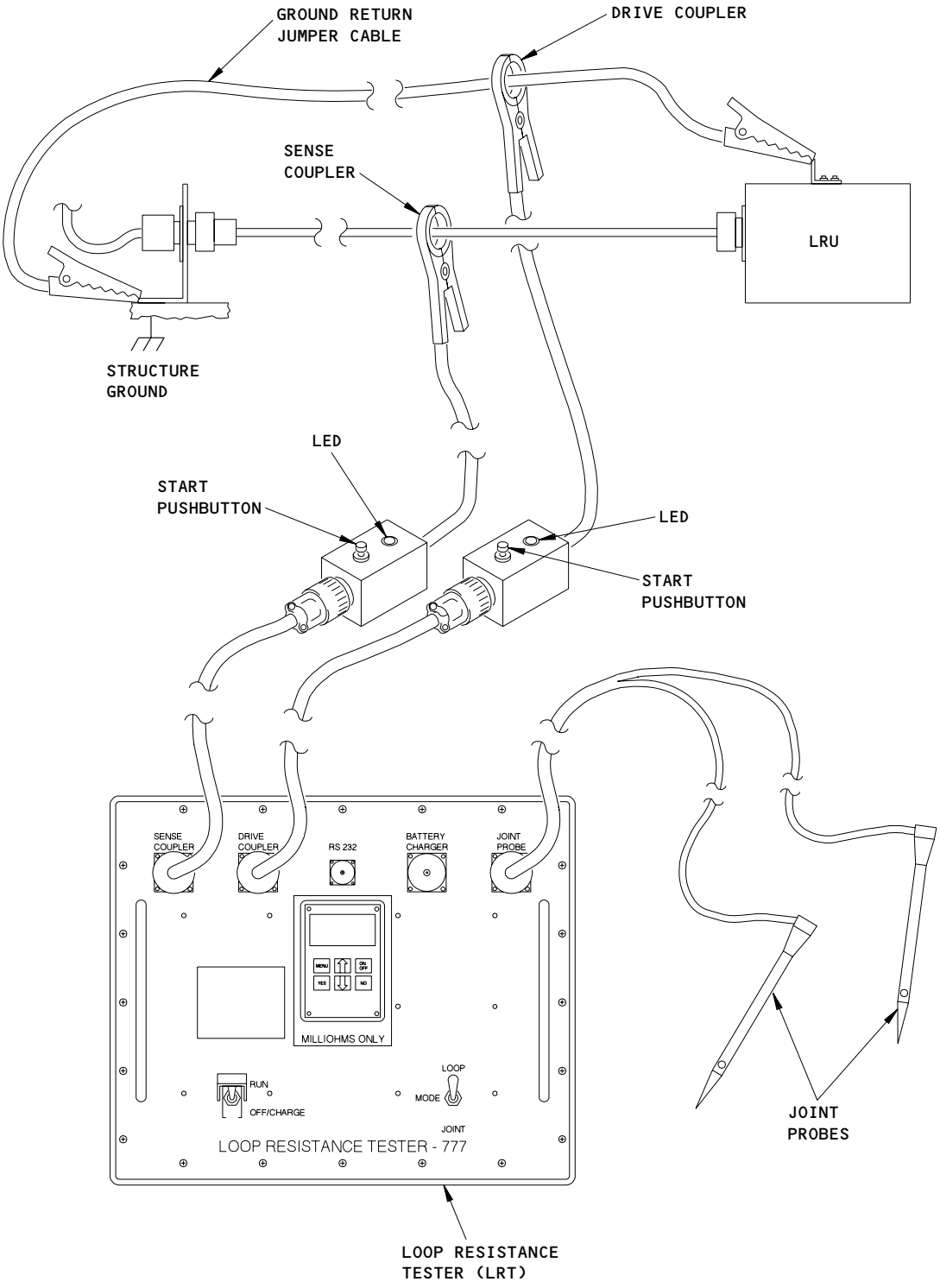
High Intensity Radiated Fields (HIRF) Inspection
Loop Resistance Tester Maintenance Practices
Figure 201 (Sheet 1)



High Intensity Radiated Fields (HIRF) Inspection
Loop Resistance Tester Maintenance Practices
Figure 201 (Sheet 2)



Typical Loop Resistance Tester (LRT)
Hookup for Loop Resistance Measurement
Figure 202



Typical Loop Resistance Tester (LRT) Hookup
for Modified Loop Resistance Measurement
Figure 203

HIRF/LIGHTNING - JOINT RESISTANCE MEASUREMENT - MAINTENANCE PRACTICES

1. General
   A. This task contains instructions on how to use the Loop Resistance Tester (LRT) to measure the resistance across a built-up joint or individual electrical connections/joints.
      (1) The direct contact voltage and current measurement capabilities of the LRT Joint Probes are used to perform a Joint Resistance Measurement.
      (2) The connections/joints to be measured must be contained within the shielding system being measured in the Loop Resistance Mode (the loop current must flow through these joints/connections).
   B. In some cases, the current path to structure may include a subassembly. An example would be one of the connectors mounted to an FSEU Gearbox. In such a case, the bonding of the subassembly-to-structure may also need to be measured. If an out-of-spec joint reading is found, refer to the AMM chapter associated with that particular subsystem for component bonding requirements.

TASK 20-56-03-762-001

2. Joint Resistance Measurement
   A. References
      (1) AMM 20-56-01/201, LRT Lid Standard Measurement
      (2) AMM 20-56-02/201, Loop Resistance Measurement
      (3) SWPM 20-20-00, Standard Wiring Practices Manual
      (4) SWPM 20-25-11, Standard Wiring Practices Manual
   B. Procedure

      S 752-002

      (1) To establish an electrical current flow in the wire bundle, joints/connections and bonding straps being measured, do a Loop Resistance Measurement (AMM 20-56-02/201) before starting the Joint Resistance Measurement.

      NOTE: Before a Joint Resistance Measurement can be performed, a Loop Measurement must have been completed on the wire bundle associated with the joint being measured. If this is a modified loop formed with a ground return jumper cable, then the LRT Sense/Drive couplers must be connected as shown for a modified loop resistance measurement. The LRT continues to monitor the loop resistance of the wire bundle while the joint measurement is being made. If the loop resistance changed by too large an amount, the LEDs on both joint probes will blink red and the message "REDO LOOP" will appear on the BITE display. This message cannot be erased without switching the LRT back to the loop mode and doing a loop resistance measurement again.

S 752-003
(2) Set the Mode Selector switch on the LRT to the joint position.

S 752-004
(3) Make sure the LEDs on both Joint Probes are red.

S 752-005
(4) Connect one joint probe to one side of a complex joint buildup (structure, LRU, receptacle, bracket, or connector backshell for example) within 1 inch of the joint being measured (Fig. 201 or 202).

NOTE: A joint may have several electrical connections. For example, a connector mounted on a bracket which is mounted to structure can provide five connections between the bundle shield and "ground". The shield is (1) connected to the connector backshell which is (2) connected to the connector itself which (3) connects to the receptacle which (4) is mounted on the bracket which is (5) connected to structure.

S 752-006
(5) Connect the second joint probe to the other side of the joint being measured, within 1 inch of the joint/connector.

NOTE: The LRT will start the Joint Resistance Measurement when the LEDs on both Joint Probes are green. The LEDs change from red to green when electrical continuity is established between the probes. It may be necessary to wiggle the probes in order to make electrical contact through surface coatings.

(a) If the Joint Probes appear to be making good electrical contact and the Joint Probe LEDs do not change to green and no error messages are displayed on the LRT, then, do LRT Lid Standard Measurement (AMM 20-56-01/201).

(b) If the BITE display shows "Joint V TooBig", then stray currents may be circulating through the shield of the wire bundle being measured.
1) If power is applied to any of the equipment attached to this bundle, remove power from the equipment.
2) Any on-board electrical equipment that does not need to be ON should be turned OFF.
3) Make sure no other sources of current or voltage are connected on or near the bundle being tested.
4) In extreme cases, all power may need to be removed from the airplane.

S 752-007
(6) When the LEDs on the probes flash green, record the resistance value of this joint from the bottom line of the BITE display.
(a) The following resistance values (Table 201) are maximum joint resistance values for common electrical connections/joints.

TABLE 201

TYPE OF JOINT	MAXIMUM ALLOWABLE RESISTANCE (ALUMINUM CONNECTORS) IN MILLIOHMS	MAXIMUM ALLOWABLE RESISTANCE (STAINLESS/STEEL) IN MILLIOHMS
Backshell-To-Receptacle	2.5	5.0
Backshell-To-Plug Body	2.5	5.0
Plug-To-Receptacle	5.0	12.5
Receptacle-To-Bracket	2.5	5.0
Bracket-To-Bond Strap	1.0	1.0
Bond Strap-To-Structure	1.0	1.0
Bracket-To-Structure	1.0	1.0
Riveted Bracket-To-Structure	1.0	1.0
Other Fay Surface Bonds	1.0	1.0

(b) To calculate the maximum allowable resistance for a built-up joint, do the following:
   1) Determine what type of electrical connections/joints and how many of each are contained within the built-up joint.
   2) Find the maximum allowable resistance for each type of electrical connection/joint (Table 201) contained within the built-up joint.
   3) Sum the individual maximum allowable resistances for each electrical connection/joint contained within the built-up joint. This sum is the calculated maximum allowable resistance for the built-up joint.

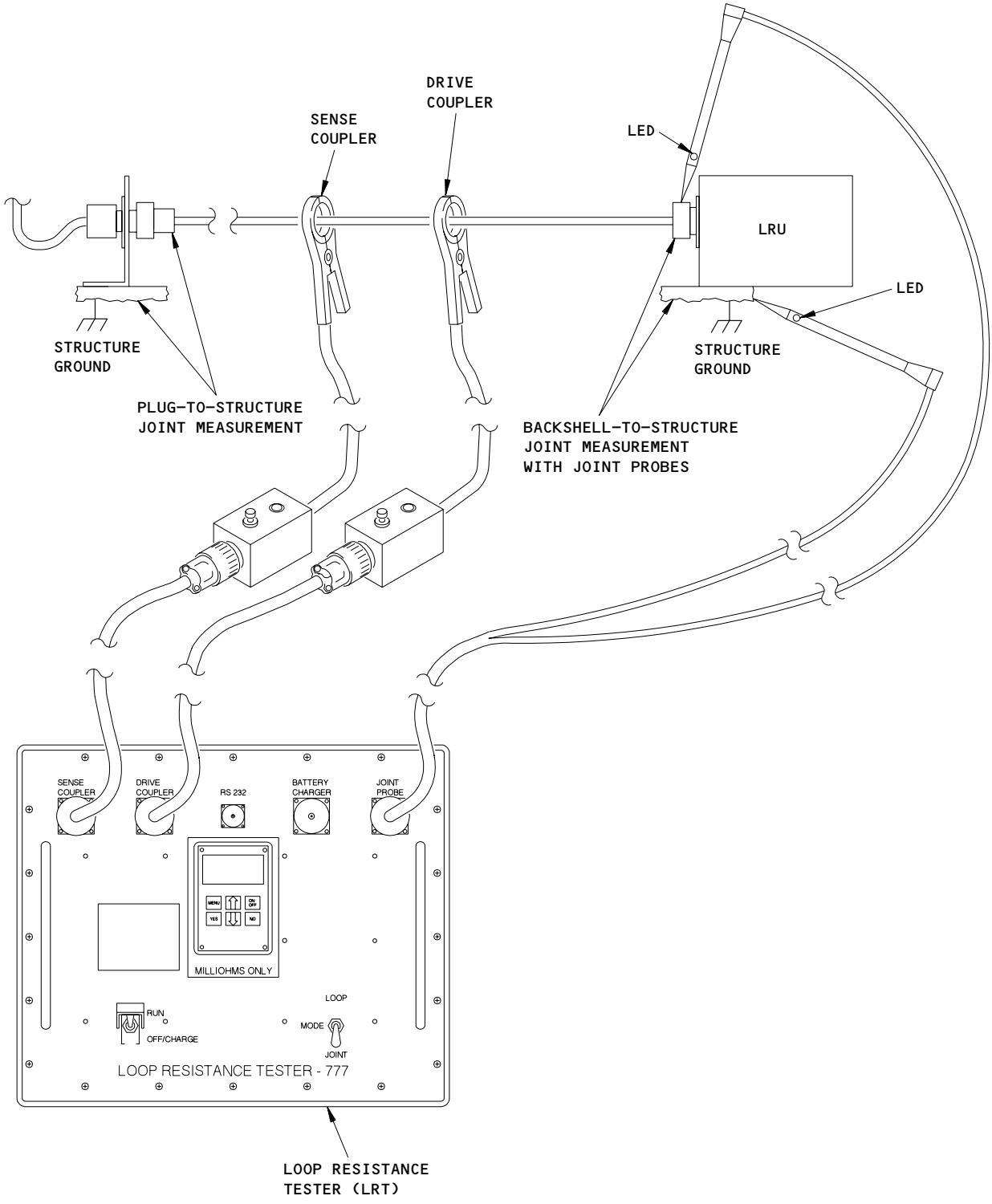
(c) If the measured built-up joint resistance is higher than the calculated maximum allowable resistance, then do a joint resistance measurement across each individual connection/joint to isolate the specific high resistance connection/joint.
   1) If an individual connection/joint resistance exceeds the maximum allowable resistance (Table 201) for that type of connection/joint, then repair the faulty connection/joint.

      NOTE: Loose connectors and backshells or pigtails can cause an out-of-tolerance resistance reading.

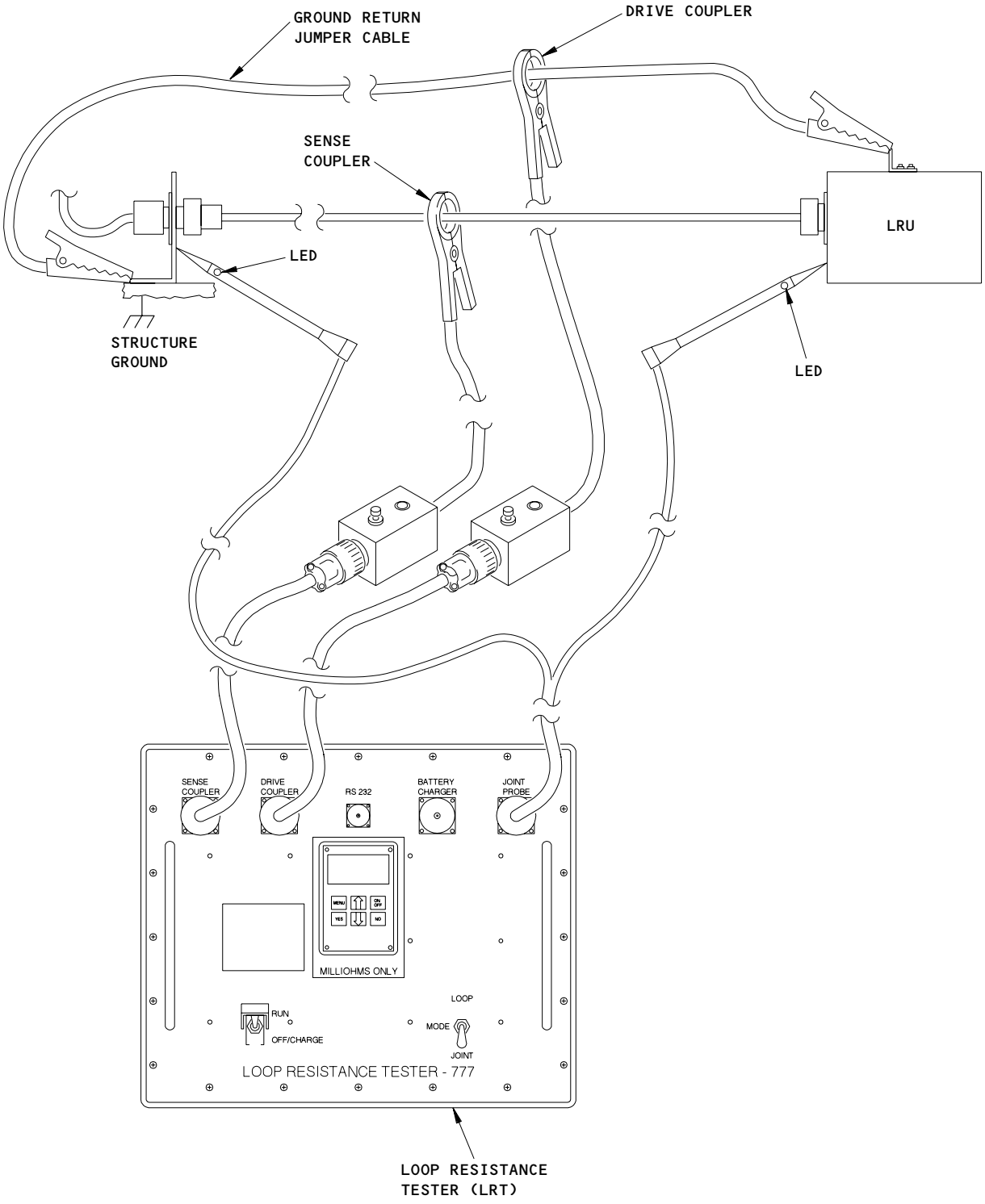
      a) Do the following SWPM 20-20-00 or SWPM 20-25-11.
   2) After you complete the joint repair, repeat the Joint Buildup Resistance Measurement to verify the repair.

(d) If the measured joint resistance is less than the calculated maximum allowable resistance for the built-up joint, then do the Joint Buildup Resistance Measurement on the next joint in the wire bundle.

(e) If all of the built-up joints/connections for a particular wire bundle have been measured and joint resistances are less than the calculated maximum allowable resistance for the built-up joints, then the Joint Buildup Resistance Measurement Task is complete.



Typical Loop Resistance Tester (LRT) Hookup for Joint Buildup Test
Figure 201



Typical Loop Resistance Tester (LRT) Hookup for Modified Joint Buildup Test
Figure 202

CIRCUIT BREAKER RESET - MAINTENANCE PRACTICES

TASK 20-60-01-862-001

1. Circuit Breaker Reset

A. General

(1) This procedure is for on-the-ground maintenance.

(2) Circuit breakers open when there is an electrical overload in the airplane system. A circuit breaker that opens because of an electrical overload is known as a "tripped" circuit breaker.

(3) If there are currently specific instructions for the reset of a tripped circuit breaker in maintenance and troubleshooting procedures, follow those instructions.

(4) A defective circuit breaker can cause the circuit breaker to open. Make sure that the circuit breaker is serviceable.

(5) Use your judgement and airline policy to reset a tripped circuit breaker.

(6) Monitor the airplane to see if a tripped circuit breaker occurs again on subsequent flights.

(7) Do not reset a tripped circuit breaker until you know the cause for the tripped circuit breaker and that the circuit breaker can be safely reset.

NOTE: Fires have occurred in which the tripped circuit breakers were reset without an examination of the cause.

(8) Use this procedure to reset a tripped circuit breaker:

(a) If you know that the circuit breaker is serviceable.

(b) If this procedure is in agreement with your airline policy.

(c) If you cannot determine the cause for the tripped circuit breaker.

(d) If you cannot determine whether it is safe to reset the circuit breaker.

B. References

(1) AMM (applicable procedure)

(2) SWPM (applicable procedure)

(3) WDM (applicable diagram)

C. Procedure

S 862-002

(1) Attach a DO-NOT-CLOSE tag to the tripped circuit breaker.

S 862-003

(2) Install a circuit breaker lock on the tripped circuit breaker.

S 862-004

(3) If the tripped circuit breaker is one of three circuit breakers protecting a 3-phase circuit:

(a) Open the other two circuit breakers.

(b) Attach DO-NOT-CLOSE tags.
(c) Install circuit breaker locks.

S 862-005
(4) Look in the aircraft logbook to find if there is recorded data about a "tripped" circuit breaker, such as:
(a) The condition existing when the circuit breaker trip occurred.
(b) The conditions existing when the circuit breaker was reset.
(c) The results of resetting the circuit breaker.

S 862-006
(5) Do a visual check for damage to electrical wiring and system components related to the tripped circuit breaker. If necessary, refer to the Wiring Diagram Manual (WDM). Look for these types of damage:
(a) Electrical shorting
(b) Electrical arcing
(c) Corrosion on the contacts of the electrical wiring and system components
(d) Abrasion of the electrical wiring and system components
(e) Cracks on the insulation of the electrical wiring
(f) Split wires

NOTE: A split wire is when you can see the conductor through the crack in the insulation of the electrical wiring.

(g) Broken wires
(h) Discoloration of the insulation of the electrical wiring
(i) Fluid or dust contamination of electrical wiring and system components

NOTE: Contamination can be a fuel source during electrical arcing.

(j) Metal shavings

NOTE: Metal shavings can cause electrical shorting.

S 862-007
(6) Make sure that there are no loose terminal connections.

NOTE: Loose terminal connections can be a source of electrical arcing.

S 862-008
(7) If you find damage to the electrical wiring, refer to the Standard Wiring Practices Manual (SWPM) and repair the electrical wiring.

S 862-009
(8) If you find damage to a system component, refer to the applicable Aircraft Maintenance Manual (AMM) procedure and replace the component.

S 862-010
(9) Remove contamination and metal shavings if necessary.

S 862-011
(10) Remove the DO-NOT-CLOSE tag(s).

S 862-012
(11) Remove the circuit breaker lock(s).

S 862-013

WARNING: KEEP PERSONS AND EQUIPMENT CLEAR OF THE SYSTEM RELATED TO THE TRIPPED CIRCUIT BREAKER. MAKE SURE THAT THERE IS NO DAMAGE TO THE ELECTRICAL WIRING AND SYSTEM COMPONENTS. MAKE SURE THAT ALL TERMINAL CONNECTIONS ARE TIGHT. DAMAGED ELECTRICAL WIRING, DAMAGED SYSTEM COMPONENTS AND LOOSE TERMINAL CONNECTIONS CAN CAUSE ELECTRICAL ARCING AND A FIRE WHEN THE CIRCUIT BREAKER IS CLOSED.

WARNING: DO NOT RESET (CLOSE) A FUEL PUMP CIRCUIT BREAKER THAT HAS OPENED (TRIPPED) UNTIL YOU CORRECT THE PROBLEM. REFER TO FIM 28-22-00/101 OR FIM 28-31-00/101. THIS CONDITION CAN CAUSE A FIRE OR EXPLOSION.

WARNING: MAKE SURE THROUGH THE BOEING COMPANY 767 SWPM 20-02-10, AIRFRAME FLAMMABLE LEAKAGE ZONES THAT THE OPEN CIRCUIT BREAKER DOES NOT HAVE AN EFFECT ON FLAMMABLE LEAKAGE ZONES. IF THE CIRCUIT BREAKER IS CLOSED WITHOUT FLAMMABLE LEAKAGE ZONE VERIFICATION, SPARKS CAN CAUSE A FIRE OR EXPLOSION.

(12) Close the circuit breaker(s).

S 862-014
(13) After you close the circuit breaker(s), make sure that there is no electrical arcing or other damage to the system.

S 862-015
(14) To make sure that the airplane system operates correctly, refer to the applicable procedure in the Aircraft Maintenance Manual (AMM).

CLEANING TO REMOVE COMBUSTIBLE MATERIAL AROUND
WIRING (EZAP) - MAINTENANCE PRACTICES

TASK 20-60-02-162-001

1. Cleaning to Remove Combustible Material Around Wiring

A. General

(1) This procedure cleans the wiring and the area around it where dust accumulates to significantly reduce the amount of combustible material.

(2) This procedure is an enhanced zonal analysis procedure (EZAP) task.

B. References

(1) AMM (applicable procedure(s))

(2) SWPM (applicable procedure(s))

(3) WDM (applicable procedure(s))

C. Equipment and Materials

(1) G00371 - Brush, Soft-bristle

(2) Vacuum Cleaner - Commercially available

D. Procedure

S 862-002

(1) Remove panels as necessary to gain access to the wire bundles and the area around them.

S 012-004

(2) Do these steps to clean the wire bundles and the area around them:

(a) Remove any contamination by hand.

(b) Use a vacuum cleaner to remove any loose dust.

(c) Use a soft bristle brush to loosen any dust that remains and vaccum the area again.

S 412-005

(3) Install all panels removed for access.

DETAILED WIRING INSPECTION (EZAP) - MAINTENANCE PRACTICES

TASK 20-60-03-202-001

1. Detailed Wiring Inspection

A. General

(1) This procedure performs a detailed inspection of wiring.

(2) This procedure is an enhanced zonal analysis procedure (EZAP) task.

B. References

(1) AMM (applicable procedure(s))

(2) SWPM (applicable procedure(s))

(3) WDM (applicable procedure(s))

C. Equipment and Materials

(1) Mirror - Inspection, Telescoping

D. Procedure

S 012-002

(1) Remove panels as necessary to gain access to the wiring (AMM (applicable procedure(s)).

S 222-003

(2) Do these steps to perform a detailed inspection of the wire bundles bundles:

NOTE: You do not need to pull on the wire bundles, shake the wire bundles, or disconnect the connectors to perform this inspection.

(a) Check the wire bundles and the area around them for combustible material.

1) If combustible material is found do this task: Cleaning to Remove Combustible Material Around Wiring (EZAP), AMM 20-60-02/201.

(b) Check the wire and the wire harnesses for contact, chafing, sagging, security, visible damage, lacing tape/ties installation, sheath/conduit deformity or installation, end of sheath rubbing on end attachment, missing or damaged grommets, dust and lint accumulation, surface contamination, deterioration of previous repairs.

(c) Check connectors for external corrosion, backshell tail, pad/packing on backshell, backshell wire securing device, fool proofing chain, missing or broken safety wire, discoloration or evidence of overheating on terminal lugs or blocks, torque stripe misalignment.

(d) Check switches for rear protection cap damage.

(e) Check ground points for corrosion, bonding braid/bonding jumper, broken or disconnected braid, multiple strands corroded or broken.

(f) Check wiring clamps or brackets for presence, corrosion, bends or twists, attachment, protection/cushion.

(g) Check supports (rails or tubes/conduit) for breaks, deformity, missing fasteners, missing edge protection on rims of feed through holes, race track cushion damage.
(h) Repair or replace any wire bundles found with defects (SWPM applicable procedure(s)).

S 412-004
(3) Install all panels removed for access (AMM (applicable procedure(s)).

GENERAL VISUAL INSPECTION OF WIRE BUNDLES (EZAP) - MAINTENANCE PRACTICES

TASK 20-60-04-102-001

1. General Visual Inspection of Wire Bundles

A. General

(1) This procedure performs a general visual inspection of wire bundles.

(2) This procedure is an enhanced zonal analysis procedure (EZAP) task.

B. References

(1) AMM (applicable procedure(s))

(2) SWPM (applicable procedure(s))

(3) WDM (applicable diagram(s))

C. Procedure

S 012-002

(1) Remove panels as necessary to gain access to the wire bundles (AMM & WDM applicable procedure(s)).

S 102-003

(2) Do these steps to perform a general visual inspection of wire bundles:

(a) Check the wire bundles and the area around them for combustible material.

1) If combustible material is found, do this task: Cleaning to Remove Combustible Matrial Around Wiring (EZAP), AMM 20-60-02/201.

(b) Check the wire and wire bundles for degradation due to wear, vibration, moisture, contamination, and excessive heat.

CAUTION: DO NOT CUT, CAUSE NICKS, OR CAUSE OTHER DAMAGE TO COMPONENTS CAN CAUSE MALFUNCTIONS OR DAMAGE TO THE EQUIPMENT. COMPLETE MAINTENANCE.

CAUTION: MAKE SURE THAT YOU REMOVE ALL TOOLS, LOOSE PARTS AND UNWANTED MATERIAL FROM THE AREA WHEN YOU COMPLETE MAINTENANCE. DAMAGE TO EQUIPMENT COULD OCCUR.

1) Make sure the wire bundles are protected from damage by drills, metal shavings and other contaminations.

2) Repair or replace any wire bundles found with defects.

S 412-004

(3) Install all panels removed for access (AMM & WDM applicable procedure(s)).

CIRCUIT BREAKER CYCLING - MAINTENANCE PRACTICES

TASK 20-60-05-802-009

1. Circuit Breaker Cycling

A. General

(1) This procedure is for on-the-ground maintenance and is preventative maintenance for those circuit breakers that are less frequently used. It is not necessary to do this procedure for frequently used circuit breakers. Because each airline operates differently, it is an airline decision as to which circuit breakers are frequently used and which circuit breakers are less frequently used.

(2) Research has shown that the cycling of less frequently used circuit breakers can help to improve operational system reliability. If a circuit breaker has not been operated for some time, it is possible that the circuit breaker may not open when an electrical fault occurs.

(3) Circuit breakers are located in all areas of the airplane such as the flight compartment, electrical equipment bays, cargo compartments, passenger compartment, and other areas.

(4) Too much repeated use of a circuit breaker can result in premature failure of the circuit breaker.

B. References

(1) AMM 24-22-00/201, CONTROL (SUPPLY POWER) - MAINTENANCE PRACTICES

(2) WDM (applicable diagram)

C. Access

D. Procedure

S 862-006

(1) Do these steps to cycle a circuit breaker on the airplane:

(a) Open the circuit breaker.

(b) Do a visual check of the circuit breaker area for damage. Look for these types of damage:

1) Electrical shorting
2) Electrical arcing
3) Discoloration of the circuit breaker
4) Contamination of the circuit breaker

(c) If you find damage to the circuit breaker, replace the circuit breaker. Refer to the Wiring Diagram Manual (WDM).

(d) If you find that the circuit breaker is unserviceable After you open and close it, replace the circuit breaker. Refer to the Wiring Diagram Manual (WDM).

S 862-007

(2) If necessary, do this procedure again to cycle another circuit breaker.

ELECTRONIC LINE REPLACEABLE UNIT CLEANING - MAINTENANCE PRACTICES

TASK 20-60-06-102-001

1. Electronic LRU Cleaning

A. General

(1) This procedure cleans the electronic line replaceable units and the area around it where dust can accumulate and obstruct filters and cooling systems.

B. Equipment and Materials

(1) B01000 - Series 80 solvent
(2) G00371 - Brush, Soft-bristle
(3) Vacuum cleaner - Commercially available

C. Procedure

S 012-002

(1) Remove panels as necessary to gain access to the LRUs and the area around them.

S 142-003

(2) Do the steps that follow to clean the LRUs and the area around them:
(a) Remove any contamination by hand.
(b) Use a vacuum cleaner to remove any loose dirt or debris.
(c) Use a soft bristle brush to loosen any dust on or around the LRU and vacuum the area again.
(d) Do the following steps to clean the LRU filters if applicable:
1) Replace fiberglass and paper filters if contaminated.
2) Clean metallic screens and filters with series 80 solvent if contaminated.

S 412-004

(3) Install all panels removed for access.

WIRE BUNDLE PROTECTION (EZAP) - MAINTENANCE PRACTICES

1. General
   A. This procedure has one task:
      (1) Protection of wire bundles during maintenance
   B. This procedure is an enhanced zonal analysis procedure (EZAP) task.
   C. This procedure gives instructions for the installation of temporary protection for the wire bundles during maintenance work when contamination or mechanical damage could occur.
   D. Protect all airplane wires, regardless of the gauge or insulation material, during airplane maintenance to prevent or significantly decrease the potential for damage from contamination or debris. Protection of the wire bundles starts with identification of the potential for contamination or mechanical damage and ends with making sure that the wire bundles and their related components are free of all sources of contamination. Prevention and frequently removing contamination during all maintenance work is necessary to keep the wire bundles and their related components and systems in an airworthy condition. Wire bundles can be easily damaged during the removal of aircraft equipment or if used as a handhold or support for personal equipment. In general, wire bundles that are undisturbed and kept free of contamination will allow for trouble-free operation without the need for unscheduled maintenance.
   E. Wire bundles and their related components are designed to be resistant to chemical contaminants. However, to maintain necessary properties of the wire bundles and their related components, they are not resistant to all chemicals and must be kept free of all chemicals and debris. Hydraulic fluid is a common cause of degradation in wire bundles and their related components. Hydraulic fluid is very damaging to connector grommets, wire bundle clamps, and to wire insulation when exposed over a long time. This can lead to indirect damage such as arcing and chafing, and breakdown of the insulation.
   F. Before maintenance work such as servicing, repairing, cleaning, or modifying, make sure that the wire bundles and systems components have protection against the accumulation of contamination.

TASK 20-60-07-842-002

2. Protection of the Wire Bundles during Maintenance

A. Procedure

S 842-003

WARNING: KEEP THESE MATERIALS AWAY FROM WIRES. THESE MATERIALS WILL DECREASE THE LIFE OF WIRES. IF YOU SPILL THESE MATERIALS, OR LET LEAKAGE GET ON THE WIRES, INJURIES TO PERSONNEL AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Keep the wires away from these materials:

NOTE: Fumes from these materials can cause damage to wires. Fluid from these materials can move up or down the wires into connectors, and other components.

(a) Hydraulic Fluid
(b) Battery Electrolytes
(c) Fuel
(d) Corrosion-Inhibiting Compounds
(e) Waste System Chemicals
(f) Cleaning Agents
(g) Deicing Fluids
(h) Paint

S 842-004

CAUTION: KEEP TOOLS, TOOL TRAYS, AND OTHER WORK ITEMS OFF OF THE WIRES. OBJECTS PUT ON THE WIRE BUNDLES OR THEIR RELATED COMPONENTS CAN CAUSE DAMAGE TO THE WIRES, INSULATION, AND CONNECTORS.

(2) Install covers on the areas below and adjacent to the maintenance area.
  (a) Use a cover that is applicable to protect components from the specific contaminant.
    1) Examples of covers are as follows:
      a) Plastic sheeting
      b) Canvas sheeting
      c) Paper masking tape
  (b) Use tape to attach the cover to the aircraft structure.
    1) Install the tape carefully to prevent damage to the structure and the collection of remaining adhesives.
    2) Make sure that you do not tape the cover to the wire bundles or other components protected by the cover.

3) Make sure that the cover is in a shape to collect and contain fluids.

(c) Make sure that the cover is attached in place.

1) Make sure that the wire bundles and their related components stay covered during all of the maintenance work.

B. Put the Airplane Back to Its Original Condition

S 842-005

(1) Remove the covers.

(a) Make sure that the contaminants are contained and do not spill.

S 212-006

(2) Do the Detailed Wiring Inspection (EZAP) procedure to examine the area to make sure that no contaminants spilled (AMM 20-60-03/201).

(a) If there is contamination on the wire bundles, do the Cleaning to Remove Combustible Material Around Wiring (EZAP) procedure (AMM 20-60-02/201).

(b) If there is damage to the wiring bundles, refer to the Standard Wiring Practices Manual for applicable repairs.