Scandinavian Airlines System

PAGE	DATE	CODE
CHAPTER 75 TAB		
AIR		
(PW4000)		
EFFECTIVE PAGES		
SEE LAST PAGE OF LIST		
FOR NUMBER OF PAGES		
75-CONTENTS		
1	DEC 22/08	NSAS
2	DEC 10/98	NSAS
3	APR 22/06	NSAS
4	AUG 22/00	NSAS
5	AUG 22/00	NSAS
6	DEC 22/05	NSAS
7	DEC 22/05	NSAS
8	BLANK	
75-00-00		
1	AUG 22/00	NO1
2	BLANK	
75-00-00		
601	FEB 10/91	NO1
602	AUG 10/94	NO1
603	AUG 22/99	NO1
604	AUG 22/99	NO1
605	NOV 10/88	NO1
606	NOV 10/88	NO1
607	NOV 10/88	NO1
608	NOV 10/88	NO1
609	NOV 10/88	NO1
610	NOV 10/88	NO1
611	NOV 10/88	NO1
612	NOV 10/88	NO1
613	NOV 10/88	NO1
614	NOV 10/88	NO1
615	NOV 10/88	NO1
616	AUG 22/99	NO1
617	FEB 10/91	NO1
618	NOV 10/88	NO1
619	FEB 10/91	NO1
620	NOV 10/88	NO1
75-00-00		
901	AUG 10/98	NO1
902	DEC 22/01	NO1
903	APR 22/03	NO1
904	AUG 10/98	NO1
905	DEC 22/01	NO1
906	DEC 22/01	NO1
907	AUG 10/98	NO1
908	AUG 10/98	NO1
909	DEC 22/01	NO1
910	AUG 10/98	NO1
911	DEC 22/01	NO1

PAGE	DATE	CODE
75-00-00		CONT.
912	DEC 22/01	NO1
913	DEC 22/01	NO1
914	AUG 10/98	NO1
915	DEC 22/01	NO1
916	AUG 10/98	NO1
75-22-00		
1	AUG 10/92	NO1
2	NOV 10/87	NO1
75-22-00		
101	FEB 10/95	NO1
102	FEB 10/95	NO1
75-22-01		
401	AUG 10/97	NO1
402	AUG 10/97	NO1
403	MAY 10/93	NO1
404	AUG 22/00	NO2
405	APR 22/08	NO2
406	AUG 22/00	NO2
407	AUG 22/00	NO2
408	AUG 22/00	NO2
409	APR 22/08	NO2
410	BLANK	
75-23-00		
1	AUG 10/92	NO1
2	FEB 10/88	NO1
3	FEB 10/88	NO1
4	FEB 10/88	NO1
5	DEC 10/98	NO1
6	BLANK	
75-23-00		
101	AUG 10/91	NO1
102	AUG 10/91	NO1
75-23-00		
501	AUG 22/00	NO1
502	FEB 10/88	NO1
503	AUG 22/00	NO1
504	FEB 10/90	NO1
505	AUG 22/00	NO1
506	BLANK	
75-23-02		
401	AUG 22/00	NO1
402	DEC 22/04	NO1
403	AUG 22/00	NO1
404	DEC 22/07	NO1
405	DEC 22/04	NO1
406	DEC 22/04	NO1

PAGE	DATE	CODE
75-23-03		
401	AUG 22/00	NO1
402	NOV 10/90	NO1
403	AUG 22/00	NO1
404	AUG 22/00	NO1
75-23-04		
401	AUG 22/00	NO1
402	FEB 10/88	NO1
403	AUG 22/00	NO1
404	AUG 22/00	NO1
75-24-00		
1	FEB 10/95	NO2
2	FEB 10/95	NO1
3	FEB 10/95	NO1
4	FEB 10/95	NO1
5	FEB 10/95	NO1
6	FEB 10/95	NO1
7	DEC 22/05	NO1
8	DEC 22/05	NO1
9	FEB 10/95	NO1
10	FEB 10/95	NO1
11	FEB 10/95	NO1
12	FEB 10/95	NO1
75-24-00		
101	AUG 10/91	NO1
102	AUG 10/91	NO1
103	AUG 10/91	NO1
104	AUG 10/91	NO1
75-24-00		
201	MAY 10/97	NO1
202	FEB 10/89	NO1
203	FEB 10/89	NO1
204	MAY 10/97	NO1
75-24-00		
501	DEC 22/99	NO1
502	AUG 10/97	NO1
503	MAY 10/95	NO1
504	MAY 10/95	NO1
505	MAY 10/95	NO1
506	MAY 10/95	NO1
507	AUG 10/97	NO1
508	AUG 10/97	NO1
509	AUG 10/97	NO1
510	AUG 10/97	NO1
511	AUG 10/97	NO1
512	AUG 10/97	NO1
75-24-00		
601	APR 22/99	NO1
602	APR 22/99	NO1
603	MAY 10/95	NO1
604	MAY 10/95	NO1
605	MAY 10/95	NO1
606	MAY 10/95	NO1

Scandinavian Airlines System

PAGE	DATE	CODE
75-24-00		CONT.
607	AUG 22/00	NO1
608	MAY 10/95	NO1
609	AUG 22/00	NO1
610	DEC 22/00	NO4
611	AUG 22/00	NO5
612	AUG 22/00	NO5
613	APR 22/99	NO5
614	APR 22/99	NO4
615	DEC 22/00	NO2
616	DEC 22/00	NO2
617	DEC 22/00	NO2
618	AUG 22/00	NO2
619	AUG 22/00	NO2
620	DEC 22/00	NO3
621	DEC 22/00	NO2
622	BLANK	
75-24-01		
401	AUG 22/00	NO1
402	AUG 22/00	NO1
403	NOV 10/94	NO1
404	AUG 22/03	NO1
405	NOV 10/94	NO1
406	AUG 22/03	NO1
407	FEB 10/97	NO1
408	APR 22/01	NO1
409	AUG 22/03	NO1
410	AUG 22/08	NO1
411	AUG 10/97	NO1
412	AUG 22/00	NO1
413	AUG 22/00	NO1
414	BLANK	
75-24-02		
401	AUG 10/97	NO1
402	AUG 10/97	NO1
403	MAY 10/94	NO1
404	AUG 22/00	NO1
405	AUG 22/00	NO1
406	NOV 10/90	NO1
407	AUG 22/00	NO1
408	AUG 22/00	NO1
409	AUG 22/00	NO1
410	AUG 22/00	NO1
411	AUG 22/00	NO1
412	AUG 22/00	NO1
413	AUG 22/00	NO2
414	DEC 22/05	NO1
415	AUG 22/00	NO1
416	AUG 22/00	NO3
417	AUG 22/00	NO2
418	BLANK	
75-24-03		
401	NOV 10/90	NO1
402	AUG 22/00	NO1
403	MAY 10/95	NO1
404	APR 22/99	NO1

PAGE	DATE	CODE
75-24-03		CONT.
405	AUG 22/00	NO1
406	DEC 22/07	NO1
407	DEC 22/07	NO1
408	AUG 22/00	NO1
409	APR 22/99	NO1
410	BLANK	
75-24-04		
401	AUG 22/00	NO1
402	AUG 22/00	NO1
403	MAY 10/95	NO1
404	MAY 10/95	NO1
405	DEC 22/07	NO3
406	AUG 22/00	NO3
75-24-05		
401	AUG 10/97	NO1
402	AUG 22/00	NO1
403	FEB 10/91	NO1
404	AUG 22/00	NO1
405	AUG 10/97	NO1
406	AUG 10/97	NO1
407	AUG 22/00	NO1
408	AUG 10/97	NO1
409	AUG 22/00	NO1
410	BLANK	
75-24-06		
401	AUG 10/97	NO1
402	NOV 10/90	NO1
403	AUG 10/97	NO1
404	AUG 10/97	NO1
405	AUG 10/97	NO1
406	AUG 10/97	NO1
407	AUG 10/97	NO1
408	BLANK	
75-24-07		
401	DEC 22/01	NO1
402	DEC 22/01	NO1
403	DEC 22/01	NO1
404	DEC 22/01	NO1
405	AUG 22/00	NO1
406	AUG 22/00	NO1
407	AUG 22/00	NO1
408	AUG 22/00	NO1
409	AUG 22/00	NO1
410	AUG 22/00	NO1
411	AUG 10/97	NO1
412	AUG 10/97	NO1
413	APR 22/08	NO1
414	AUG 10/97	NO1
415	AUG 10/97	NO1
416	AUG 10/97	NO1
417	AUG 10/97	NO1
418	AUG 10/97	NO1
419	AUG 10/97	NO1
420	AUG 22/00	NO1

PAGE	DATE	CODE
75-24-07		CONT.
421	AUG 10/97	NO1
422	AUG 22/00	NO1
423	APR 22/08	NO1
424	APR 22/08	NO1
425	AUG 22/00	NO1
426	AUG 22/00	NO1
75-24-08		
401	AUG 22/00	NO1
402	AUG 22/00	NO1
403	AUG 22/00	NO2
404	FEB 10/95	NO2
405	AUG 22/00	NO1
406	AUG 22/00	NO1
407	NOV 10/95	NO2
408	AUG 22/00	NO4
409	AUG 22/00	NO4
410	AUG 22/00	NO2
411	AUG 22/00	NO1
412	BLANK	
75-24-09		
401	AUG 22/00	NO1
402	DEC 22/00	NO1
403	AUG 22/00	NO1
404	NOV 10/97	NO1
405	AUG 22/00	NO1
406	AUG 22/00	NO1
407	AUG 22/00	NO1
408	AUG 22/00	NO1
409	AUG 22/00	NO1
410	AUG 22/00	NO1
411	AUG 22/00	NO1
412	AUG 22/00	NO1
413	AUG 22/00	NO1
414	AUG 22/00	NO1
415	AUG 22/00	NO1
416	AUG 22/00	NO1
417	DEC 22/00	NO1
418	AUG 22/00	NO1
419	AUG 22/00	NO3
420	AUG 22/00	NO2
421	AUG 22/00	NO2
422	AUG 22/00	NO3
423	AUG 22/00	NO3
424	AUG 22/00	NO3
425	AUG 22/00	NO4
426	AUG 22/00	NO3
427	APR 22/08	NO3
428	AUG 22/00	NO3
429	AUG 22/00	NO3
430	AUG 22/00	NO3
431	APR 22/08	NO4
432	AUG 22/00	NO4
433	APR 22/08	NO4
434	AUG 22/00	NO4
435	AUG 22/00	NO5
436	APR 22/08	NO5

Scandinavian Airlines System

PAGE	DATE	CODE
75-24-09		CONT.
437	AUG 22/00	NO5
438	NOV 10/97	NO2
439	AUG 22/00	NO1
440	BLANK	
75-24-11		
401	AUG 10/97	NO1
402	FEB 10/90	NO1
403	FEB 10/90	NO1
404	AUG 10/97	NO1
405	AUG 10/97	NO1
406	AUG 10/97	NO1
407	AUG 10/97	NO1
408	BLANK	
75-24-12		
401	AUG 10/97	NO1
402	AUG 10/97	NO1
403	AUG 10/97	NO1
404	AUG 10/97	NO1
75-24-13		
401	AUG 22/00	NO1
402	AUG 22/00	NO1
403	AUG 22/00	NO1
404	APR 22/06	NO1
405	AUG 22/00	NO1
406	BLANK	
75-24-15		
401	AUG 22/00	NO1
402	AUG 22/00	NO1
403	AUG 22/00	NO1
404	APR 22/08	NO1
405	AUG 22/00	NO1
406	APR 22/08	NO1
407	APR 22/08	NO1
408	AUG 22/00	NO1
75-24-16		
401	AUG 22/00	NO1
402	AUG 22/00	NO1
403	AUG 22/00	NO1
404	AUG 22/00	NO1
405	AUG 22/00	NO1
406	AUG 22/00	NO1
407	AUG 22/00	NO1
408	BLANK	
75-24-17		
401	AUG 22/00	NO1
402	AUG 22/00	NO1
403	AUG 22/00	NO1
404	APR 22/08	NO1
405	AUG 22/00	NO1
406	APR 22/08	NO1
407	AUG 22/00	NO1
408	BLANK	

PAGE	DATE	CODE
75-31-00		
1	AUG 10/92	NO1
2	NOV 10/87	NO1
3	AUG 10/92	NO1
4	BLANK	
75-31-00		
101	MAY 10/94	NO1
102	MAY 10/94	NO1
75-31-00		
501	AUG 22/00	NO2
502	AUG 22/00	NO2
503	MAY 10/91	NO2
504	NOV 10/91	NO1
505	AUG 10/97	NO2
506	AUG 22/00	NO2
507	AUG 10/97	NO2
508	AUG 22/00	NO2
509	AUG 22/00	NO2
510	AUG 22/00	NO1
511	APR 22/08	NO2
512	AUG 10/97	NO2
513	AUG 22/00	NO2
514	FEB 10/97	NO2
515	AUG 22/00	NO2
516	AUG 10/97	NO2
517	AUG 10/97	NO2
518	AUG 22/00	NO2
519	AUG 22/00	NO2
520	AUG 22/00	NO2
521	APR 22/08	NO2
522	AUG 22/00	NO1
75-31-00		
601	AUG 22/00	NO2
602	AUG 22/00	NO2
603	AUG 10/93	NO1
604	AUG 22/00	NO2
605	DEC 22/05	NO1
606	DEC 22/05	NO1
607	DEC 22/05	NO2
608	DEC 22/06	NO2
609	DEC 22/05	NO2
610	DEC 22/05	NO2
611	DEC 22/05	NO2
612	DEC 22/05	NO2
613	DEC 22/05	NO2
614	DEC 22/05	NO2
615	DEC 22/05	NO2
616	DEC 22/05	NO2
617	DEC 22/05	NO2
618	DEC 22/05	NO1
75-31-02		
401	AUG 10/97	NO1
402	AUG 10/97	NO1
403	FEB 10/91	NO1
404	AUG 22/00	NO1

PAGE	DATE	CODE
75-31-02		CONT.
405	AUG 22/00	NO1
406	APR 22/08	NO1
407	APR 22/99	NO1
408	AUG 22/00	NO1
409	APR 22/08	NO1
410	APR 22/99	NO1
75-31-02		
501	AUG 22/00	NO2
502	AUG 10/97	NO1
503	AUG 22/00	NO1
504	AUG 22/00	NO2
505	AUG 22/00	NO2
506	AUG 10/97	NO2
507	AUG 10/97	NO2
508	APR 22/08	NO2
509	AUG 10/92	NO1
510	AUG 10/97	NO1
511	AUG 10/97	NO1
512	AUG 22/00	NO2
513	AUG 22/00	NO2
514	AUG 10/97	NO2
515	APR 22/08	NO2
516	APR 22/08	NO2
75-32-00		
1	AUG 10/92	NO1
2	NOV 10/91	NO1
3	MAY 10/90	NO1
4	FEB 10/96	NO1
5	AUG 22/01	NO1
6	BLANK	
75-32-00		
101	MAY 10/94	NO1
102	MAY 10/94	NO1
103	MAY 10/94	NO1
104	BLANK	
75-32-00		
601	NOV 10/97	NO1
602	NOV 10/97	NO1
603	AUG 10/98	NO1
604	NOV 10/97	NO1
605	NOV 10/97	NO1
606	APR 22/05	NO1
607	APR 22/07	NO1
608	APR 22/05	NO1
609	APR 22/05	NO1
610	BLANK	
75-32-01		
201	AUG 10/98	NO1
202	AUG 10/98	NO1
203	AUG 10/98	NO1
204	AUG 10/98	NO1
205	AUG 10/98	NO1
206	AUG 10/98	NO1

Scandinavian Airlines System

PAGE	DATE	CODE
75-32-01		CONT.
207	AUG 10/98	NO1
208	AUG 10/98	NO1
75-32-01		
401	NOV 10/97	NO1
402	NOV 10/97	NO1
403	NOV 10/97	NO1
404	NOV 10/97	NO1
405	DEC 22/08	NO1
406	DEC 22/08	NO1
407	DEC 22/08	NO1
408	DEC 22/08	NO1
409	DEC 22/08	NO1
410	BLANK	
75-32-01		
501	DEC 22/00	NO1
502	DEC 22/00	NO1
503	DEC 10/98	NO1
504	APR 22/99	NO1
505	DEC 10/98	NO1
506	DEC 10/98	NO1
507	DEC 10/98	NO1
508	DEC 10/98	NO1
509	DEC 10/98	NO1
510	DEC 10/98	NO1
511	DEC 22/00	NO1
512	DEC 22/00	NO1
513	DEC 10/98	NO1
514	DEC 10/98	NO1
515	DEC 10/98	NO1
516	DEC 10/98	NO1
517	APR 22/99	NO1
518	APR 22/99	NO1
519	APR 22/99	NO1
520	APR 22/99	NO1
521	APR 22/99	NO1
522	APR 22/99	NO1
75-32-03		
401	AUG 22/00	NO1
402	NOV 10/91	NO1
403	NOV 10/91	NO1
404	AUG 10/97	NO1
405	APR 22/08	NO1
406	AUG 10/97	NO1
407	APR 22/08	NO1
408	NOV 10/97	NO1
75-32-04		
401	AUG 10/97	NO1
402	AUG 22/00	NO2
403	AUG 22/00	NO2
404	NOV 10/90	NO2
405	NOV 10/90	NO2
406	AUG 22/00	NO2
407	APR 22/08	NO2
408	AUG 10/97	NO2

PAGE	DATE	CODE
75-32-04		CONT.
409	APR 22/08	NO2
410	APR 22/08	NO1
411	AUG 10/97	NO1
412	AUG 10/97	NO1
75-32-05		
401	AUG 10/97	NO1
402	AUG 22/00	NO2
403	AUG 22/00	NO2
404	APR 22/06	NO2
405	AUG 22/00	NO2
406	AUG 10/97	NO2
75-32-06		
401	AUG 22/00	NO1
402	AUG 22/00	NO1
403	AUG 22/00	NO1
404	AUG 22/00	NO1
405	AUG 22/00	NO1
406	NOV 10/91	NO1
75-33-00		
1	AUG 10/92	NO1
2	FEB 10/88	NO1
3	FEB 10/88	NO1
4	FEB 10/88	NO1
5	AUG 10/92	NO1
6	BLANK	
75-33-00		
101	MAY 10/94	NO1
102	MAY 10/94	NO1
103	MAY 10/94	NO1
104	MAY 10/94	NO1
105	MAY 10/94	NO1
106	BLANK	
75-33-00		
501	APR 22/99	NO1
502	BLANK	
75-33-00		
601	AUG 22/00	NO1
602	AUG 22/00	NO1
603	NOV 10/95	NO1
604	NOV 10/95	NO1
605	NOV 10/95	NO1
606	NOV 10/95	NO1
607	AUG 22/00	NO1
608	AUG 22/00	NO1
609	APR 22/05	NO1
610	APR 22/05	NO1
611	APR 22/05	NO1
612	BLANK	

PAGE	DATE	CODE
75-33-01		
401	AUG 22/00	NO1
402	AUG 22/00	NO2
403	AUG 22/00	NO2
404	DEC 22/05	NO1
405	APR 22/08	NO1
406	AUG 22/00	NO2
407	AUG 22/00	NO2
408	APR 22/08	NO1
409	AUG 22/00	NO2
410	AUG 22/00	NO2
75-33-03		
401	AUG 22/00	NO1
402	AUG 22/00	NO2
403	AUG 22/00	NO3
404	APR 22/08	NO1
405	AUG 22/00	NO2
406	AUG 22/00	NO2
407	AUG 22/00	NO2
408	BLANK	
75-33-04		
401	AUG 22/00	NO1
402	AUG 22/00	NO2
403	AUG 22/00	NO2
404	AUG 22/00	NO2
405	APR 22/08	NO1
406	APR 22/08	NO1
407	APR 22/08	NO1
408	AUG 22/00	NO2
75-33-05		
201	AUG 22/00	NO1
202	AUG 22/00	NO1
203	FEB 10/91	NO1
204	AUG 22/00	NO1
205	AUG 22/00	NO1
206	APR 22/07	NO1
207	AUG 22/00	NO1
208	BLANK	
75-33-05		
401	AUG 10/97	NO1
402	FEB 10/94	NO3
403	FEB 10/94	NO3
404	AUG 10/97	NO1
405	APR 22/08	NO1
406	APR 22/08	NO1
407	AUG 10/97	NO1
408	BLANK	
75-33-06		
801	DEC 22/05	NO1
802	DEC 22/05	NO1
803	DEC 22/05	NO1
804	BLANK	

CHAPTER 75 - AIR

TABLE OF CONTENTS

CHAPTER 75 - AIR

TABLE OF CONTENTS

CHAPTER 75 - AIR

TABLE OF CONTENTS

CHAPTER 75 - AIR

TABLE OF CONTENTS

CHAPTER 75 - AIR

TABLE OF CONTENTS

CHAPTER 75 - AIR

TABLE OF CONTENTS

CHAPTER 75 - AIR

TABLE OF CONTENTS

AIR - DESCRIPTION AND OPERATION

1. General
   A. The engine air system controls the air in the engine to decrease the temperature and for control functions.
   B. The engine bearing cooling system (AMM 75-22-00) uses 12th-stage bleed air, which is cooled by fan air, to decrease the temperature in the No. 3 bearing compartment.
   C. The temperature of the engine external accessories (AMM 75-23-00) is decreased with fan air to cool the nacelle zone and engine components. This includes the ignition exciters, starter valve, secondary flow control valves, and the oil quantity transmitter.
   D. The turbine cooling system (AMM 75-24-00) is the turbine case cooling system and the turbine vane and blade cooling system. This system makes small tip clearance for the turbine blade which causes a better engine performance. The fan air is used to decrease the temperature of the turbine case. The 12th-stage air from the high pressure compressor is used to decrease the temperature of the turbine vane and blade.
   E. The compressor stator vane control system (AMM 75-31-00) controls the inlet guide vanes and the 5th-, 6th-, and 7th-stage variable stator vanes on the high pressure compressor. With control of these vanes, you will get a better stall limit and compressor performance.
   F. The compressor bleed control system (AMM 75-32-00) uses 2.5 and 2.9 bleed valves to bleed the remaining compressor air overboard during an engine start. Also, these valves are open for a better compressor stability for engine surge and reverse thrust conditions.
   G. The HPC secondary flow control system (AMM 75-33-00) controls 9th-stage bleed airflow to the HPC inner hole. This controls tip clearance of the HPC blade for better compressor performance.

AIR - INSPECTION/CHECK

TASK 75-00-00-226-001-N00

1. Air System Fits and Clearances

A. General

(1) The numbers on the figures tell you the location of the parts for which the fits and clearances are found in the tables.

(2) Unless specified differently, all the fits are measured by its diameter.

(a) The numbers in all columns are in inches, and (millimeters).

(3) The letter "T" which follows the limits tells you it is a tight fit.

(4) The Description column gives you the name for the part or parts.

B. Inspection Frequency Requirements (IFR)

S 996-002-N00

(1) The IFR column gives you the Inspection Frequency Requirements. The Letter Codes A, B, or C found in the IFR column show how and when it is recommended to examine the item identified by the adjacent reference number, as applicable to regular repairs. These IFR codes are in the table that follows:

IFR Code	Definition
A	The clearance or fit is calculated from the dimension of the part at each assembly of the parts. These dimensions written at the time of each part inspection are equally as correct as the dimensions written at the time of the part installation.
B	You must make an analysis of the clearance or fit at each installation of the parts. Use the trial assembly or the equivalent procedure to make an estimate of the clearance or fit. The dimension of the clearance or fit you calculated is only necessary if: The procedure you used to make an estimate shows that the clearnace or fit is not in the specified limits, or One or two of the mating parts inlcuded is replaced or repaired in an area or in a procedure which changes the clearance or fit.
C	The fit is not made to change in the normal engine operation. The dimension of the parts and the quantity you calculated of the fit is necessary if one of the mating parts included is replaced or repaired in the area or a procedure which would change the fit.

C. New Part Reference Dimensions

S 996-003-N00

(1) The dimensions are given in this column to refer to only.

S 996-004-N00

(2) The dimensions are the initial Minimum and Maximum values in inches (and millimeters) for each part found in the description column.

D. Limits

S 996-005-N00

(1) The Limits are applicable to all mixtures of new parts or parts which are used:

(a) This column gives the permitted (minimum - maximum) range of the fit or clearance in inches (and millimeters). You can use these limits with all mixtures of new parts or parts which are used.

(b) The limits are found from the minimum and maximum values which are specified in the New Part Reference Dimensions column (See Example 1).

(c) Some limits are made larger to be more applicable than the new part conditions. These larger limits are identified with an asterisk (*) adjacent to the value (See Example 2).

EXAMPLE 1 *[1]

REF NO	IFR	DESCRIPTION	NEW PART REFERENCE			
			DIMENSIONS		LIMITS	
			MIN	MAX	MIN	MAX
1812		Bearing	0.508 (12.903)	0.512 (13.005)		
		Support	0.517 (13.131)	0.527 (13.385)	0.005 (0.126)	0.019 (0.482)

*[1] In Example 1, compare the dimensions for the bearing and support to find the limits:

0.517 (13.131) (-) 0.512 (13.005) = 0.005 (0.126)

0.527 (13.385) (-) 0.508 (12.903) = 0.019 (0.482)

EXAMPLE 2 *[1]						
			NEW PART REFERENCE			
			DIMENSIONS		LIMITS	
REF NO	I F R	DESCRIPTION	MIN	MAX	MIN	MAX
1812		Bearing	0.508 (12.903)	0.512 (13.005)		
		Support	0.517 (13.131)	0.527 (13.385)	0.005 (0.126)	0.020* (0.508)*

*[1] In Example 2, the limits are larger than the usual limits as shown by the asterisk (*).

S 226-006-N00

(2) You can use one of the two applicable limits for engines which are scheduled for a repair which is not fully done.

(a) You can also get a second set of limits which are contained by lines (See Example 3). These limits, which are contained by the lines, are larger than the usual limits and are used with engines which are scheduled for a repair which is not fully done.

EXAMPLE 3 *[1]						
			NEW PART REFERENCE			
			DIMENSIONS		LIMITS	
REF NO	I F R	DESCRIPTION	MIN	MAX	MIN	MAX
1812		Bearing	0.508 (12.903)	0.512 (13.005)		
		Support	0.517 (13.131)	0.527 (13.385)	0.005 (0.126)	0.019 (0.482)
					0.005 (0.13)	0.022 (0.56)

*[1] In Example 3, the limits which are contained by the lines are used on engines which are scheduled for a repair which is not fully done.

REF NO	IFR	DESCRIPTION	NEW PART REFERENCE			
			DIMENSIONS		LIMITS	
			MIN	MAX	MIN	MAX
492 (Fig. 601)	B	Self-Retaining Pin (Bleed Valve Linkage)				
		Bleed Valve Connecting Link Bearing				
		Pin	0.248 (6.300)	0.249 (6.324)		
		Bearing	0.2495 (6.3373)	0.2500 (6.3500)	0.0005 (0.013)	0.002 (0.050)
493 (Fig. 601)	B	Side Clearance,				
		Bleed Valve Connecting Link Bearing				
		Bleed Valve Linkage Rod Assembly				
		Bearing	0.338 (8.586)	0.343 (8.712)		
		Rod	0.344 (8.738)	0.346 (8.788)	0.001 (0.025)	0.008 (0.203)
505 (Fig. 601)	B	Bleed Valve Connecting Link Pin Self-Retaining Pin (Bleed Valve Linkage)				
		Bleed Valve Linkage Rod Assembly				
		Pin	0.248 (6.300)	0.247 (6.324)		
		Rod	0.2495 (6.338)	0.2505 (6.362)	0.0005 (0.013)	0.0025 (0.063)

REF NO	IFR	DESCRIPTION	NEW PART REFERENCE			
			DIMENSIONS		LIMITS	
			MIN	MAX	MIN	MAX
582 (Fig. 602)	C	Bolt				
		Stage 6 Rod End Bearing				
		Bolt	0.3109 (7.897)	0.3119 (7.922)		
		Bearing	0.3120 (7.9248)	0.3125 (7.9375)	0.0001 (0.003)	0.0016 (0.040)
583 (Fig. 602)	C	Bolt				
		Stage 6 Synchronizing Ring Assembly				
		Bolt	0.3109 (7.897)	0.3119 (7.922)		
		Ring	0.3120 (7.9248)	0.3125 (7.9375)	0.0001 (0.003)	0.0016 (0.040)
584 (Fig. 602)	C	Bolt				
		Inlet HPC Lever				
		Bolt	0.3380 (8.5852)	0.3382 (8.5902)		
		Lever	0.3374 (8.5700)	0.3380 (8.5852)	0.0008T (0.0203T)	0.0000 (0.0000)
585 (Fig. 602)	C	Bolt				
		HPC Lever Set				
		Bolt	0.3380 (8.5852)	0.3382 (8.5902)		
		Lever	0.3374 (8.5700)	0.3380 (8.5852)	0.0008T (0.0203T)	0.0000 (0.0000)

REF NO	IFR	DESCRIPTION	NEW PART REFERENCE			
			DIMENSIONS		LIMITS	
			MIN	MAX	MIN	MAX
586 (Fig. 602)	C	HPC Lever Set				
		Inlet HPC Lever				
		Lever Set	1.7722 (45.0139)	1.7727 (45.0265)		
		Inlet Lever	1.7727 (45.027)	1.7752 (45.090)	0.000 (0.000)	0.003 (0.076)
587 (Fig. 602)	C	Inlet HPC Lever				
		Bearing				
		Lever Set	1.7722 (45.0139)	1.7727 (45.0265)		
		Bearing	1.7712 (44.9885)	1.7717 (45.0011)	0.0015T (0.038T)	0.0005T (0.013T)
588 (Fig. 602)	B	Bearing				
		Compressor Stator Lever Support				
		Bearing	2.6757 (67.963)	2.6772 (68.000)		
		Support	2.6774 (68.0060)	2.6779 (68.0186)	0.0002 (0.006)	0.0022 (0.055)
589 (Fig. 602)	C	Bolt				
		HPC Synchronizing Ring Clevis Assembly				
		Bolt	0.4345 (11.037)	0.4355 (11.061)		
		Ring	0.437 (11.100)	0.438 (11.125)	0.0015 (0.039)	0.0035 (0.088)

REF NO	I F R	DESCRIPTION	NEW PART REFERENCE			
			DIMENSIONS		LIMITS	
			MIN	MAX	MIN	MAX
592 (Fig. 602)	C	Bolt				
		Cylinder Stop				
		Bolt	0.216 (5.487)	0.217 (5.511)		
		Stop	0.218 (5.538)	0.220 (5.588)	0.001 (0.026)	0.004 (0.101)
593 (Fig. 602)	B	Bearing				
		Compressor Stator Cylinder Support				
		Bearing	1.4360 (36.475)	1.4375 (36.512)		
		Support	1.438 (36.526)	1.439 (36.550)	0.0005 (0.013)	0.0030 (0.076)
599 (Fig. 602)	C	Compressor Cylinder				
		Bearing				
		Cylinder	0.7487 (19.0170)	0.7490 (19.0246)		
		Bearing	0.7495 (19.0373)	0.7500 (19.0500)	0.0005 (0.0127)	0.0013 (0.0330)
600 (Fig. 602)	C	Bolt				
		HPC Lever Set				
		Bolt	0.497 (12.624)	0.498 (12.649)		
		Lever	0.4995 (12.688)	0.5005 (12.712)	0.0015 (0.039)	0.0035 (0.088)

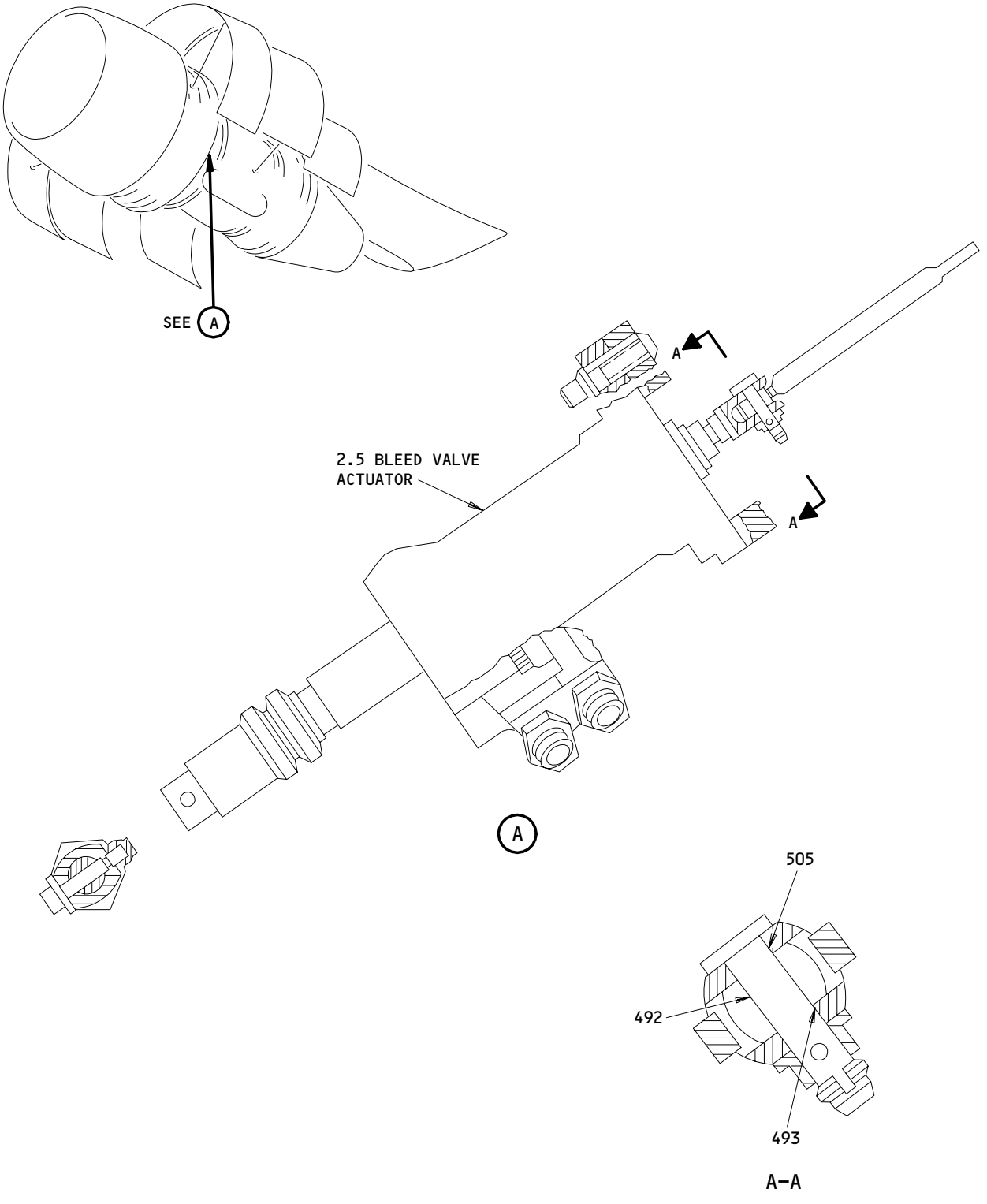
REF NO	IFR	DESCRIPTION	NEW PART REFERENCE			
			DIMENSIONS		LIMITS	
			MIN	MAX	MIN	MAX
601 (Fig. 602)	C	Bolt				
		HPC Lever Set				
		Bolt	0.3739 (9.4971)	0.3744 (9.5097)		
		Lever	0.3745 (9.513)	0.3755 (9.537)	0.0001 (0.003)	0.0016 (0.040)
602 (Fig. 602)	C	Bolt				
		Rod End Bearing Assembly				
		Bolt	0.3739 (9.4971)	0.3744 (9.5097)		
		Bearing	0.3745 (9.5123)	0.3750 (9.5250)	0.0001 (0.103)	0.0011 (0.027)
603 (Fig. 602)	C	Bearing				
		Rod End				
		Bearing	0.8120 (20.6248)	0.8125 (20.6375)		
		Rod	0.8123 (20.6325)	0.8128 (20.6451)	0.0002T (0.0051T)	0.0008 (0.0203)
604 (Fig. 602)	C	Bolt				
		HPC Synchronizing Ring Clevis Assembly				
		Bolt	0.4345 (11.037)	0.4355 (11.061)		
		Ring	0.437 (11.100)	0.438 (11.125)	0.0015 (0.039)	0.0035 (0.088)

REF NO	I F R	DESCRIPTION	NEW PART REFERENCE			
			DIMENSIONS		LIMITS	
			MIN	MAX	MIN	MAX
605 (Fig. 602)	C	Bolt				
		HPC Synchronizing Ring Clevis Assembly				
		Bolt	0.3109 (7.897)	0.3119 (7.922)		
		Ring	0.3120 (7.9248)	0.3125 (7.9375)	0.0001 (0.003)	0.0016 (0.040)
606 (Fig. 602)	C	Bolt				
		Stage 5 and 7 Rod End Bearings				
		Bolt	0.3109 (7.897)	0.3119 (7.922)		
		Bearings	0.3120 (7.9248)	0.3125 (7.9375)	0.0001 (0.003)	0.0016 (0.040)
607 (Fig. 602)	A	Radial Clearance Rod End Spherical Bearing	- - - -	- - - -	0.000	
609 (Fig. 602)	C	Bolt				
		HPC Clevis				
		Bolt	0.4345 (11.037)	0.4355 (11.061)		
		Clevis	0.437 (11.100)	0.438 (11.125)	0.0015 (0.039)	0.0035 (0.088)

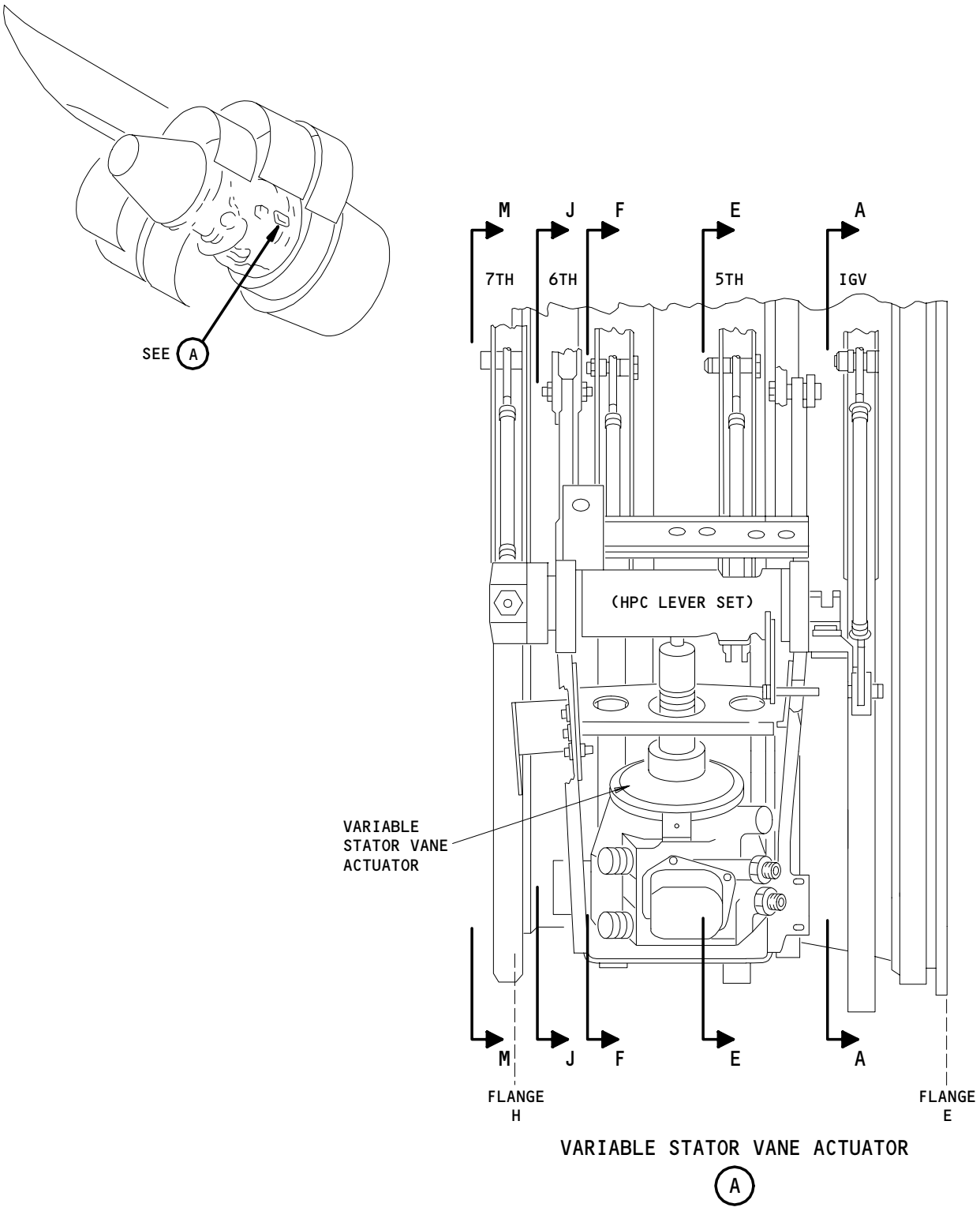
REF NO	IFR	DESCRIPTION	NEW PART REFERENCE			
			DIMENSIONS		LIMITS	
			MIN	MAX	MIN	MAX
610 (Fig. 602)	C	Bolt				
		Rod End Bearing				
		Bolt	0.3109 (7.897)	0.3119 (7.922)		
		Bearing	0.3120 (7.9248)	0.3125 (7.9375)	0.0001 (0.003)	0.0016 (0.040)
611 (Fig. 602)	C	Bolt				
		HPC Clevis				
		Bolt	0.3109 (7.897)	0.3119 (7.922)		
		Clevis	0.3120 (7.9248)	0.3125 (7.9375)	0.0001 (0.003)	0.0016 (0.040)
612 (Fig. 602)	C	Bolt				
		HPC Synchronizing Ring Clevis Assembly				
		Bolt	0.4345 (11.037)	0.4355 (11.061)		
		Ring	0.437 (11.100)	0.438 (11.125)	0.0015 (0.039)	0.0035 (0.088)
613 (Fig. 602)	C	Bolt				
		Rod End Bearing				
		Bolt	0.3109 (7.897)	0.3119 (7.922)		
		Bearing	0.3120 (7.9248)	0.3125 (7.9375)	0.0001 (0.003)	0.0016 (0.040)

REF NO	I F R	DESCRIPTION	NEW PART REFERENCE			
			DIMENSIONS		LIMITS	
			MIN	MAX	MIN	MAX
614 (Fig. 602)	C	Bolt				
		HPC Synchronizing Ring Clevis Assembly				
		Bolt	0.3109 (7.897)	0.3119 (7.922)		
		Ring	0.3120 (7.9248)	0.3125 (7.9375)	0.0001 (0.003)	0.0016 (0.040)
837 (Fig. 603)	B	Support Link Shoulder Bolts				
		No. 3 Bearing Air Cooler Assembly Support Brackets				
		Bolt	0.2494 (6.3348)	0.2499 (6.3474)		
		Bracket	0.2500 (6.350)	0.2510 (6.375)	0.0001 (0.003)	0.0016 (0.040)
838 (Fig. 603)	B	Support Link Shoulder Bolts				
		Support Link Rod End Bearings				
		Bolt	0.2494 (6.3348)	0.2499 (6.3474)		
		Bearing	0.2495 (6.3373)	0.2500 (6.3500)	0.0006 (0.0152)	0.004T (0.0102T)

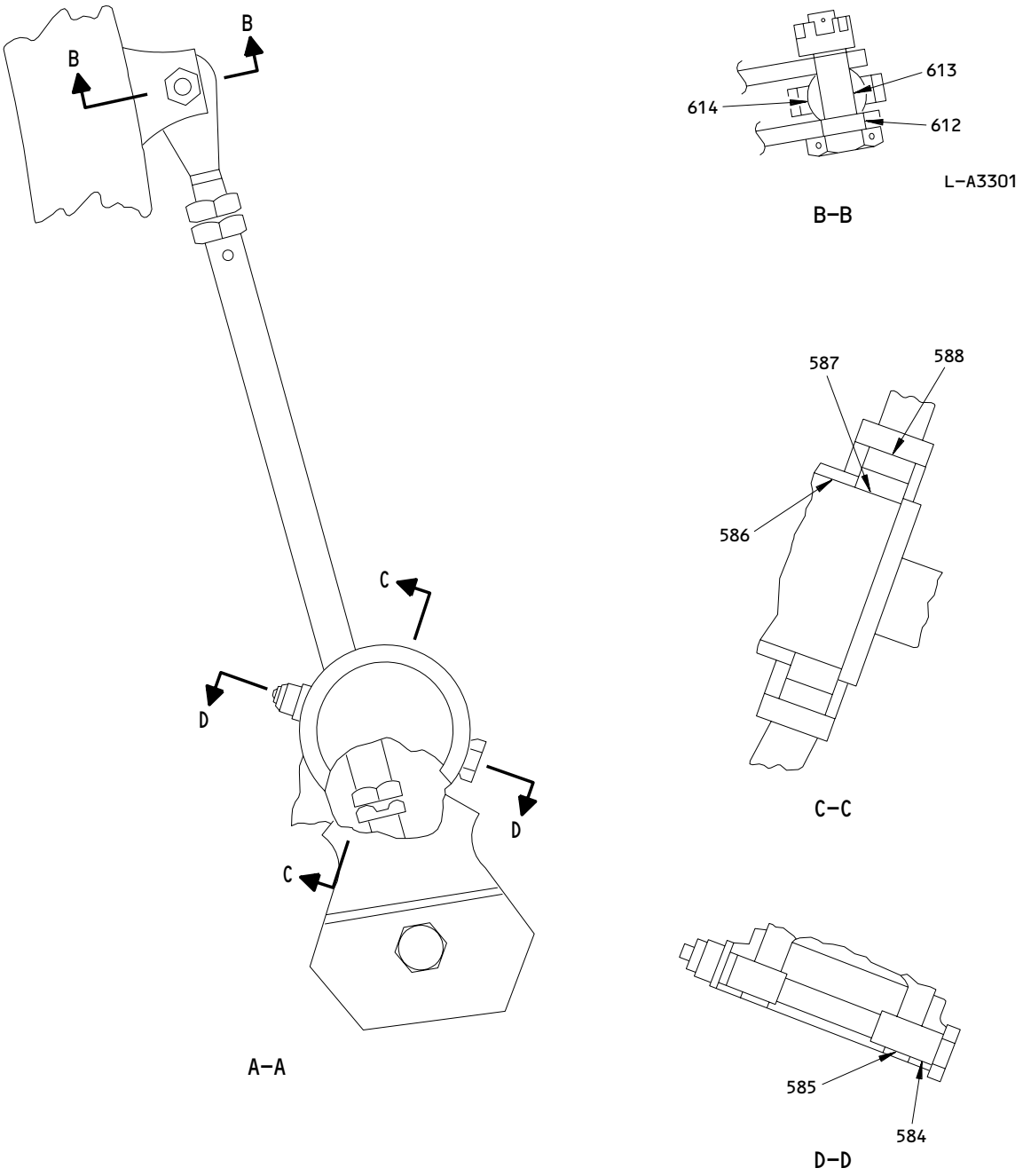
REF NO	I F R	DESCRIPTION	NEW PART REFERENCE			
			DIMENSIONS		LIMITS	
			MIN	MAX	MIN	MAX
839 (Fig. 603)	B	Side Clearances, Support Link Rod End Bearings No. 3 Bearing Air Cooler Assembly Support Brackets Bearing	0.432 (10.973)	0.437 (11.099)		
		Bracket	0.4375 (11.113)	0.4395 (11.163)	0.0005 (0.013)	0.0075 (0.190)



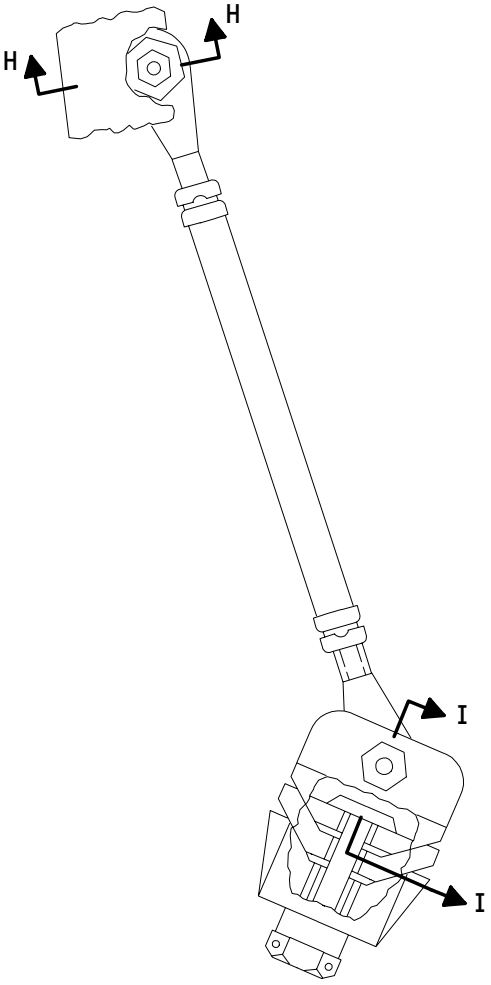
2.5 Bleed Valve Actuator Fits and Clearances
Figure 601



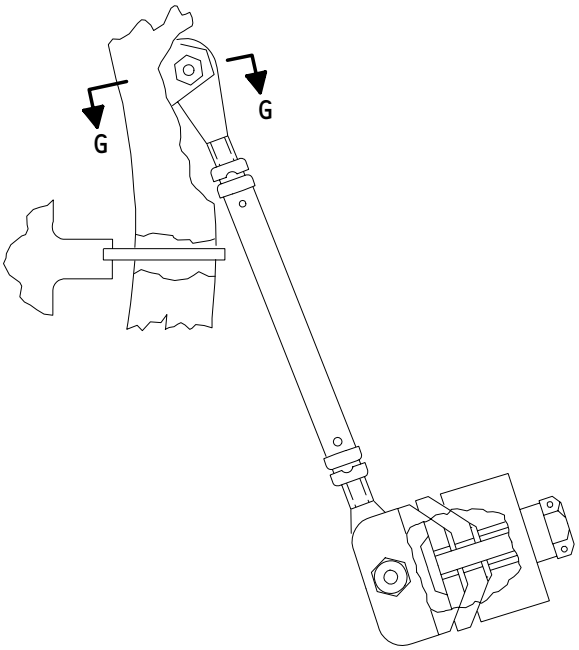
Compressor Stator Vane Control System Fits and Clearances
Figure 602 (Sheet 1)



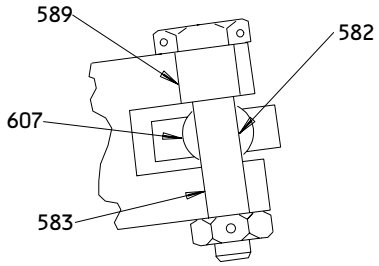
Compressor Stator Vane Control System Fits and Clearances
Figure 602 (Sheet 2)



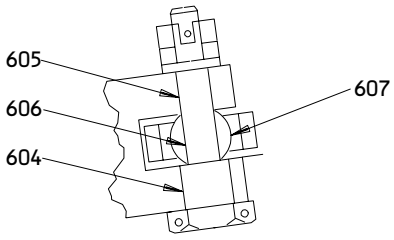
(STAGE 5)
E-E



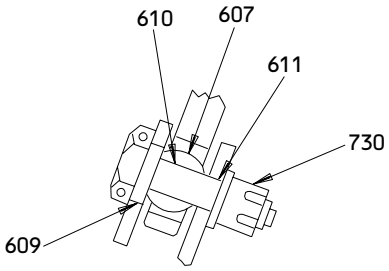
(STAGE 6)
F-F



G-G

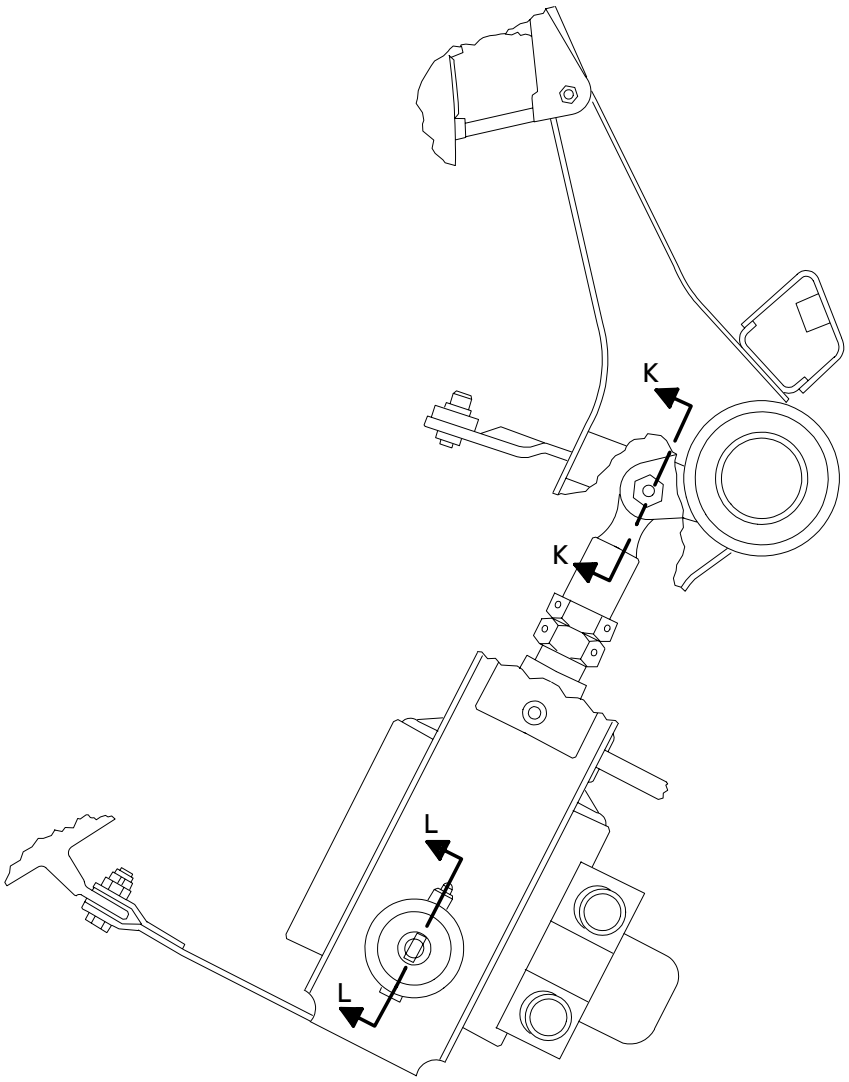


EXAMPLE 2 LOCATIONS
H-H

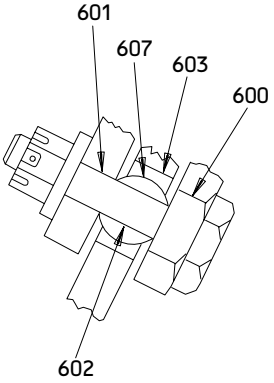


EXAMPLE AT IGV, AND
STAGES 5,6 AND 7
I-I

Compressor Stator Vane Control System Fits and Clearances
Figure 602 (Sheet 3)

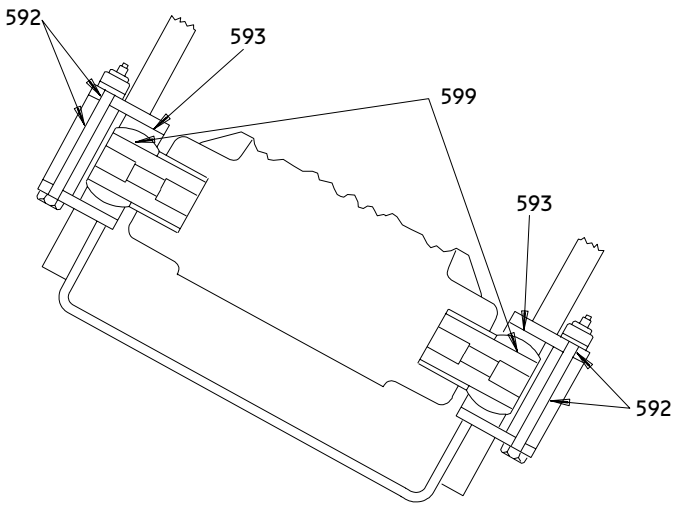


(COMPRESSOR STATOR LEVER SET AND ACTUATOR)
J-J

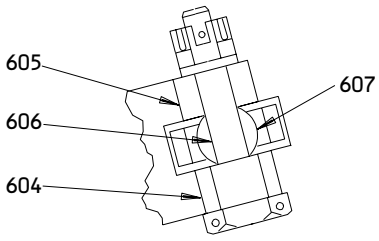


K-K

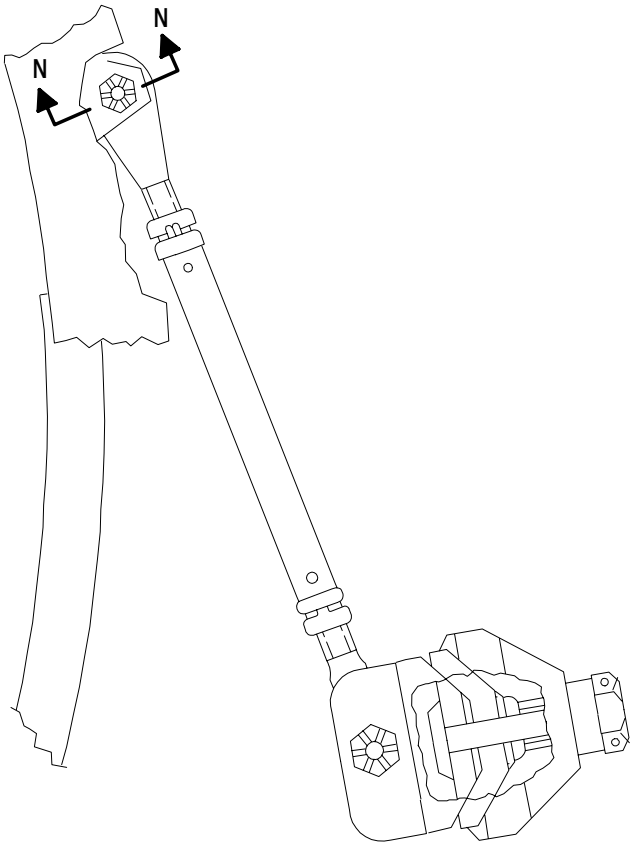
Compressor Stator Vane Control System Fits and Clearances
Figure 602 (sheet 4)



L-L

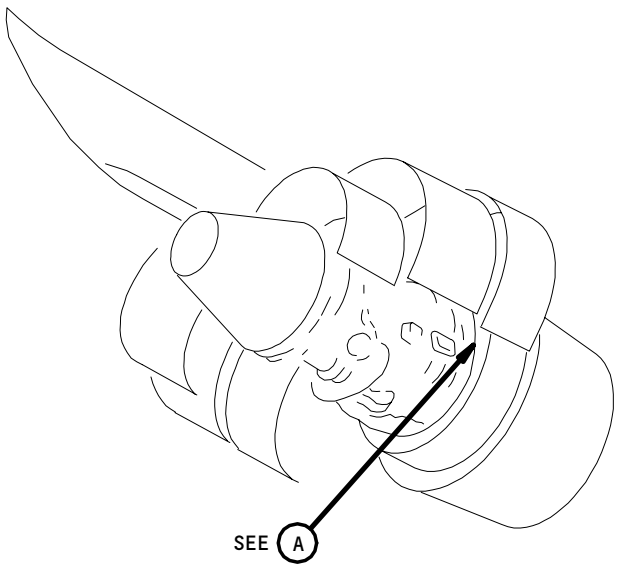


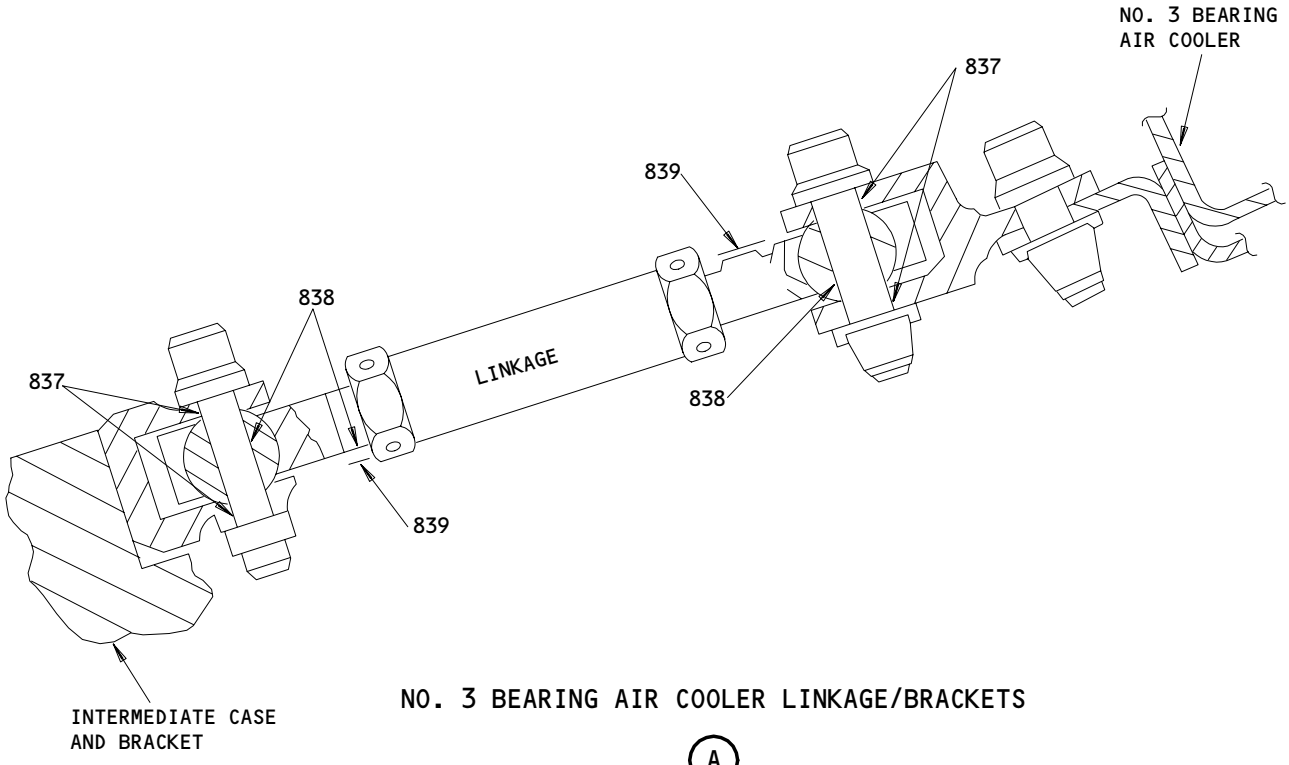
EXAMPLE 2 LOCATIONS
N-N



STAGE 7
M-M

Compressor Stator Vane Control System Fits and Clearances
Figure 602 (Sheet 5)





NO. 3 BEARING AIR COOLER LINKAGE/BRACKETS

A

L-A3296

Engine Bearing Cooling System Fits and Clearances
Figure 603

AIR - DDG MAINTENANCE PROCEDURES

1. General
   A. This procedure includes these DDG maintenance procedures:
      (1) DDG 75-21-1 Preparation - IDG Air/Oil Cooler Valves Inoperative
      (2) DDG 75-21-1 Restoration - IDG Air/Oil Cooler Valves Inoperative
      (3) DDG 75-21-2 Preparation - Engine Air/Oil Cooler Valves Inoperative
      (4) DDG 75-21-2 Restoration - Engine Air/Oil Cooler Valves Inoperative
      (5) DDG 75-23-1 Preparation - Nacelle Zone Ventilation Valves Inoperative
      (6) DDG 75-23-1 Restoration - Nacelle Zone Ventilation Valves Inoperative
      (7) DDG 75-24-1 Preparation - Turbine Case Cooling System Inoperative
      (8) DDG 75-24-1 Restoration - Turbine Case Cooling System Inoperative
      (9) DDG 75-24-2 Preparation - Turbine Cooling Air System Inoperative
      (10) DDG 75-24-2 Restoration - Turbine Cooling Air System Inoperative

TASK 75-00-00-049-001-N00

2. DDG 75-21-1 Preparation - IDG Air/Oil Cooler Valves Inoperative
   A. References
      (1) AMM 71-11-04/201, Fan Cowl Panels
      (2) AMM 71-11-06/201, Core Cowl Panels
      (3) AMM 72-34-03/401, Fan Exit Liner Segment
      (4) AMM 78-31-00/201, Thrust Reverser System
   B. Access
      (1) Location Zones
          411 Engine, Left
          421 Engine, Right

      (2) Access Panels
          414AR Fan Cowl Panel (Right)
          416AR Fan Reverser (Right)
          418AR Core Cowl Panel (Right)
          424AR Fan Cowl Panel (Right)
          426AR Fan Reverser (Right)
          428AR Core Cowl Panel (Right)

   C. Procedure

      S 869-016-N00
      (1) For the applicable engine, open these circuit breakers on the overhead circuit breaker panel, P11, and attach DO-NOT-CLOSE tags:
          (a) 11M4, L ENG IDG VALVE
          (b) 11M31, R ENG IDG VALVE

S 049-002-N00

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE THRUST REVERSER TO PREVENT THE OPERATION OF THE THRUST REVERSER. ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

(2) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).

S 019-003-N00

(3) Open the right fan cowl panel (AMM 71-11-04/201).

S 019-004-N00

(4) Open the right core cowl panel (AMM 71-11-06/201).

S 019-005-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 TO OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS WHEN YOU OPEN THE THRUST REVERSERS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(5) Open the right thrust reverser (AMM 78-31-00/201).

S 219-014-N00

(6) Do one of the steps that follow to visually make sure the valve is in the open position:
   (a) Look at the position indicator to make sure the valve is in the open position.
      1) Remove the No. 2 fan exit lining segment (AMM 72-34-03/401).
      2) Look at the position indicator to make sure the valve is in the open position.
   (b) With a mirror, look through the fan exit liner opening at the 4 o'clock position of the intermediate case to visually make sure the valve is in the open position.

S 869-015-N00

(7) If the valve is not in the open position, the airplane cannot be dispatched.

S 039-009-N00

(8) Disconnect the electrical connector, D11046, from the IDG air/oil heat exchanger.
(a) Put a cap on the electrical connector.
(b) Safety the harness end.

S 439-008-N00

(9) If it was removed, install the No. 2 fan exit lining segment (AMM 72-34-03/401).

S 419-010-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 TO CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS WHEN YOU CLOSE THE THRUST REVERSERS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(10) Close the right thrust reverser (AMM 78-31-00/201).

S 439-011-N00

(11) Close the right core cowl panel (AMM 71-11-06/201).

S 419-012-N00

(12) Close the right fan cowl panel (AMM 71-11-04/201).

S 449-013-N00

(13) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

S 869-017-N00

(14) For the applicable engine, remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:
(a) 11M4, L ENG IDG VALVE
(b) 11M31, R ENG IDG VALVE

TASK 75-00-00-449-052-N00

3. DDG 75-21-1 Restoration - IDG Air/Oil Cooler Valves Inoperative

A. References
(1) AMM 24-11-12/401, IDG Air/Oil Heat Exchanger and Valve

B. Access
(1) Location Zones
411 Engine, Left
421 Engine, Right

(2) Access Panels

414AR	Fan Cowl Panel (Right)
416AR	Fan Reverser (Right)
418AR	Core Cowl Panel (Right)
424AR	Fan Cowl Panel (Right)
426AR	Fan Reverser (Right)
428AR	Core Cowl Panel (Right)

C. Procedure

S 909-018-N00

(1) Replace the valve for the IDG Air/Oil Heat Echanger (AMM 24-11-12/401).

TASK 75-00-00-049-019-N00

4. DDG 75-21-2 Preparation - Engine Air/Oil Cooler Valves Inoperative

A. References

(1) AMM 71-11-04/201, Fan Cowl Panels
(2) AMM 71-11-06/201, Core Cowl Panels
(3) AMM 72-34-03/401, Fan Exit Liner Segment
(4) AMM 78-31-00/201, Thrust Reverser System

B. Access

(1) Location Zones

411	Engine, Left
421	Engine, Right

(2) Access Panels

413AL	Fan Cowl Panel (Left)
415AL	Fan Reverser (Left)
417AL	Core Cowl Panel (Left)
423AL	Fan Cowl Panel (Left)
425AL	Fan Reverser (Left)
427Al	Core Cowl Panel (Left)

C. Procedure

S 869-034-N00

(1) For the left engine, open these circuit breakers on the overhead circuit breaker panel, P11, and attach DO-NOT-CLOSE tags:
(a) 11L3, L ENG PERF SOL CHAN A
(b) 11L4, L ENG PERF SOL CHAN B

S 869-035-N00

(2) For the right engine, open these circuit breakers on the overhead circuit breaker panel, P11, and attach DO-NOT-CLOSE tags:
(a) 11L30, R ENG PERF SOL CHAN A

(b) 11L31, R ENG PERF SOL CHAN B

S 019-020-N00

(3) Open the left fan cowl panel (AMM 71-11-04/201).

S 049-021-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(4) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).

S 019-022-N00

(5) Open the left core cowl panel (AMM 71-11-06/201).

S 019-023-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(6) Open the left thrust reverser (AMM 78-31-00/201).

S 219-024-N00

(7) Do one of the steps that follow to get access to the valve position indicator disk (found on the lower forward outboard area of the valve):
   (a) Remove the No. 6 fan exit liner segment (AMM 72-34-03/401).
   (b) With a mirror, look through the fan exit liner opening, forward of the No. 6 fan exit liner segment.

S 219-025-N00

(8) Look at the valve position indicator disk to visually make sure the valve is in the open position.
   (a) The dot on the disk must be at the O (OPEN) position.
   (b) If the dot is at the C (CLOSE) position, the airplane cannot be dispatched.

S 439-026-N00

(9) If it was removed, install the No. 6 fan exit liner segment (AMM 72-34-03/401).

S 039-027-N00

(10) Disconnect the electrical connector from the air/oil heat exchanger.
(a) Install the protection caps.
(b) Safety the harness end.

S 419-028-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(11) Close the left thrust reverser (AMM 78-31-00/201).

S 419-029-N00

(12) Close the left core cowl panel (AMM 71-11-06/201).

S 419-030-N00

(13) Close the left fan cowl panel (AMM 71-11-04/201).

S 449-031-N00

(14) Do the activation procedure for the thrust reversers (AMM 78-31-00/201).

S 869-032-N00

(15) For the left engine, remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:
(a) 11L3, L ENG PERF SOL CHAN A
(b) 11L4, L ENG PERF SOL CHAN B

S 869-033-N00

(16) For the right engine, remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:
(a) 11L30, R ENG PERF SOL CHAN A
(b) 11L31, R ENG PERF SOL CHAN B

TASK 75-00-00-449-051-N00

5. DDG 75-21-2 Restoration - Engine Air/Oil Cooler Valves Inoperative

A. References
(1) AMM 79-21-09/401, Air/Oil Heat Exchanger and Valve

B. Access
(1) Location Zones
411 Engine, Left
421 Engine, Right

(2) Access Panels

413AL	Fan Cowl Panel (Left)
415AL	Fan Reverser (Left)
417AL	Core Cowl Panel (Left)
423AL	Fan Cowl Panel (Left)
425AL	Fan Reverser (Left)
427Al	Core Cowl Panel (Left)

C. Procedure

S 909-036-N00

(1) Replace the air/oil heat exchanger (AMM 79-21-09/401).

TASK 75-00-00-049-039-N00

6. DDG 75-23-1 Preparation - Nacelle Zone Ventilation Valves Inoperative

A. General

(1) The performance penalty for the PW4000 is only applicable above 22,500 feet MSL. When the valve operates correctly, it is open below this altitude.

B. References

(1) AMM 71-11-04/201, Fan Cowl Panels
(2) AMM 71-11-06/201, Core Cowl Panels
(3) AMM 78-31-00/201, Thrust Reverser System

C. Access

(1) Location Zones

411	Engine, Left
421	Engine, Right

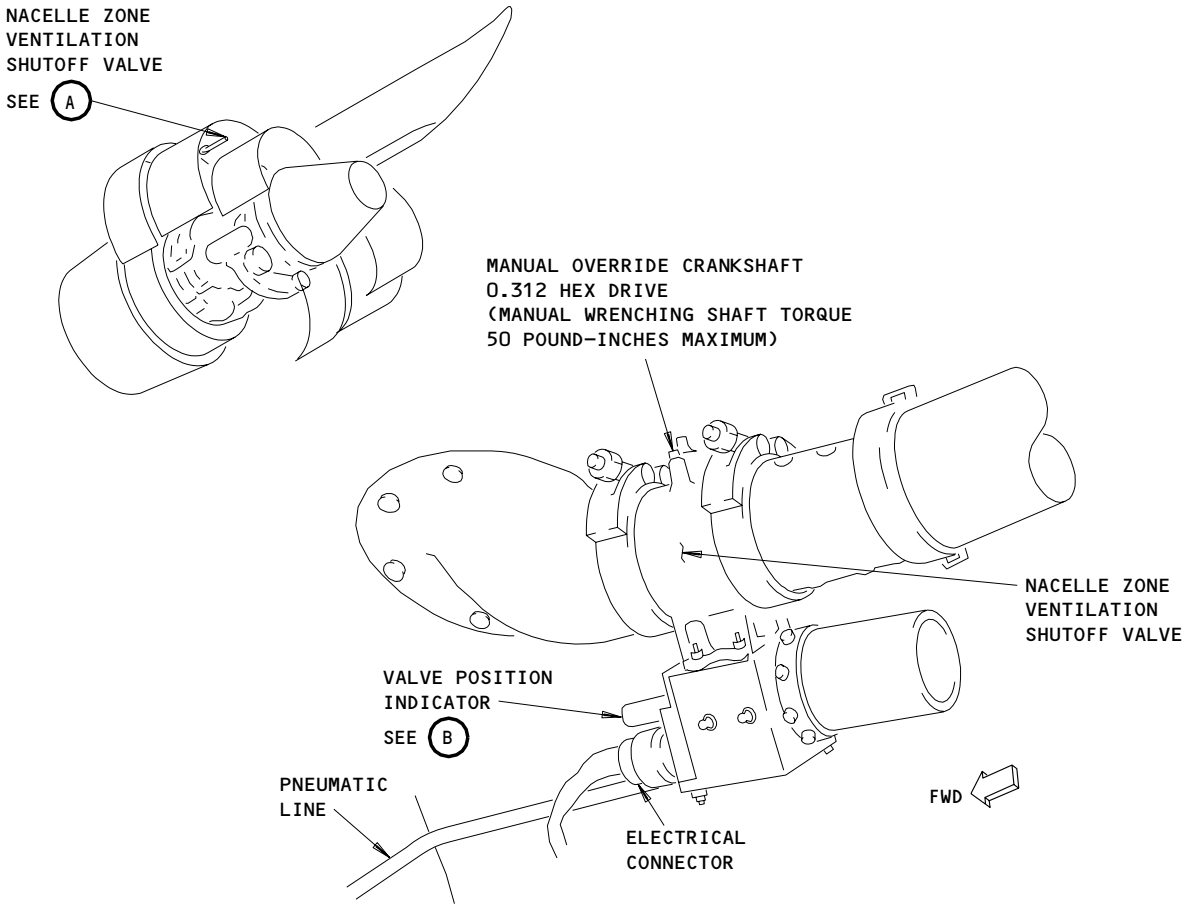
(2) Access Panels

413AL	Fan Cowl Panel (Left)
415AL	Fan Reverser (Left)
417AL	Core Cowl Panel (Left)
423AL	Fan Cowl Panel (Left)
425AL	Fan Reverser (Left)
427AL	Core Cowl Panel (Left)

D. Procedure

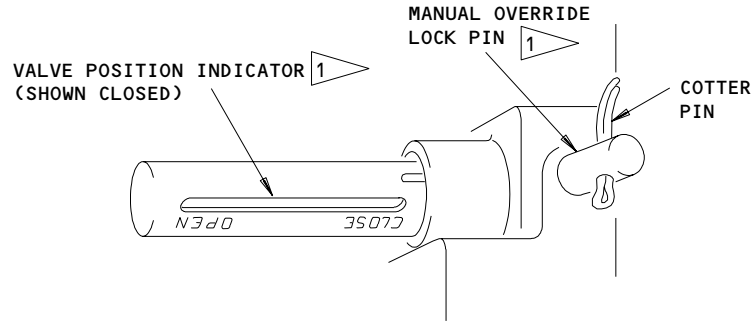
S 869-037-N00

(1) Open the circuit breaker for the NAC VENT on the overhead circuit breaker panel, P11.
(a) Attach the placard NAC VENT SHUTOFF VALVE INOP.



NACELLE ZONE VENTILATION
SHUTOFF VALVE

A



VALVE POSITION INDICATOR

B

1 MANUAL OVERRIDE LOCK PIN IS RETAINED IN THE LOCKED POSITION WITH A COTTER PIN. REMOVE THE PIN TO OPERATE THE MANUAL OVERRIDE IN THE LOCKED POSITION

Nacelle Zone Ventilation Valves
Figure 901

S 049-038-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE FOR THE THRUST REVERSER TO PREVENT OPERATION OF THE THRUST REVERSER. ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

(2) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).

S 019-040-N00

(3) Open the left fan cowl panel (AMM 71-11-04/201).

S 019-041-N00

(4) Open the left core cowl panel (AMM 71-11-06/201).

S 019-042-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS WHEN YOU OPEN THE THRUST REVERSERS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(5) Open the left thrust reverser (AMM 78-31-00/201).

S 219-043-N00

(6) Visually examine the nacelle ventilation shutoff valve to make sure it is in the OPEN position.

S 869-044-N00

(7) Safety the valve in the open position.
   (a) If the valve is open, remove the cotter pin and push the lock pin in the actuator shaft.
   (b) If the valve is closed, manually open the valve with a wrench.
      1) Remove the cotter pin.
      2) Push the lock pin in the actuator shaft.

S 419-045-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 TO CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS WHEN YOU CLOSE THE THRUST REVERSERS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(8) Close the left thrust reverser (AMM 78-31-00/201).

S 419-046-N00
(9) Close the left core cowl panel (AMM 71-11-06/201).

S 419-047-N00
(10) Close the left fan cowl panel (AMM 71-11-04/201).

S 449-048-N00
(11) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

TASK 75-00-00-449-049-N00

7. DDG 75-23-1 Restoration - Nacelle Zone Ventilation Valves Inoperative

A. References
(1) AMM 75-23-02/401, Nacelle Zone Ventilation Shutoff Valve

B. Access
(1) Location Zones
411 Engine, Left
421 Engine, Right

(2) Access Panels
413AL Fan Cowl Panel (Left)
415AL Core Cowl Panel (Left)
417AL Fan Reverser (Left)
423AL Fan Cowl Panel (Left)
425AL Core Cowl Panel (Left)
427AL Fan Reverser (Left)

C. Procedure

S 909-050-N00
(1) Replace the nacelle zone ventilation shutoff valve (AMM 75-23-02/401).

TASK 75-00-00-049-053-N00

8. DDG 75-24-1 Preparation - Turbine Case Cooling System Inoperative

A. References
(1) AMM 71-00-00/501, Power Plant
(2) AMM 71-11-04/201, Fan Cowl Panels
(3) AMM 71-11-06/201, Core Cowl Panels
(4) AMM 78-31-00/201, Thrust Reverser System

B. Access
(1) Location Zones
411 Engine, Left
421 Engine, Right

(2) Access Panels

414AR	Fan Cowl Panel (Right)
416AR	Fan Reverser (Right)
418AR	Core Cowl Panel (Right)
424AR	Fan Cowl Panel (Right)
426AR	Fan Reverser (Right)
428AR	Core Cowl Panel (Right)

C. Procedure

S 869-059-N00

(1) If the turbine case cooling (TCC) air flow system does not operate, do these steps:

NOTE: This keeps the air shutoff valves for the TCC in the closed position.

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE THRUST REVERSER TO PREVENT THE OPERATION OF THE THRUST REVERSER. ACCIDENTAL OPERATION OF THE THRUST REVERSR CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

(a) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).
(b) Open the right fan cowl panel (AMM 71-11-04/201).
(c) Open the right core cowl panel (AMM 71-11-06/201).

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 TO OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS WHEN YOU OPEN THE THRUST REVERSERS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(d) Open the right thrust reverser (AMM 78-31-00/201).
(e) Disconnect the control cable for the TCC air valve on the aft rod end from the idler arm of the HPT TCC air shutoff valve.
(f) Make sure the air shutoff valves for the HPT and LPT case are in the closed position.
1) If the valves are not in the closed position, manually put the valves to the closed position.

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 TO CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS WHEN YOU CLOSE THE THRUST REVERSERS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(g) Close the right thrust reverser (AMM 78-31-00/201).
(h) Close the right core cowl panel (AMM 71-11-06/201).
(i) Close the right fan cowl panel (AMM 71-11-04/201).
(j) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

S 869-060-N00

(2) If the turbine case cooling (TCC) actuator has external or internal (drain line) fuel leakage in excess of the AMM limit, do these steps:

NOTE: This keeps the air shutoff valves for the TCC in the closed position.

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE THRUST REVERSER TO PREVENT THE OPERATION OF THE THRUST REVERSER. ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

(a) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).
(b) Open the right fan cowl panel (AMM 71-11-04/201).
(c) Open the right core cowl panel (AMM 71-11-06/201).

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 TO OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS WHEN YOU OPEN THE THRUST REVERSERS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(d) Open the right thrust reverser (AMM 78-31-00/201).
(e) Disconnect the control cable for the TCC air valve on the aft rod end from the idler arm of the HPT TCC air shutoff valve.
(f) Make sure the air shutoff valves for the HPT and LPT case are in the closed position.
    1) If the valves are not in the closed position, manually put the valves to the closed position.
(g) Remove fuel pressure and fuel return lines from the actuator and put caps on.
    1) Tighten the cap for the fuel pressure line to 450-500 pound-inches.
    2) Tighten the cap for the fuel return line to 270-300 pound-inches.

(h) Do Test 15 (AMM 71-00-00/501).

NOTE: This action will result in display of the EICAS EEC C1 message (PIMU message: CH A/B TCC FD-BK fail).

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 TO CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS WHEN YOU CLOSE THE THRUST REVERSERS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(i) Close the right thrust reverser (AMM 78-31-00/201).
(j) Close the right core cowl panel (AMM 71-11-06/201).
(k) Close the right fan cowl panel (AMM 71-11-04/201).
(l) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

TASK 75-00-00-449-058-N00

9. DDG 75-24-1 Restoration - Turbine Case Cooling System Inoperative

A. References
(1) AMM 75-24-00/601, Turbine Cooling System
(2) AMM 75-24-05/401, Turbine Case Cooling (TCC) Air Valve Actuator

B. Access
(1) Location Zones
411 Engine, Left
421 Engine, Right

(2) Access Panels
414AR Fan Cowl Panel (Right)
416AR Fan Reverser (Right)
418AR Core Cowl Panel (Right)
424AR Fan Cowl Panel (Right)
426AR Fan Reverser (Right)
428AR Core Cowl Panel (Right)

C. Procedure

S 729-061-N00
(1) If the TCC system does not operate correctly, do an inspection of the Turbine Cooling System (AMM 75-24-00/601).

S 909-062-N00
(2) If the TCC air valve actuator had more leakage than the AMM limits, replace the TCC air valve actuator (AMM 75-24-05/401).

TASK 75-00-00-049-054-N00

10. DDG 75-24-2 Preparation - Turbine Cooling Air System Inoperative

A. References

(1) AMM 71-11-04/201, Fan Cowl Panels
(2) AMM 71-11-06/201, Core Cowl Panels
(3) AMM 78-31-00/201, Thrust Reverser System

B. Access

(1) Location Zones

411 Engine, Left
421 Engine, Right

(2) Access Panels

413AL Fan Cowl Panel (Left)
414AR Fan Cowl Panel (Right)
415AL Fan Reverser (Right)
416AR Fan Reverser (Right)
417AL Core Cowl Panel (Left)
418AR Core Cowl Panel (Right)
423AL Fan Cowl Panel (Left)
424AR Fan Cowl Panel (Right)
425AL Fan Reverser (Left)
426AR Fan Reverser (Right)
427AL Core Cowl Panels (Left)
428AR Core Cowl Panel (Right)

C. Procedure

S 869-055-N00

(1) If the turbine vane and blade cooling air (TVBCA) valve is inoperative due to valve failure or HPC secondary flow control valve and TVBCA valve solenoid failure, make sure the valves are in the open position:

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE FOR THE THRUST REVERSER TO PREVENT OPERATION OF THE THRUST REVERSER. ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

(a) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).
(b) Open the fan cowl panels (AMM 71-11-04/201).
(c) Open the core cowl panels (AMM 71-11-06/201).

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS WHEN YOU OPEN THE THRUST REVERSERS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(d) Open the thrust reversers (AMM 78-31-00/201).
(e) Examine the visual position indicator on the left TVBCA valve or on the right TVBCA valve position switch, as applicable, to make sure it is in the protruded position.
(f) Disconnect the air signal tube nut from the applicable TVBCA valve.
(g) Install the plug in the air signal tube and the protective cap on the valve adapter.

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 TO CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS WHEN YOU CLOSE THE THRUST REVERSERS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(h) Close the thrust reversers (AMM 78-31-00/201).
(i) Close the core cowl panels (AMM 71-11-06/201).
(j) Close the fan cowl panels (AMM 71-11-04/201).
(k) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

TASK 75-00-00-449-056-N00

11. DDG 75-24-2 Restoration - Turbine Cooling Air System Inoperative

A. References
(1) AMM 75-33-01/401, HPC Secondary Flow Control Valve
(2) AMM 75-33-03/401, HPC Secondary Flow Control Valve, Turbine Vane and Blade Cooling Air Valve Solenoid

B. Access
(1) Location Zones
411 Engine, Left
421 Engine, Right

(2) Access Panels

413AL	Fan Cowl Panel (Left)
414AR	Fan Cowl Panel (Right)
415AL	Fan Reverser (Right)
416AR	Fan Reverser (Right)
417AL	Core Cowl Panel (Left)
418AR	Core Cowl Panel (Right)
423AL	Fan Cowl Panel (Left)
424AR	Fan Cowl Panel (Right)
425AL	Fan Reverser (Left)
426AR	Fan Reverser (Right)
427AL	Core Cowl Panels (Left)
428AR	Core Cowl Panel (Right)

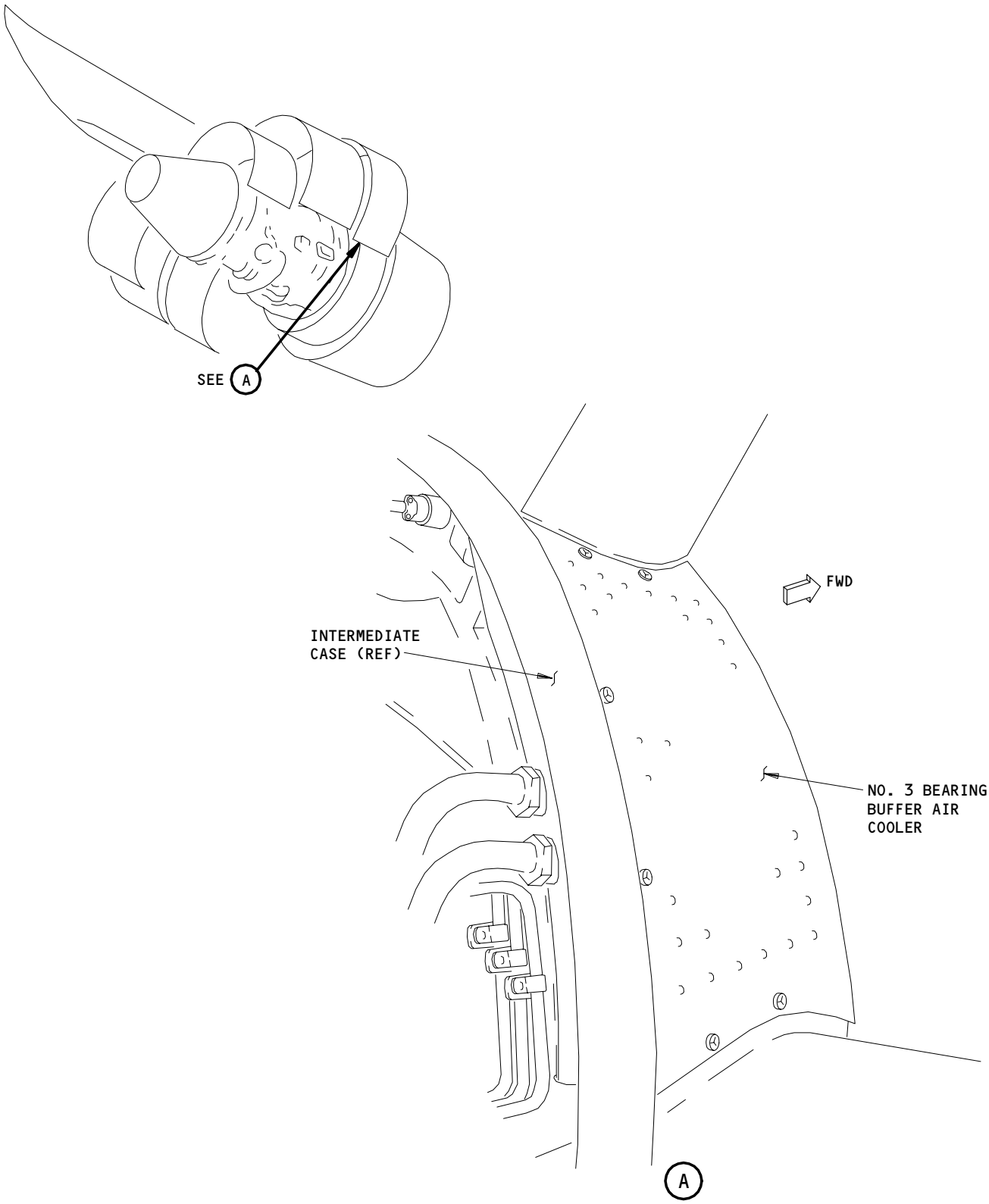
C. Procedure

S 909-057-N00

(1) Replace the applicable component that has the failure:
   (a) HPC Secondary Flow Control Valve (AMM 75-33-01/401)
   (b) HPC Secondary Flow Control Valve, Turbine Vane and Blade Cooling Air Valve Solenoid (AMM 75-33-03/401)

ENGINE BEARING COOLING SYSTEM - DESCRIPTION AND OPERATION

1. General
   A. The function of the engine bearing cooling system is to prevent too much heat around the No. 3 bearing compartment.
2. Component Details (Fig. 1)
   A. No. 3 Bearing Buffer Air Cooler
      (1) The buffer air cooler for the No. 3 bearing is installed in the intermediate case at the 2 o'clock position.
      (2) The buffer air cooler supplies the HPC bleed air from the 12th-stage through a heat exchanger that is cooled by fan discharge air.
3. Operation
   A. Functional Description
      (1) The HPC bleed air from the 12th-stage is bled off through the buffer air cooler and decreased in temperature by the fan discharge air. The cooled 12th-stage air is put through external pipes to an inner buffer space at the diffuser case.
      (2) The pressurized air from the buffer space is bled through a series of bleed holes to the No. 3 bearing compartment. This decreases the temperature and seals the bearing compartment from the hot HPC discharge air.

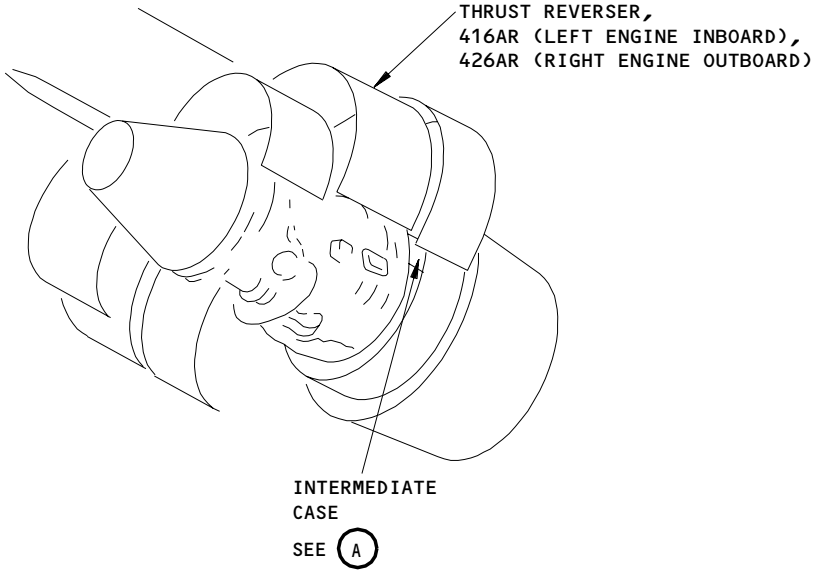


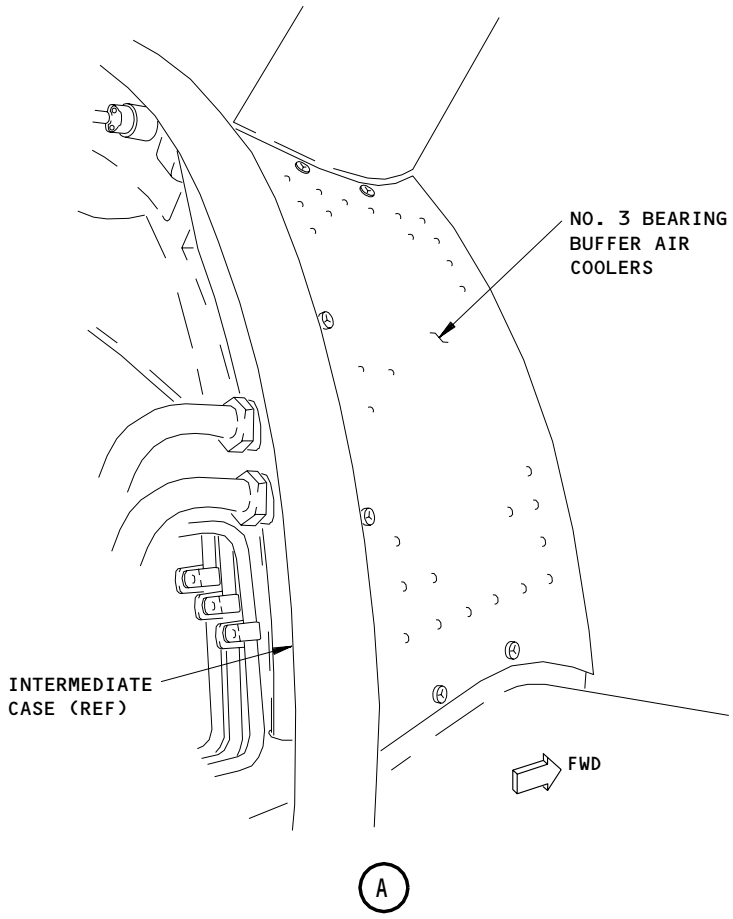
Engine Bearing Cooling System
Figure 1

ENGINE BEARING COOLING SYSTEM

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	AMM REFERENCE
COOLER - NO. 3 BEARING BUFFER AIR		2	416AR,426AR THRUST REVERSER	75-22-01

Engine Bearing Cooling System - Component Index
Figure 101





Engine Bearing Cooling System – Component Location
Figure 102

NO. 3 BEARING BUFFER AIR COOLER - REMOVAL/INSTALLATION

1. General
   A. This procedure gives the instructions for the removal and the installation of the buffer air cooler for the No. 3 bearing.
   B. The buffer air cooler is found on the intermediate case at the 2 o'clock position.
   C. You must open the right thrust reverser to get access to the buffer air cooler.

TASK 75-22-01-004-001-N00

2. Remove the No. 3 Bearing Buffer Air Cooler
   A. References
      (1) AMM 71-11-04/201, Fan Cowl Panels
      (2) AMM 71-11-06/201, Core Cowl Panels
      (3) AMM 78-31-00/201, Thrust Reverser System
   B. Access
      (1) Location Zones
          411 Left Engine
          421 Right Engine

      (2) Access Panels
          414AR Fan Cowl Panel (Right), Left Engine
          416AR Thrust Reverser (Right), Left Engine
          418AR Core Cowl Panel (Right), Left Engine
          424AR Fan Cowl Panel (Right), Right Engine
          426AR Thrust Reverser (Right), Right Engine
          428AR Core Cowl Panel (Right), Right Engine

   C. Prepare to Remove the Buffer Air Cooler

      S 014-002-N00
      (1) Open the right fan cowl panel (AMM 71-11-04/201).

      S 044-003-N00

      WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

      (2) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 014-004-N00

(3) Open the right core cowl panel (AMM 71-11-06/201).

S 014-005-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(4) Open the right thrust reverser (AMM 78-31-00/201).

D. Procedure

S 024-054-N00

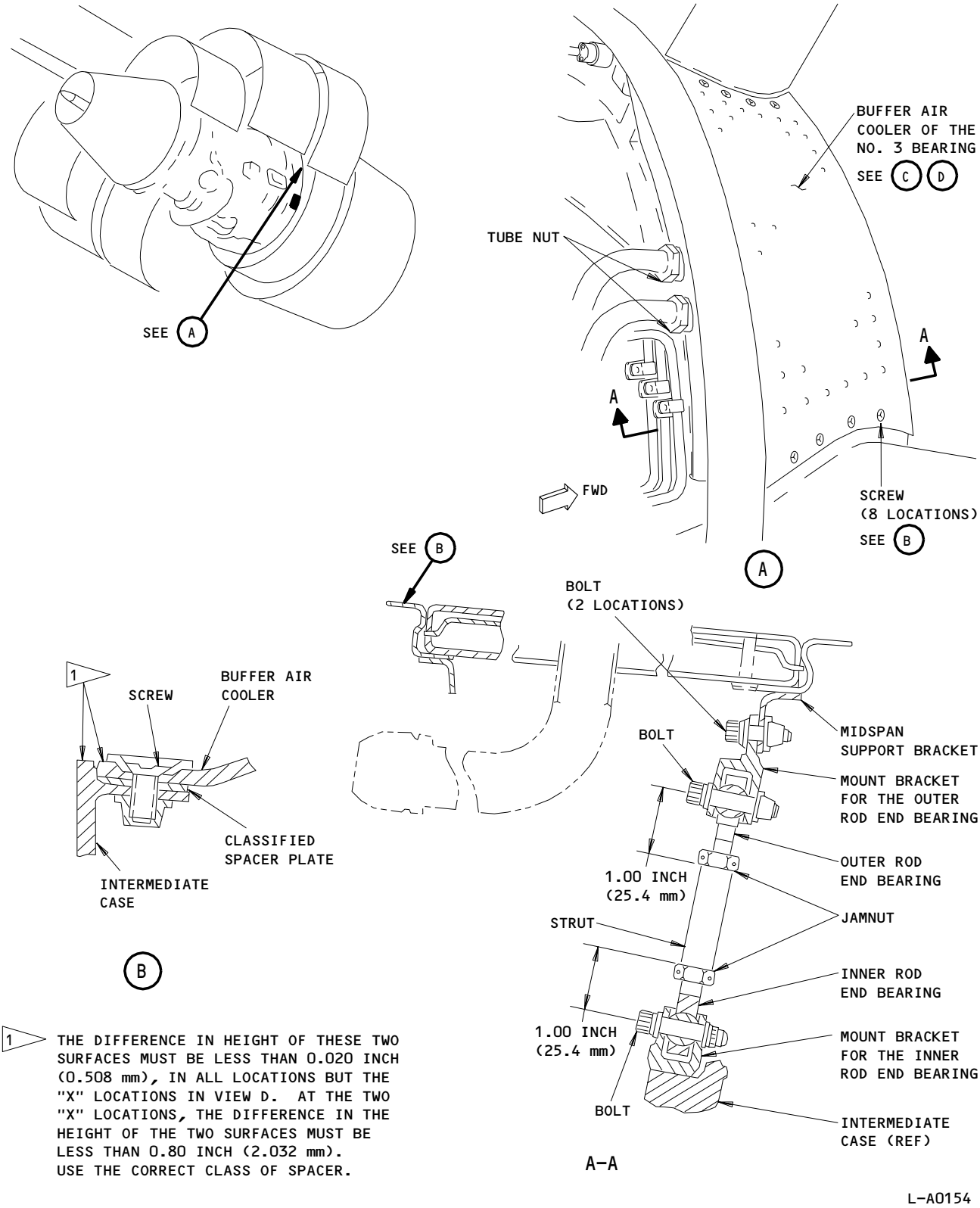
(1) Remove the buffer air cooler for the No. 3 bearing (Fig. 401):

WARNING: PERMIT SUFFICIENT TIME FOR THE BUFFER AIR COOLER AND THE RELATED TUBES OF THE NO. 3 BEARING TO BECOME COOL AFTER ENGINE SHUTDOWN. THESE COMPONENTS CAN BE VERY HOT WHICH CAN CAUSE INJURY TO PERSONS.

(a) If there is sealant around the edges of the buffer air cooler, remove the sealant.
(b) Disconnect the tube nuts from the buffer air cooler.
(c) Remove the screws which attach the buffer air cooler to the intermediate case.
(d) Remove the bolts which attach the buffer air cooler to the mount bracket.
(e) Remove the buffer air cooler and the classified spacer plate from the engine.

NOTE: Keep the classified spacer plates with the buffer air cooler.

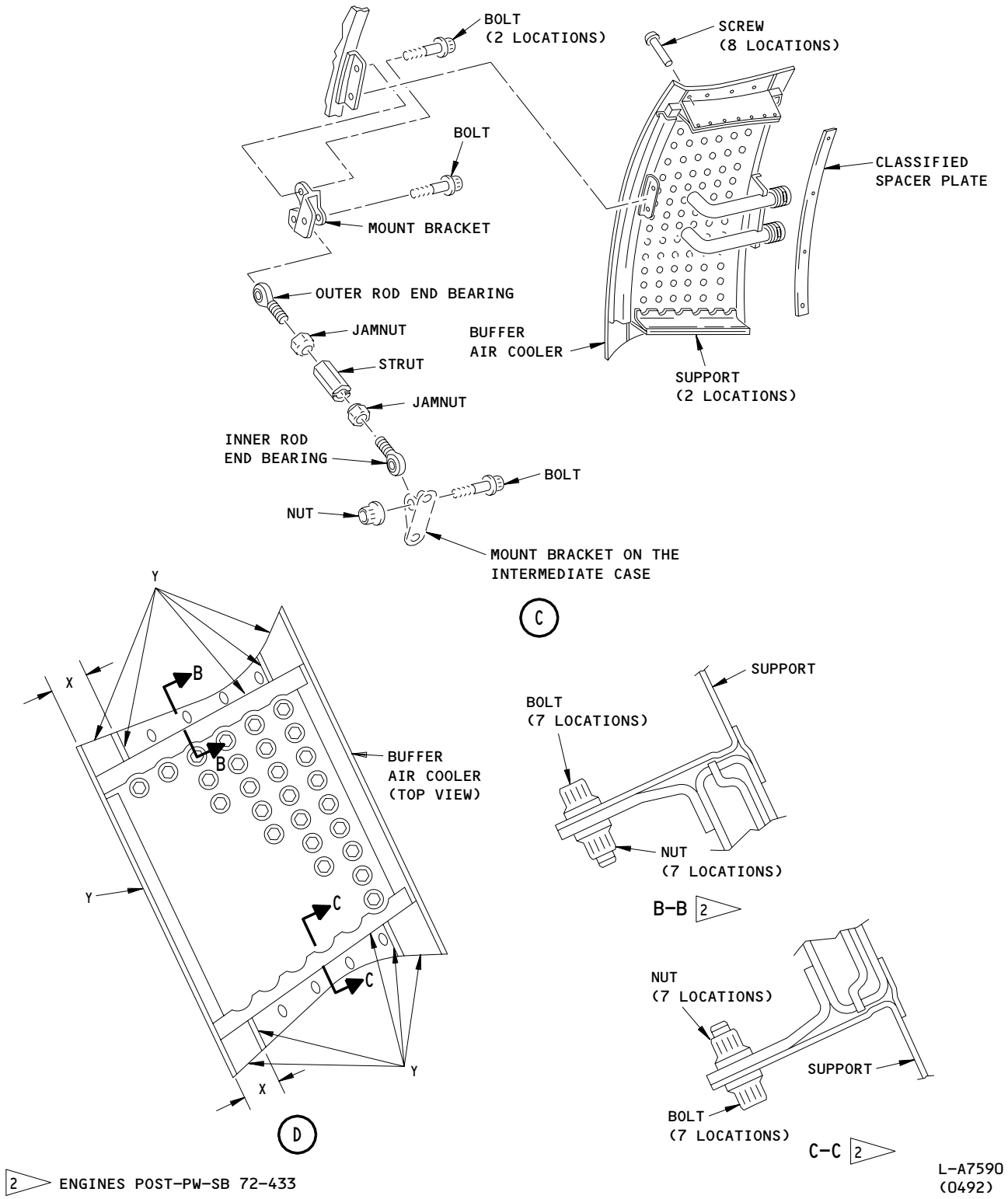
(f) Remove the assembly that holds the buffer air cooler with the steps that follow:
1) Remove the bolt which attaches the outer rod end bearing to the mount bracket.
2) Remove the mount bracket.



1 THE DIFFERENCE IN HEIGHT OF THESE TWO SURFACES MUST BE LESS THAN 0.020 INCH (0.508 mm), IN ALL LOCATIONS BUT THE "X" LOCATIONS IN VIEW D. AT THE TWO "X" LOCATIONS, THE DIFFERENCE IN THE HEIGHT OF THE TWO SURFACES MUST BE LESS THAN 0.80 INCH (2.032 mm). USE THE CORRECT CLASS OF SPACER.

L-A0154

No. 3 Bearing Buffer Air Cooler Installation
Figure 401 (Sheet 1)



No. 3 Bearing Buffer Air Cooler Installation
Figure 401 (Sheet 2)

3) Loosen the outer jamnut.
4) Remove the outer rod end bearing from the strut.
5) Remove the jamnut from the outer rod end bearing.
6) Loosen the inner jamnut and remove the strut.
7) Remove the jamnut from the inner rod end bearing.
8) Remove the bolt and jamnut which attaches the inner rod end bearing to the mount bracket on the intermediate case.
9) Remove the inner rod end bearing from the mount bracket.

(g) ENGINES POST-PW-SB 72-433;
Remove the two supports along the axial edges of the buffer air cooler with the steps that follow:
1) Remove the bolts and nuts that attach the two supports along the axial edges of the buffer air cooler.
2) Remove the two supports.

(h) Install the protection covers to the cooling air tubes.

(i) Remove all remaining sealant from the intermediate case and the buffer air cooler.

TASK 75-22-01-404-012-N00

3. Install the No. 3 Bearing Buffer Air Cooler

A. Equipment

(1) M303, M305, or M307 Bergen Mechanical Crimper
Bergen Cable Technologies Inc
170 Gregg St
P.O. Box 1300
Lodi, NJ 07644-9982

B. Consumable Materials

(1) A01043 Sealant, Silicone Rubber - PWA 36003
(2) B00379 Alcohol, Isopropyl
(3) D00137 Engine Oil - PWA 521
(4) D50124 Anti-seize Compound - P06-054
(5) G02334 Lockwire - AS3214-02
(6) G02332 Ferrule - P05-292 (Optional)
(7) G02335 Cable - Safety - P05-291 (Optional)

C. References

(1) AMM 71-11-04/201, Fan Cowl Panels
(2) AMM 71-11-06/201, Core Cowl Panels
(3) AMM 78-31-00/201, Thrust Reverser System

D. Access

(1) Location Zones
411 Left Engine
421 Right Engine

(2) Access Panels

414AR	Fan Cowl Panel (Right), Left Engine
416AR	Thrust Reverser (Right), Left Engine
418AR	Core Cowl Panel (Right), Left Engine
424AR	Fan Cowl Panel (Right), Right Engine
426AR	Thrust Reverser (Right), Right Engine
428AR	Core Cowl Panel (Right), Right Engine

E. Prepare to Install the Buffer Air Cooler for the No. 3 Bearing (Fig. 401)

S 224-045-N00

(1) If you do not know if the classified spacer plate at the trailing edge of the buffer air cooler is the correct class of spacer, do the steps that follow:
   (a) Install the buffer air cooler and the classified spacer plate on the intermediate case.
      1) Use the work screws.
   (b) Measure the distance between the trailing edge of the buffer air cooler and the intermediate case (Fig. 401).
   (c) If the classified spacer plate does not have the correct fit, use another classified spacer plate from the table below.

Class	Spacer Thickness - Inch (mm)
1	0.022-0.028 (0.559-0.711)
2	0.036-0.044 (0.914-1.118)
3	0.058-0.068 (1.473-1.727)
4	0.075-0.085 (1.905-2.159)
5	0.095-0.105 (2.413-2.667)
6	0.120-0.130 (3.048-3.302)

Table 401

   (d) Remove the buffer air cooler and classified spacer plate.

S 424-055-N00

(2) ENGINES POST-PW-SB 72-433;
Attach the two supports with the steps that follow:
   (a) Lubricate the threads of the bolts, which attach the supports, with engine oil.
   (b) Attach the supports to the axial edges of the buffer air cooler with the bolts and nuts.

F. Procedure

S 424-048-N00

(1) Install the buffer air cooler:
  (a) Lubricate the threads of the jamnut with engine oil.
  (b) Assemble the strut and one rod end bearing and jamnut.

NOTE: Make sure the dimension between the jamnut and the rod end bearing is 1.0 inch (25.4 mm) (View A-A).

    1) Tighten the jamnut with your hand.
  (c) Install the rod end bearing in the mount bracket at the 2 o'clock position on the intermediate case.
    1) Lubricate the threads of the bolt, which attaches the inner rod end bearing, with engine oil.
    2) Attach the rod end bearing to the intermediate case with the bolt and nut.
      a) Tighten the nut to 85-95 pound-inches (9.6-10.7 newton-meters).
  (d) Remove the protection covers from the cooling air tubes.
  (e) Lubricate the threads of the two bolts, which attach the mount bracket to the bracket, with engine oil.
  (f) Attach the mount bracket of the outer rod end bearing to the bracket at the front of the buffer air cooler with the bolts.
    1) Tighten the bolts with your hand.
  (g) ENGINES PRE-PW-SB 72-433;
  Install the buffer air cooler:
    1) Put the buffer air cooler and the classified spacer plate in position on the intermediate case.
    2) Lubricate the threads of the screws, which attach the buffer air cooler, with engine oil.
    3) Attach the buffer air cooler to the intermediate case with the screws.
      a) Tighten the screws to 36-40 pound-inches (4.1-4.5 newton-meters).
    4) Do a check of the buffer air cooler installation as follows:
      a) Make sure the installation agrees with flagnote 1 of Fig. 401.
      b) If necessary, remove the buffer air cooler and use a different classified spacer plate for the correct fit.
  (h) Lubricate the threads of the jamnut, which attaches the remaining rod end bearing to the strut, with engine oil.
  (i) Assemble the remaining rod end bearing and jamnut to the strut.
    1) Tighten the jamnut with your hand.
  (j) Lubricate the threads of the bolt, which attaches the mount bracket to the outer rod end bearing, with engine oil.
  (k) Attach the outer rod end bearing to the mount bracket with the bolt.
    1) Tighten the bolt with your hand.

(l) After the last adjustment of the length of the strut, examine the inspection holes in the strut for blockage.

NOTE: The blockage of the inspection holes shows the threads are correctly engaged.

(m) Tighten the jamnuts to 75-85 pound-inches (8.5-9.6 newton-meters).
1) Safety the jamnuts with lockwire.

(n) Tighten the bolt which attaches the outer rod end bearing to the mount bracket to 85-95 pound-inches (9.6-10.7 newton-meters).

(o) Tighten the bolts, which attach the mount bracket for the outer rod end bearing to the bracket for the cooler midspan support, to 85-95 pound-inches (9.6-10.7 newton-meters).

(p) ENGINES POST-PW-SB 72-433;
Install the buffer air cooler:
1) Loosen the 14 bolts and nuts in the supports at the axial edges of the buffer air cooler.
2) Install the buffer air cooler and classified spacer plate on the intermediate case.
3) Measure the distance between the buffer air cooler and the intermediate case at the trailing edge.
4) If necessary, use a different classified spacer plate for the correct fit (Refer to flagnote 1 for the correct dimension).

(q) Tighten the bolts and nuts in the supports to 85-95 pound-inches (9.6-10.7 newton-meters).

(r) Lubricate the threads of the screws, which attach the buffer air cooler, with engine oil.

(s) Attach the buffer air cooler with the screws.
1) Tighten the screws to 36-40 pound-inches (4.1-4.5 newton-meters).

(t) Apply the sealant around the edges of the buffer air cooler at the Y locations in Fig. 401:
1) Clean the edges of the buffer air cooler with a clean cheesecloth made moist with the alcohol.

2) Let the cleaned areas are dry and make sure there is no remaining alcohol on the surfaces.
3) In less than two hours after you clean the parts, fill the spaces at the Y locations with the sealant.
4) Let the sealant dry for a minimum of eight hours before you operate the engine.

NOTE: A minimum relative humidity of the air of 25% is necessary for the correct curing of the sealant.

(u) Lubricate the threads of the tube adapters on the buffer air cooler with the anti-seize paste.
(v) Connect the cooling air tubes to the adapters.
1) Tighten the tube nuts to 825-900 pound-inches (93.2-101.7 newton-meters).
2) Safety the tube nuts with lockwire or safety cable and safety cable ferrule.

G. Return the Aircraft to Its Usual Condition

S 414-033-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Close the right thrust reverser (AMM 78-31-00/201).

S 414-034-N00
(2) Close the right core cowl panel (AMM 71-11-06/201).

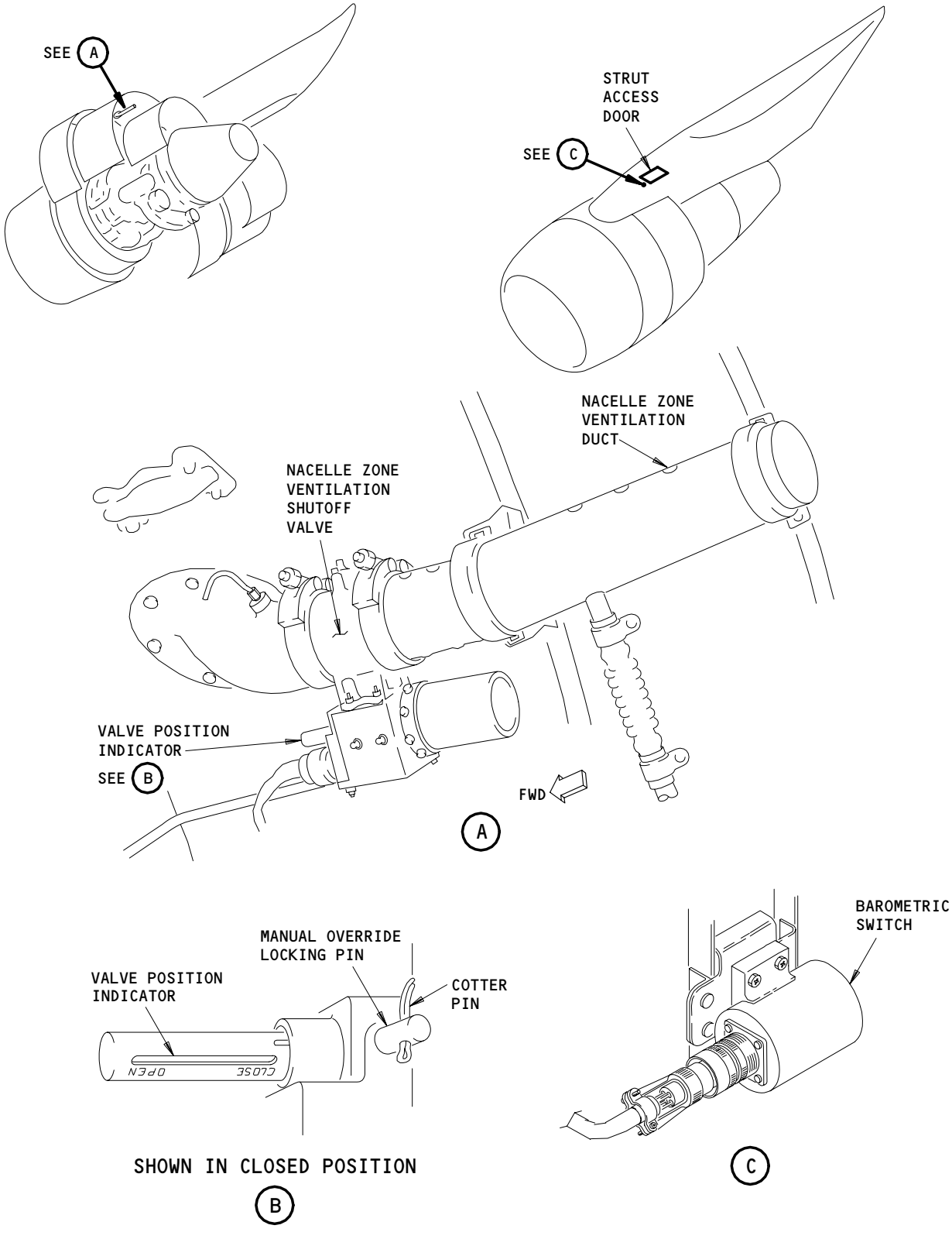
S 414-035-N00
(3) Close the right fan cowl panel (AMM 71-11-04/201).

S 444-036-N00
(4) Do the activation procedure for the thrust reversers (AMM 78-31-00/201).

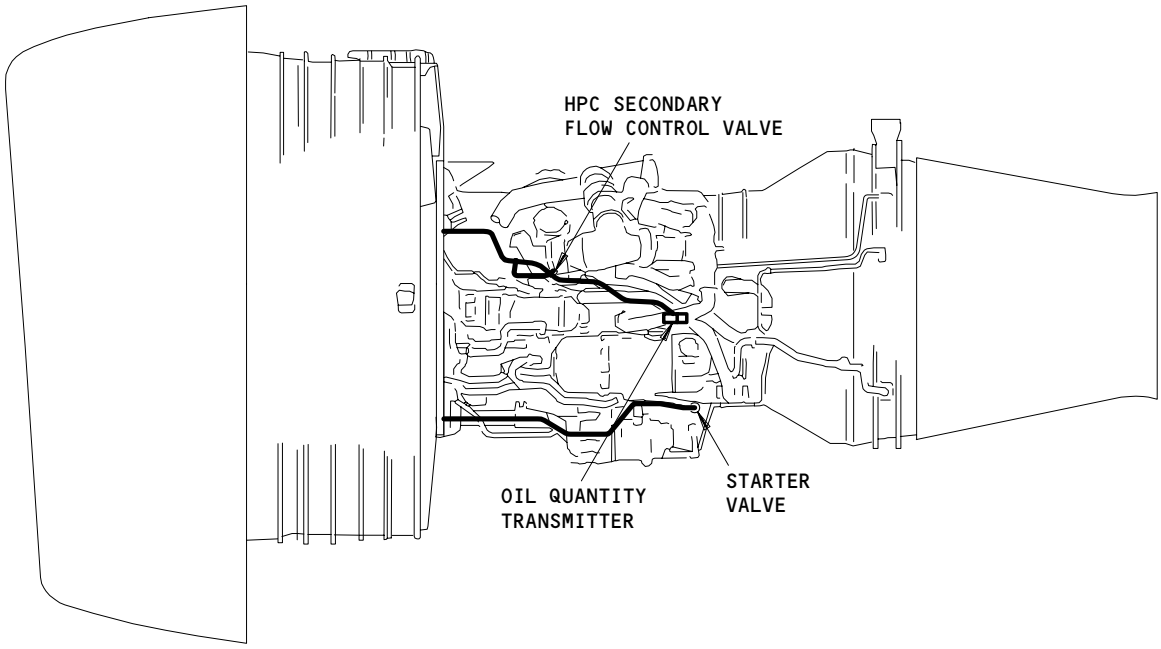
S 714-051-N00
(5) Do the test of the buffer air cooler for the No. 3 bearing that is shown in the Power Plant Test Reference Table (AMM 71-00-00/501).

ENGINE EXTERNAL ACCESSORIES COOLING - DESCRIPTION AND OPERATION

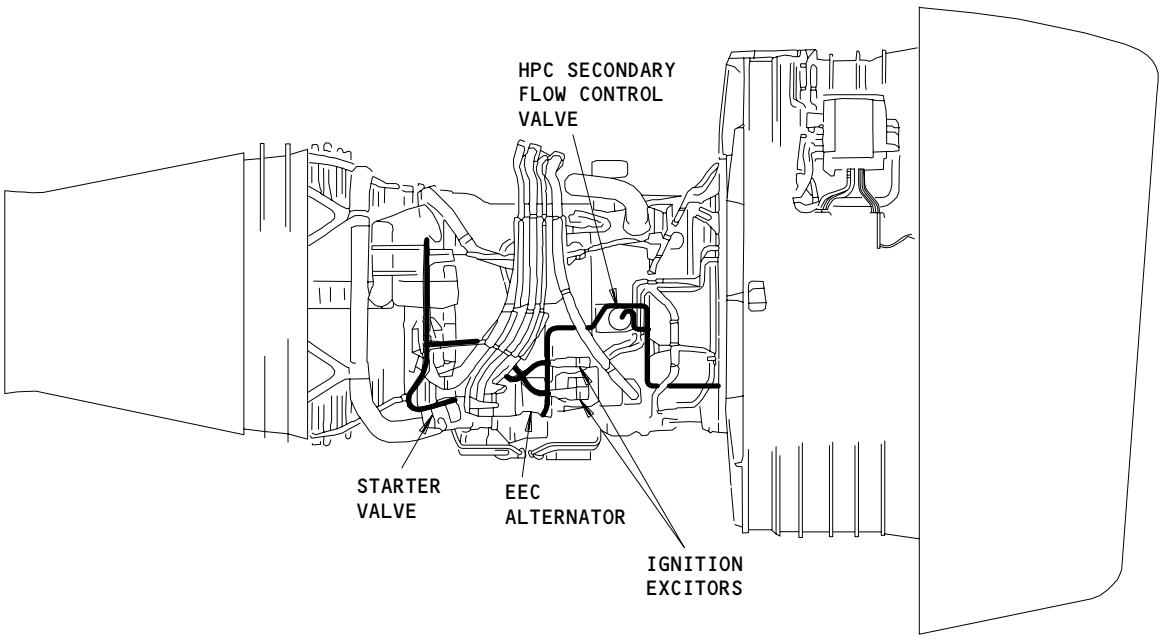
1. General
   A. The temperature of the engine external accessories is decreased with fan air supplied into the nacelle zone area, and to components which must be kept cool.
   B. The nacelle zone ventilation system uses a shutoff valve for the nacelle zone ventilation, and a duct to bleed fan cooling air.
2. Component Details (Fig. 1 and 2)
   A. Nacelle Zone Ventilation Shutoff Valve
      (1) The shutoff valve for nacelle zone ventilation is on the inner wall of the left thrust reverser.
      (2) The shutoff valve is an electrically and pneumatically operated, butterfly-type air shutoff valve. It has an actuator, body, and vane assembly, with a solenoid, actuator pressure relief valve, valve position indicator, and a manual override lock.
      (3) The manual override lock lets the shutoff valve be manually locked in the open position.
   B. Nacelle Zone Ventilation Duct
      (1) The nacelle zone ventilation duct is attached to the aft end of the shutoff valve. It is a perforated discharge duct that permits cooling fan air to be bled into the nacelle area.
   C. Nacelle Zone Ventilation Barometric Switch
      (1) The barometric switch is installed at the middle of the strut.
      (2) The barometric switch is an electrically and pneumatically operated snap-action switch. It controls the position of the shutoff valve at a specified altitude.
   D. Engine External Accessories Cooling Air Ducts.
      (1) The cooling air ducts go around the engine to the applicable accessories. The cooling air ducts supply cooling fan air to the ignition exciters, HPC secondary flow control valves, starter valve, oil quantity transmitter, and EEC alternator.
      (2) These cooling air ducts are not connected from the shutoff valve and duct for the nacelle zone ventilation.
   E. EICAS Indication
      (1) The EICAS advisory (level C) message, L(R) NAC VENT VALVE, will show when the position of the L(R) engine shutoff valve does not agree with the position of the L(R) barometric switch. This message will show only if the engine is in operation, and below an altitude of 35,000 feet.
3. Operation
   A. Functional Description (Fig. 3)
      (1) The nacelle zone ventilation system is controlled by the barometric switch for the nacelle zone as a function of altitude.
      (2) As the airplane goes higher in altitude, the shutoff valve for nacelle zone ventilation stays open until an altitude of 23,900 ±600 feet. At this altitude, the lower ambient pressure permits the barometric switch to supply a ground to energize the solenoid on the shutoff valve with 28 volts dc.



Engine External Accessory Cooling
Figure 1

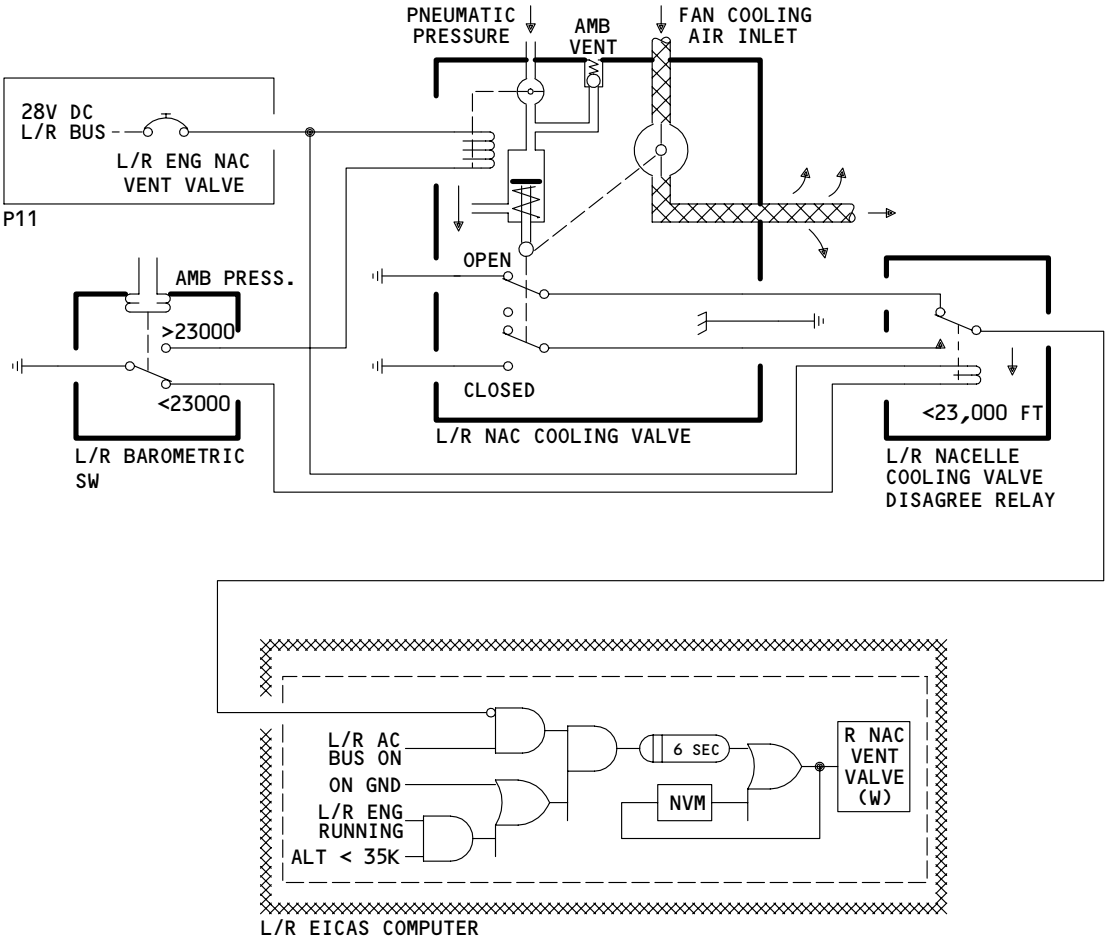


COOLING AIR DUCTS – LEFT SIDE



COOLING AIR DUCTS – RIGHT SIDE

Engine External Accessory Cooling Air Ducts
Figure 2



Engine External Accessory Cooling Schematic
Figure 3

(3) When energized, the solenoid permits pneumatic pressure to close the shutoff valve. The shutoff valve stops the cooling fan air into the nacelle zone ventilation duct.
(4) When the airplane decreases in altitude, the barometric switch removes electrical power from the solenoid at an altitude of 22,600 ±600 feet. This closes the solenoid and stops pneumatic pressure which holds the shutoff valve closed. The shutoff valve opens and lets cooling fan air into the nacelle zone ventilation duct.
(5) If the positions of the shutoff valve and the barometric switch do not agree at an altitude less than 35,000 feet, the valve disagree relay will send a signal to the EICAS computers.

NOTE: The "L (R) NAC VENT VAL" EICAS Maintenance Message will be set when the aircraft is operated between 23,000 feet and 35,000 feet, and the associated engine bleed system is turned off. For this condition, the system is operating as designed, and no troubleshooting is required.

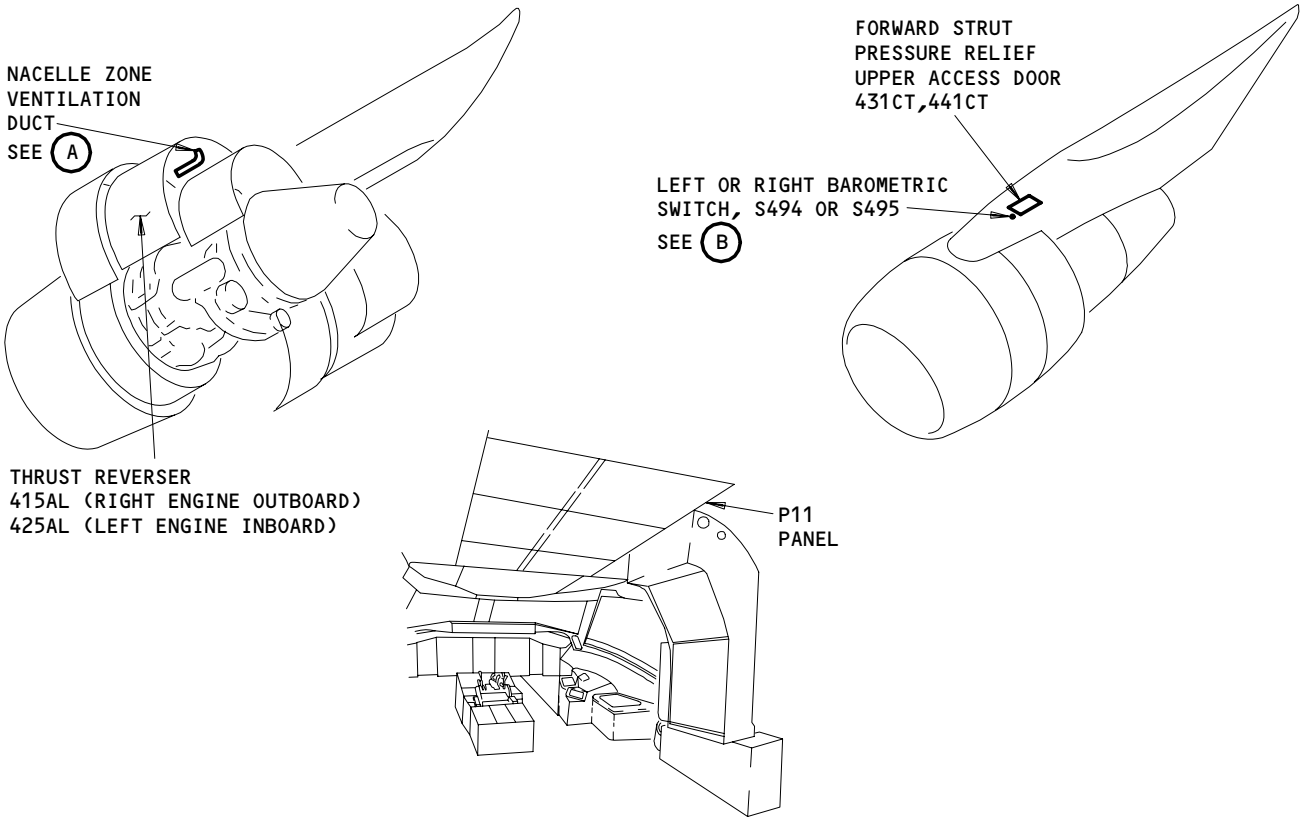
(6) The shutoff valve is made for all modes of failure to cause an open valve.
(7) If you apply a torque on the flats on the bottom of the butterfly shaft, you can manually operate the shutoff valve to the open position. If you engage a lockpin in the actuator shaft, it will lock the shutoff valve in the open position.

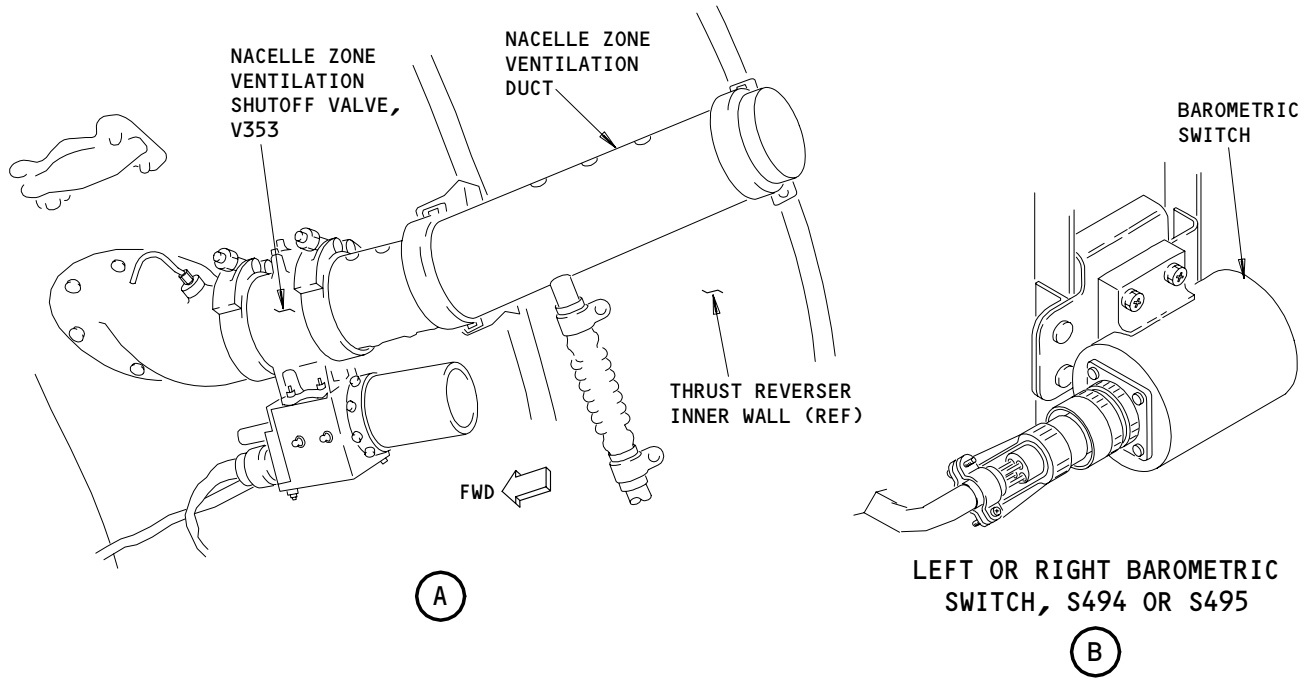
ENGINE EXTERNAL ACCESSORIES COOLING

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	REFERENCE
CIRCUIT BREAKERS	1		FLT COMPT, P11	
NAC VENT VALVE, C1449		1	11K9	*
NAC VENT VALVE, C1450		1	11L35	*
COMPUTER - (REF 31-41-00, FIG. 101)				
L EICAS, M10181				
R EICAS, M10182				
DUCT - NAC ZONE VENTILATION	1	2	415AL,425AL, THRUST REVERSER	75-23-03
RELAY - (REF 31-01-36, FIG. 101)				
L NACELLE COOLING VALVE DISAGREE, K676				
R NACELLE COOLING VALVE DISAGREE, K677				
SWITCH - L BAROMETRIC, S494	1	1	441CT, FWD STRUT PRESS RELIEF UPPER ACCESS DOOR	75-23-04
SWITCH - R BAROMETRIC, S495	1	1	431CT, FWD STRUT PRESS RELIEF UPPER ACCESS DOOR	75-23-04
VALVE - NACELLE ZONE VENTILATION SHUTOFF, V353	1	2	415AL,425AL, THRUST REVERSER	75-23-02

* SEE THE WDM EQUIPMENT LIST

Engine External Accessories Cooling - Component Index
Figure 101





Engine External Accessories Cooling - Component Location
Figure 102

ENGINE EXTERNAL ACCESSORIES COOLING - ADJUSTMENT/TEST

TASK 75-23-00-705-032-N00

1. System Test - Engine External Accessories Cooling

A. Equipment

(1) Vacuum gage - can read an altitude up to 25,000 feet, accurate to ± 50 feet.

(2) Vacuum pump - can supply a pressure of 10 psig (equivalent to an altitude of 25,000 feet).

(3) Air pressure source - adjustable from 0 to 40 psi, accurate to ± 5 psi.

B. References

(1) AMM 24-22-00/201, Electrical Power - Control

(2) AMM 71-11-04/201, Fan Cowl Panels

(3) AMM 71-11-06/201, Core Cowl Panels

(4) AMM 78-31-00/201, Thrust Reverser System

C. Access

(1) Location Zones

431 L Nacelle Strut
441 R Nacelle Strut

(2) Access Panels

431CT Forward Nacelle Strut Fairing
441CT Forward Nacelle Strut Fairing

D. Test the Nacelle Ventilation System (Fig. 501)

S 865-002-N00

(1) Supply electrical power (AMM 24-22-00/201).

S 865-003-N00

(2) Make sure these circuit breakers on the overhead circuit breaker panel P11 are closed:
(a) 11U15, LANDING GEAR AIR/GND SYS 1
(b) 11U23, LANDING GEAR POSITION AIR/GND SYS 2

S 865-004-N00

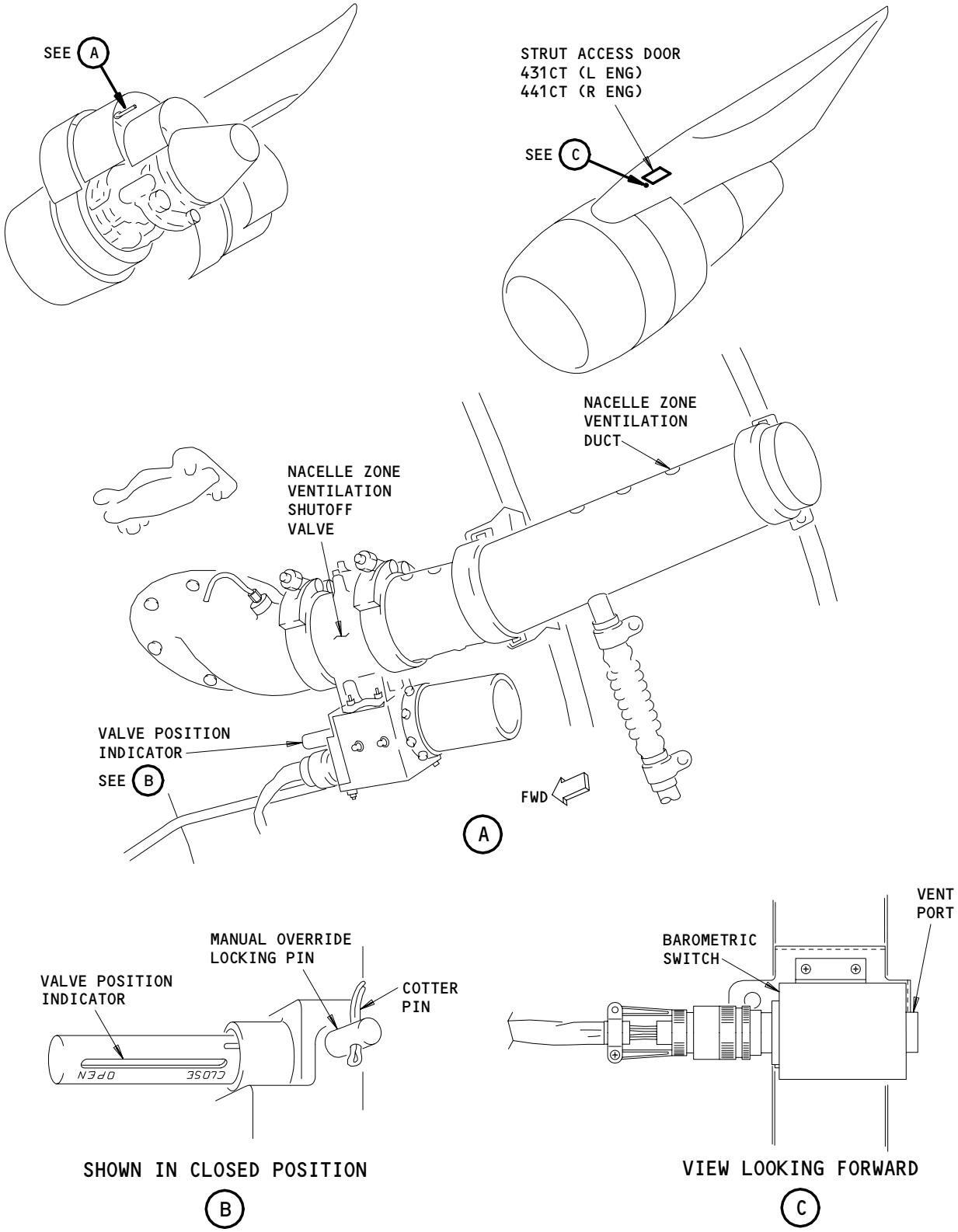
(3) Make sure the six EICAS circuit breakers are closed.

S 865-005-N00

(4) For the left engine, make sure this circuit breaker on the overhead circuit breaker panel P11 is closed:
(a) 11K9, LEFT ENGINE NAC VENT VALVE

S 865-006-N00

(5) For the right engine, make sure this circuit breaker on the overhead circuit breaker panel P11 is closed:
(a) 11L35, RIGHT ENGINE NAC VENT VALVE



Engine External Accessories Cooling Test
Figure 501

S 015-007-N00
(6) Open the left fan cowl panel (AMM 71-11-04/201).

S 045-008-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO YOU OR DAMAGE TO EQUIPMENT.

(7) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 015-009-N00
(8) Open the left core cowl panel (AMM 71-11-06/201).

S 015-010-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT COULD OCCUR.

(9) Open the left thrust reverser (AMM 78-31-00/201).

S 015-031-N00
(10) Open the strut access door 431CT (441CT).

S 495-011-N00
(11) Attach the vacuum pump line to the vent port on the barometric switch.

S 495-012-N00
(12) Attach the air supply to the pneumatic line of the nacelle-zone-ventilation-shutoff valve.

S 865-013-N00
(13) Make sure the nacelle-zone-ventilation-shutoff valve is in the open position.
(a) Pneumatic supply and vacuum is not applied to the barometric switch.

S 865-014-N00
(14) Make sure the nacelle-zone-ventilation-shutoff valve is not manually locked in the open position.

S 865-015-N00
(15) Make sure the EICAS message, L (R) NAC VENT VAL, does not show on the bottom display.

S 865-016-N00
(16) Apply a slow and continuous vacuum, to the vent port on the barometric switch, to a maximum altitude of 25,000 feet (standard atmosphere).
(a) Make sure the nacelle-zone-ventilation-shutoff valve stays open.
(b) Make sure this EICAS message, L(R) NAC VENT VAL, shows on the bottom display.

S 865-017-N00
(17) Apply a pressure of 35 psig to the pneumatic line on the nacelle-zone-ventilation-shutoff valve.
(a) Make sure the nacelle-zone-ventilation-shutoff valve closes.
(b) Make sure this EICAS message, L(R) NAC VENT VAL, does not show on the bottom display.

S 865-018-N00
(18) Slowly and continuously decrease the vacuum to the barometic switch.
(a) Make sure the nacelle-zone-ventilation-shutoff valve opens between an altitude of 23,200 and 22,000 feet when you decrease the vacuum.

S 865-019-N00
(19) Increase the vacuum to an altitude of 25,000 feet.
(a) Make sure the nacelle-zone-ventilation-shutoff valve closes between an altitude of 23,300 and 24,500 feet when you increase the vacuum.

S 865-020-N00
(20) Decrease the vacuum to the vent port on the barometric switch.

S 095-021-N00
(21) Remove the vacuum line from the vent port on the barometric switch.

S 865-022-N00
(22) Decrease the pneumatic pressure to zero.

S 095-023-N00
(23) Remove the air pressure line from the nacelle-zone-ventilation-shutoff valve.

S 435-024-N00
(24) Connect the pneumatic line to the nacelle-zone-ventilation-shutoff valve with the tube nut.
(a) Tighten the tube nut.

E. Put the airplane back to its initial condition.

S 415-025-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT COULD OCCUR.

(1) Close the left thrust reverser (AMM 78-31-00/201).

S 415-026-N00

(2) Close the left core cowl panel (AMM 71-11-06/201).

S 415-027-N00

(3) Close the left fan cowl panel (AMM 71-11-04/201).

S 415-028-N00

(4) Close the strut access door 431CT (441CT).

S 445-029-N00

(5) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

S 865-030-N00

(6) Remove electrical power if it is no longer necessary (AMM 24-22-00/201).

NACELLE ZONE VENTILATION SHUTOFF VALVE - REMOVAL/INSTALLATION

1. General
   A. The shutoff valve for the nacelle zone ventilation is attached to the fan duct cowl on the left half of the thrust reverser.

TASK 75-23-02-004-001-N00

2. Remove the Nacelle Zone Ventilation Shutoff Valve
   A. References
      (1) AMM 36-00-00/201, Pneumatic Power
      (2) AMM 71-11-04/201, Fan Cowl Panels
      (3) AMM 71-11-06/201, Core Cowl Panels
      (4) AMM 78-31-00/201, Thrust Reverser System
   B. Access
      (1) Location Zones
          411 Left Engine
          421 Right Engine

      (2) Access Panels
          415AL Fan Reverser (Left)
          425AL Fan Reverser (Left)

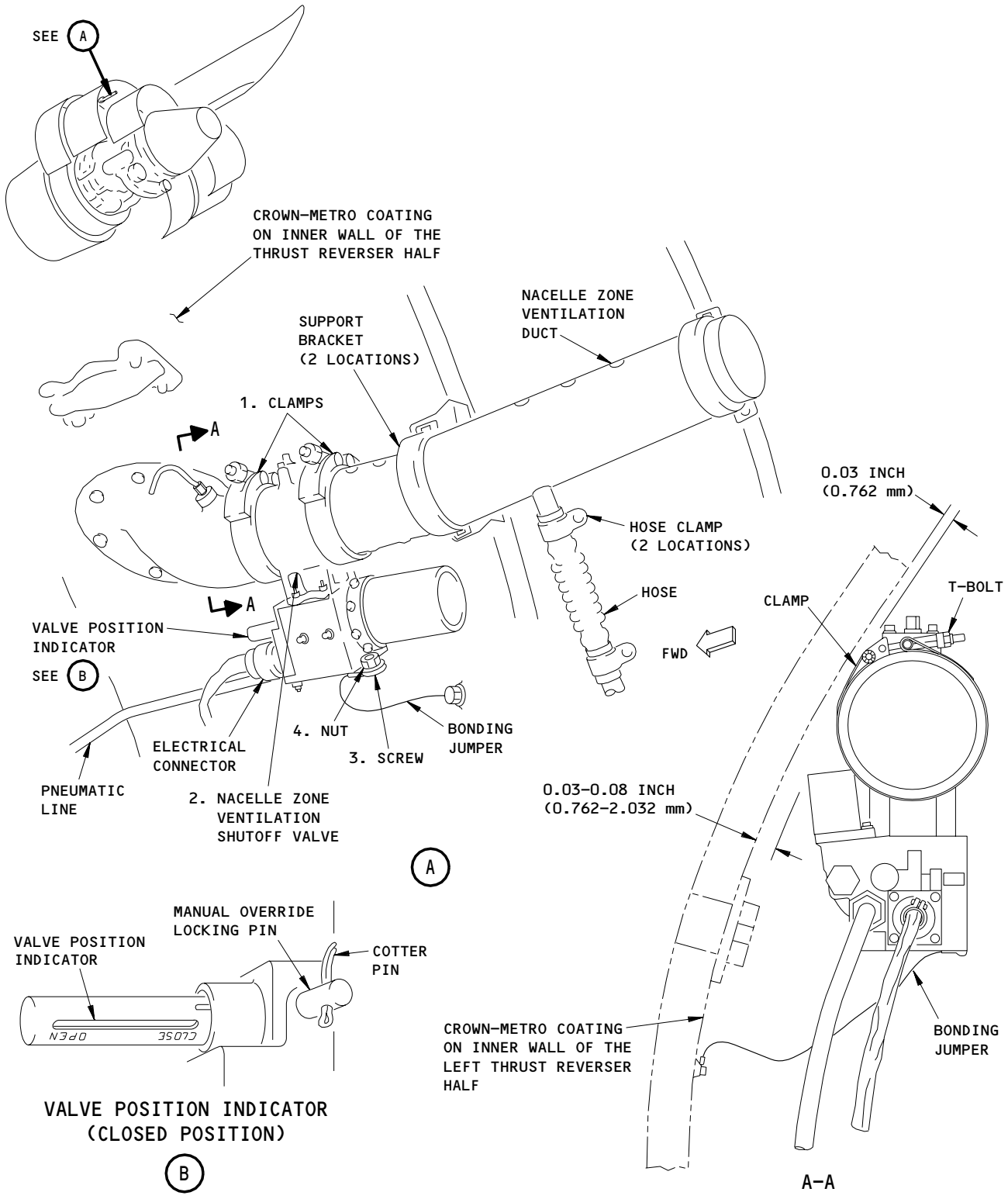
   C. Prepare to Remove the Shutoff Valve

      S 864-002-N00
      (1) For the left engine, open this circuit breaker on the overhead circuit breaker panel, P11, and attach a DO-NOT-CLOSE tag:
          (a) 11K9, LEFT ENGINE NAC VENT VALVE

      S 864-003-N00
      (2) For the right engine, open this circuit breaker on the overhead circuit breaker panel, P11, and attach a DO-NOT-CLOSE tag:
          (a) 11L35, RIGHT ENGINE NAC VENT VALVE

      S 864-004-N00
      (3) Remove pneumatic power (AMM 36-00-00/201).

      S 014-005-N00
      (4) Open the left fan cowl panel (AMM 71-11-04/201).



Nacelle Zone Ventilation Shutoff Valve Installation
Figure 401

S 044-006-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(5) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 014-007-N00

(6) Open the left core cowl panel (AMM 71-11-06/201).

S 014-008-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT COULD OCCUR.

(7) Open the left thrust reverser (AMM 78-31-00/201).

D. Remove the Shutoff Valve for the Nacelle Zone Ventilation (Fig. 401)

S 034-009-N00

(1) Disconnect the electrical connector.
(a) Install the protection covers.

S 034-010-N00

(2) Disconnect the pneumatic line from the shutoff valve.
(a) Install the protection covers.

S 034-011-N00

(3) Remove the screws (3) and nut (4) to disconnect the bonding jumper.

S 024-012-N00

(4) Remove the clamps (1) which attach the shutoff valve (2) to the ventilation duct for the nacelle zone.

S 024-013-N00

(5) Remove the shutoff valve from the engine.
(a) Install the protection covers.

TASK 75-23-02-404-014-N00

3. Install the Nacelle Zone Ventilation Shutoff Valve

A. Parts

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	2	Valve - Shutoff	75-23-02	10	240

B. References
(1) AMM 20-10-21/601, Electrical Bonding
(2) AMM 36-00-00/201, Pneumatic Power
(3) AMM 71-11-04/201, Fan Cowl Panels
(4) AMM 71-11-06/201, Core Cowl Panels
(5) AMM 78-31-00/201, Thrust Reverser System

C. Access
(1) Location Zones
411 Left Engine
421 Right Engine

(2) Access Panels
415AL Fan Reverser (Left)
425AL Fan Reverser (Left)

D. Procedure (Fig. 401)

S 434-033-N00
(1) Make sure the cotter pin holds the lockpin in the correct position.

NOTE: If you do not install the cotter pin, the lockpin will be pushed. With the lockpin pushed, the valve will be manually locked in the open position.

S 424-015-N00
(2) Put the valve clamps (1) on the duct so that they are on the left and right sides of the installed valve (2).

S 434-034-N00

CAUTION: PUT THE VALVE AS CLOSE TO THE INNER WALL OF THE LEFT THRUST REVERSER AS POSSIBLE. THERE MUST BE SUFFICIENT CLEARANCE BETWEEN THE VALVE AND THE GENERATOR FEEDER CABLES. IF THE VALVE TOUCHES THE GENERATOR FEEDER CABLES, THE CABLES CAN BE DAMAGED AND THE GENERATOR CAN TRIP OFF.

(3) Put the valve (2) as shown in View A.
  (a) Adjust the valve position.

    NOTE: Make sure the bottom of the valve is close to the inner wall of the left thrust reverser.

  (b) Point the clamps (1) with the T-bolt out and down.
  (c) Turn the clamp on the flange.
  (d) Do a check of the clearance between the shutoff valve and Crown-metro coating on the inner wall of the left thrust reverser, as follows:
    1) Make sure that the distance between the head of the bolt to the Crown-metro coating on the inner wall surface is 0.03 inch (0.762 mm) or less.
      a) If the clearance is not correct, adjust the T-bolt again.
    2) Make sure that the distance between the shutoff valve to the Crown-metro coating on the inner wall surface is 0.03 - 0.08 inch (0.762 - 2.032 mm) or less.
      a) If the clearance is not correct, adjust the shutoff valve assembly.
  (e) Tighten the clamp nuts.

S 434-019-N00
(4) Remove the protection cover from the pneumatic line.

S 434-020-N00
(5) Connect the pneumatic line to the shutoff valve (2).
  (a) Tighten the tube nut.

S 434-021-N00
(6) Remove the protection cover from the electrical connector.

S 434-022-N00
(7) Connect the electrical connector to the shutoff valve (2).

S 214-023-N00
(8) Make sure the manual override locking pin is not in the housing.
  (a) Make sure the cotter pin is installed to hold the manual override locking pin in the open position as shown.

S 434-024-N00
(9) Connect the bonding jumper from the inner wall of the thrust reverser to the shutoff valve (2) with the screw (3) and nut (4).

S 224-025-N00
(10) Examine the bonding resistance between the shutoff valve (2) and the inner wall (AMM 20-10-21/601).
(a) Make sure the bonding resistance is not more than 0.001 ohms.

E. Put the Airplane Back to Its Usual Condition

S 864-026-N00
(1) Supply pneumatic power (AMM 36-00-00/201).

S 414-027-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT COULD OCCUR.

(2) Close the left thrust reverser (AMM 78-31-00/201).

S 414-028-N00
(3) Close the left core cowl panel (AMM 71-11-06/201).

S 444-029-N00
(4) Do the activation procedure for the thrust reversers (AMM 78-31-00/201).

S 414-030-N00
(5) Close the left fan cowl panel (AMM 71-11-04/201).

S 864-031-N00
(6) For the left engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 panel:
(a) 11K9, LEFT ENGINE NAC VENT VALVE

S 864-032-N00
(7) For the right engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 panel:
(a) 11L35, RIGHT ENGINE NAV VENT VALVE

NACELLE ZONE VENTILATION DUCT - REMOVAL/INSTALLATION

1. General
   A. This procedure has two tasks. The first task removes the ventilation duct for the nacelle zone. The second task installs the ventilation duct for the nacelle zone.
   B. The ventilation duct is attached to the fan duct cowl on the left half of the thrust reverser.

TASK 75-23-03-004-001-N00

2. Remove the Nacelle Zone Ventilation Duct
   A. References
      (1) AMM 71-11-04/201, Fan Cowl Panels
      (2) AMM 71-11-06/201, Core Cowl Panels
      (3) AMM 78-31-00/201, Thrust Reverser System
   B. Access
      (1) Location Zones
          411 Left Engine
          421 Right Engine

      (2) Access Panels
          415AL Fan Reverser (Left)
          425AL Fan Reverser (Left)

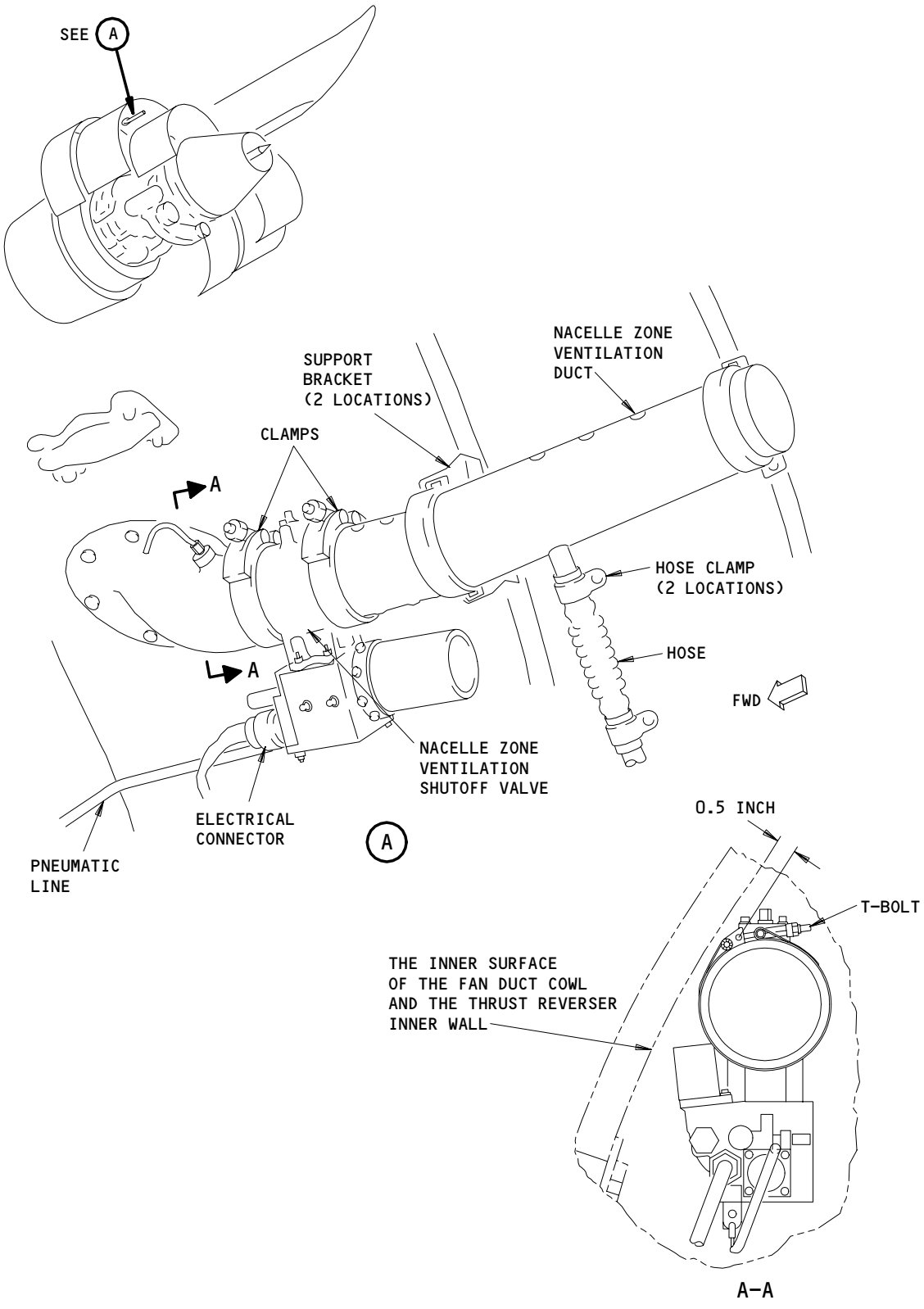
   C. Prepare to Remove the Ventilation Duct

      S 014-002-N00
      (1) Open the left fan cowl panel (AMM 71-11-04/201).

      S 044-003-N00

      WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

      (2) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).



Nacelle Zone Ventilation Duct Installation
Figure 401

S 014-004-N00
(3) Open the core cowl panel (AMM 71-11-06/201).

S 014-005-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(4) Open the left thrust reverser (AMM 78-31-00/201).

D. Remove the Ventilation Duct (Fig. 401)

S 034-006-N00
(1) Remove the clamp which attaches the ventilation duct to the shutoff valve for the nacelle zone ventilation.

S 034-007-N00
(2) Loosen the hose clamp which attaches the hose to the ventilation duct.

S 034-008-N00
(3) Disconnect the hose from the ventilation duct.

S 024-009-N00
(4) Remove the bolts which attach the ventilation duct and the support brackets to the fan duct cowl and the thrust reverser.

S 024-010-N00
(5) Remove the ventilation duct and the support brackets.

TASK 75-23-03-404-011-N00

3. Install the Nacelle Zone Ventilation Duct

A. References
(1) AMM 71-11-04/201, Fan Cowl Panels
(2) AMM 71-11-06/201, Core Cowl Panels
(3) AMM 78-31-00/201, Thrust Reverser System

B. Access
(1) Location Zones
411 Left Engine
421 Right Engine

(2) Access Panels
415AL Fan Reverser (Left)
425AL Fan Reverser (Left)

C. Procedure (Fig. 401)

S 434-012-N00
(1) Put the clamp on the shutoff valve for the nacelle zone ventilation.

S 424-013-N00
(2) Install the ventilation duct and the support brackets to the fan duct cowl and the thrust reverser with the bolts.
(a) Tighten the bolts.

S 434-014-N00
(3) Connect the hose to the ventilation duct.
(a) Tighten the hose clamp.

S 424-015-N00
(4) Install the clamp to attach the ventilation duct to the shutoff valve with the T-bolt, threads which extend outboard and down.

S 424-016-N00
(5) Turn the clamp on the flange to put the cross-head of the T-bolt in 0.5 inch or less from the inner surface of the fan duct cowl and the inner wall of the thrust reverser.
(a) Tighten the clamp.

D. Put the Airplane Back to Its Usual Condition.

S 414-017-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Close the left thrust reverser (AMM 78-31-00/201).

S 414-018-N00
(2) Close the left core cowl panel (AMM 71-11-06/201).

S 414-019-N00
(3) Close the left fan cowl panel (AMM 71-11-04/201).

S 444-020-N00
(4) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

BAROMETRIC SWITCH - REMOVAL/INSTALLATON

1. General
   A. This procedure has two tasks. The first task removes the barometric switch. The second task installs the barometric switch.

   TASK 75-23-04-004-001-N00

2. Remove the Barometric Switch
   A. References
      (1) AMM 78-31-00/201, Thrust Reverser System
   B. Access
      (1) Location Zones
          431 L Forward Nacelle Strut Fairing
          441 R Forward Nacelle Strut Fairing

      (2) Access Panels
          431CT Forward Strut Pressure Relief Upper Access Door
          441CT Forward Strut Pressure Relief Upper Access Door

   C. Prepare to Remove the Barometric Switch

      S 044-002-N00

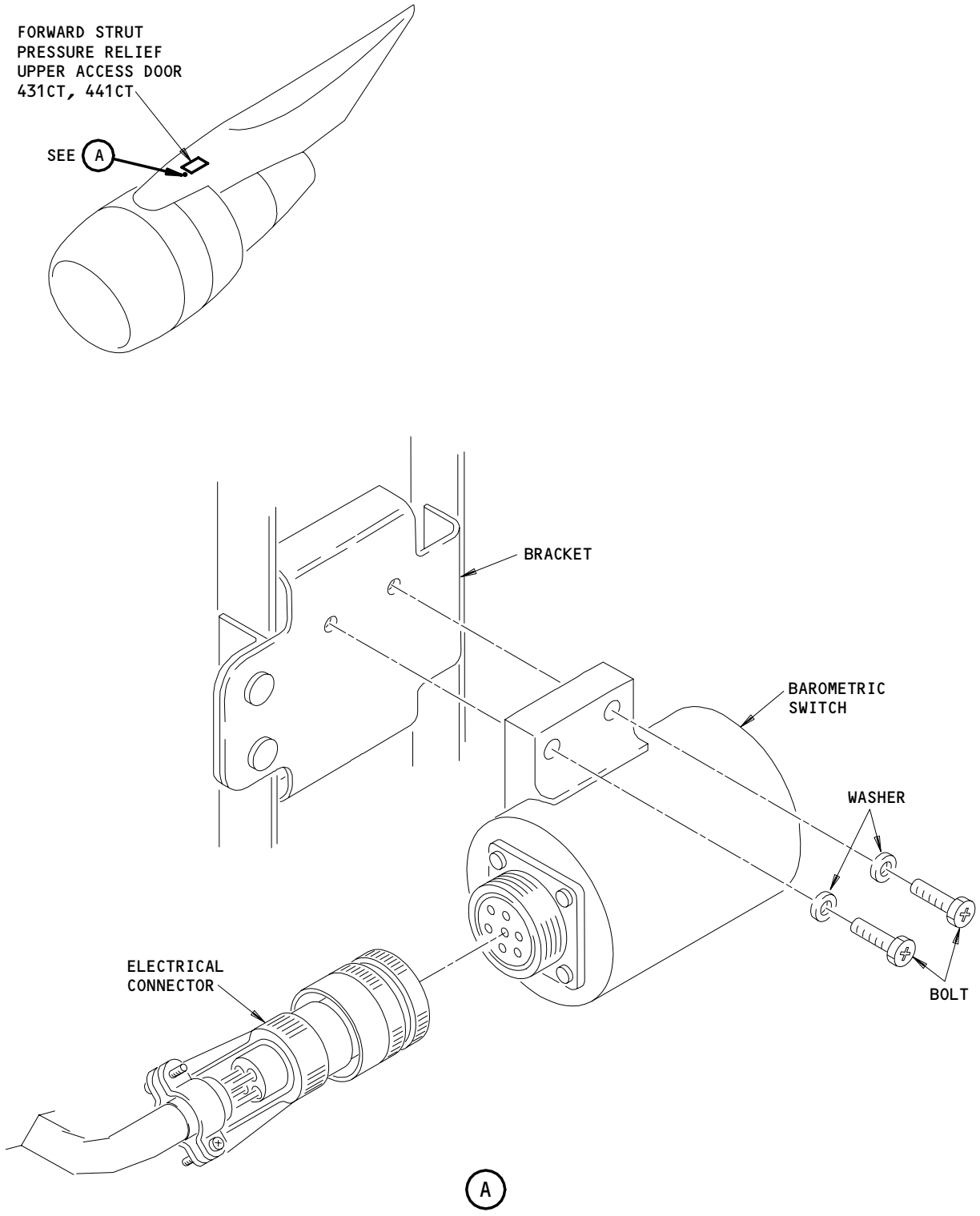
      WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

      (1) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

      S 014-003-N00
      (2) Open the upper access door on the forward strut for pressure relief.

      S 864-004-N00
      (3) For the left engine, open this circuit breaker on the overhead circuit breaker panel, P11, and attach a DO-NOT-CLOSE tag:
      (a) 11K9, L ENG NAC VENT VALVE

      S 864-005-N00
      (4) For the right engine, open this circuit breaker on the overhead circuit breaker panel, P11, and attach a DO-NOT-CLOSE tag:
      (a) 11L35, R ENG NAC VENT VALVE



Barometric Switch Installation
Figure 401

D. Remove the Barometric Switch (Fig. 401)

S 034-006-N00

(1) Disconnect the electrical connector from the barometric switch.

S 024-007-N00

(2) Remove the bolts and washers which attach the barometric switch to the bracket.

S 024-008-N00

(3) Remove the barometric switch.

S 154-009-N00

(4) Remove the remaining sealant of the fillet seal for the barometric switch on the bracket.

TASK 75-23-04-404-010-N00

3. Install the Barometric Switch

A. Consumable Materials

(1) A00436 Sealant - BMS 5-26

B. References

(1) AMM 51-31-01/201, Seals and Sealing

(2) AMM 78-31-00/201, Thrust Reverser System

C. Access

(1) Location Zones

431 L Forward Nacelle Strut Fairing

441 R Forward Nacelle Strut Fairing

(2) Access Panels

431CT Forward Strut Pressure Relief Upper Access Door

441CT Forward Strut Pressure Relief Upper Access Door

D. Procedure (Fig. 401)

S 154-011-N00

CAUTION: MAKE SURE THE THE ELECTRICAL BONDING SURFACE, AS SEEN WITH YOUR EYES, ARE SMOOTH, FLAT AND VISUALLY FREE OF ALL MATERIALS WHICH TRANSMIT ELECTRICITY OR CAUSE CORROSION. THESE MATERIALS ARE OILS, GREASES, FINISHES AND ABRASIVE PARTICLES AND METAL OXIDES ON THE SURFACE. YOU MUST OBEY THESE INSTRUCTIONS TO MAKE SURE THERE IS A SUFFICIENT ELECTRICAL BOND.

(1) Before you install the barometric switch, do the steps that follow:

(a) You must remove all temporary protection coatings.

(b) Clean the bonding surfaces of the barometric switch and the bracket again.

(c) Prepare the bonding surfaces as it is necessary.

S 424-012-N00
(2) Install the barometric switch to the bracket with the bolts and washers.
(a) Tighten the bolts.

S 434-013-N00
(3) Install the electrical connector to the barometric switch.

S 394-014-N00
(4) Apply the extensive fillet seal BMS 5-26 at this joint all around the barometric switch (AMM 51-31-01/201).

E. Put the Airplane Back to Its Usual Condition

S 414-015-N00
(1) Close the upper access door on the forward strut for pressure relief.

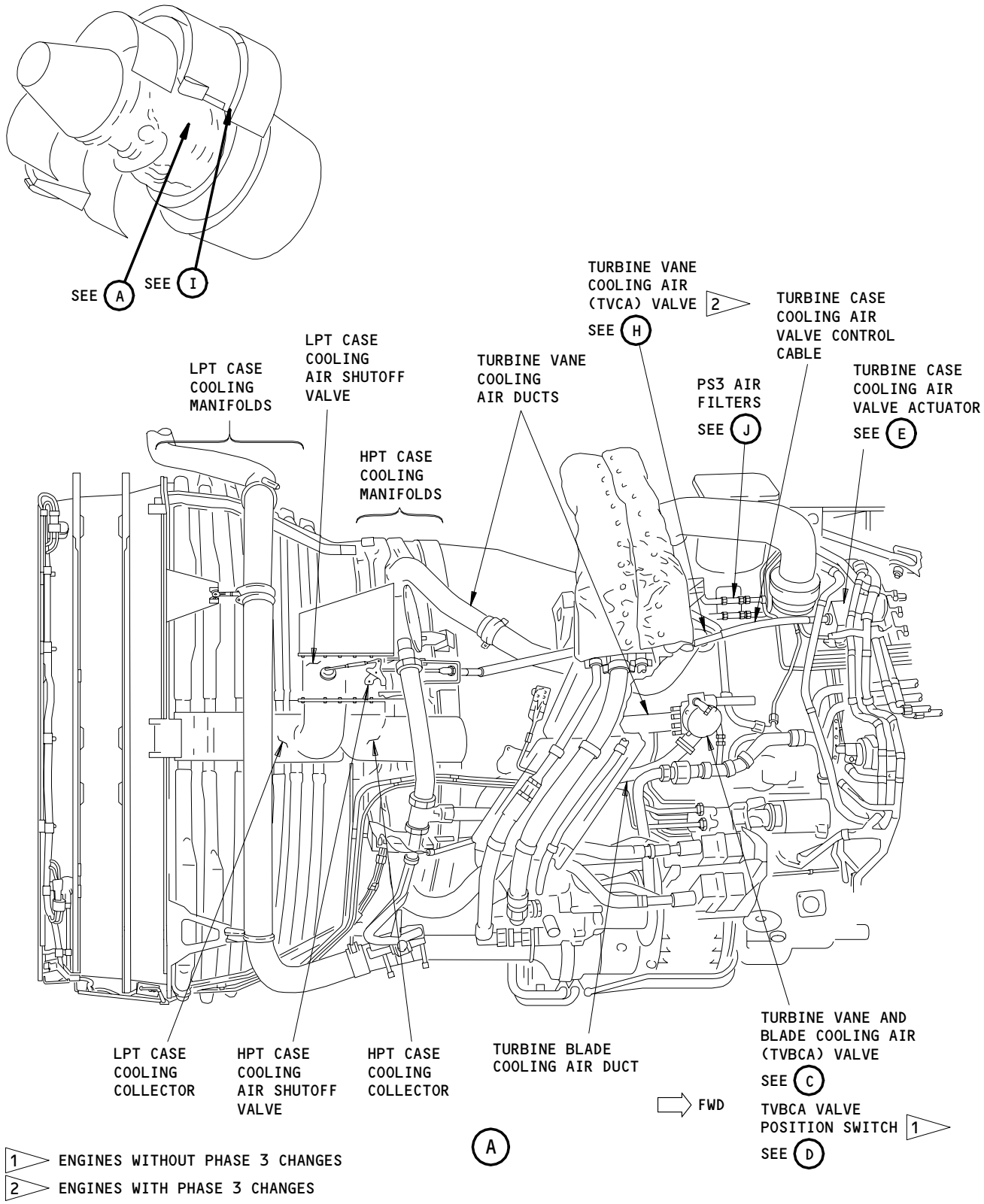
S 864-016-N00
(2) For the left engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 panel:
(a) 11K9, L ENG NAC VENT VALVE

S 864-017-N00
(3) For the right engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 panel:
(a) 11L35, R ENG NAC VENT VALVE

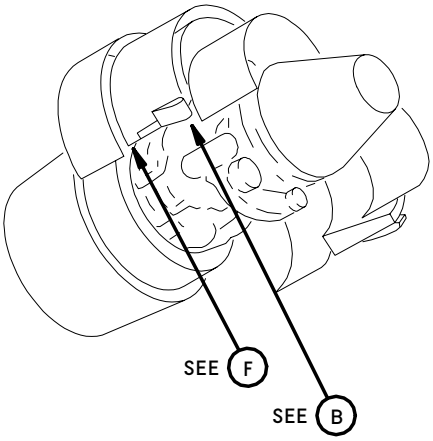
S 444-018-N00
(4) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

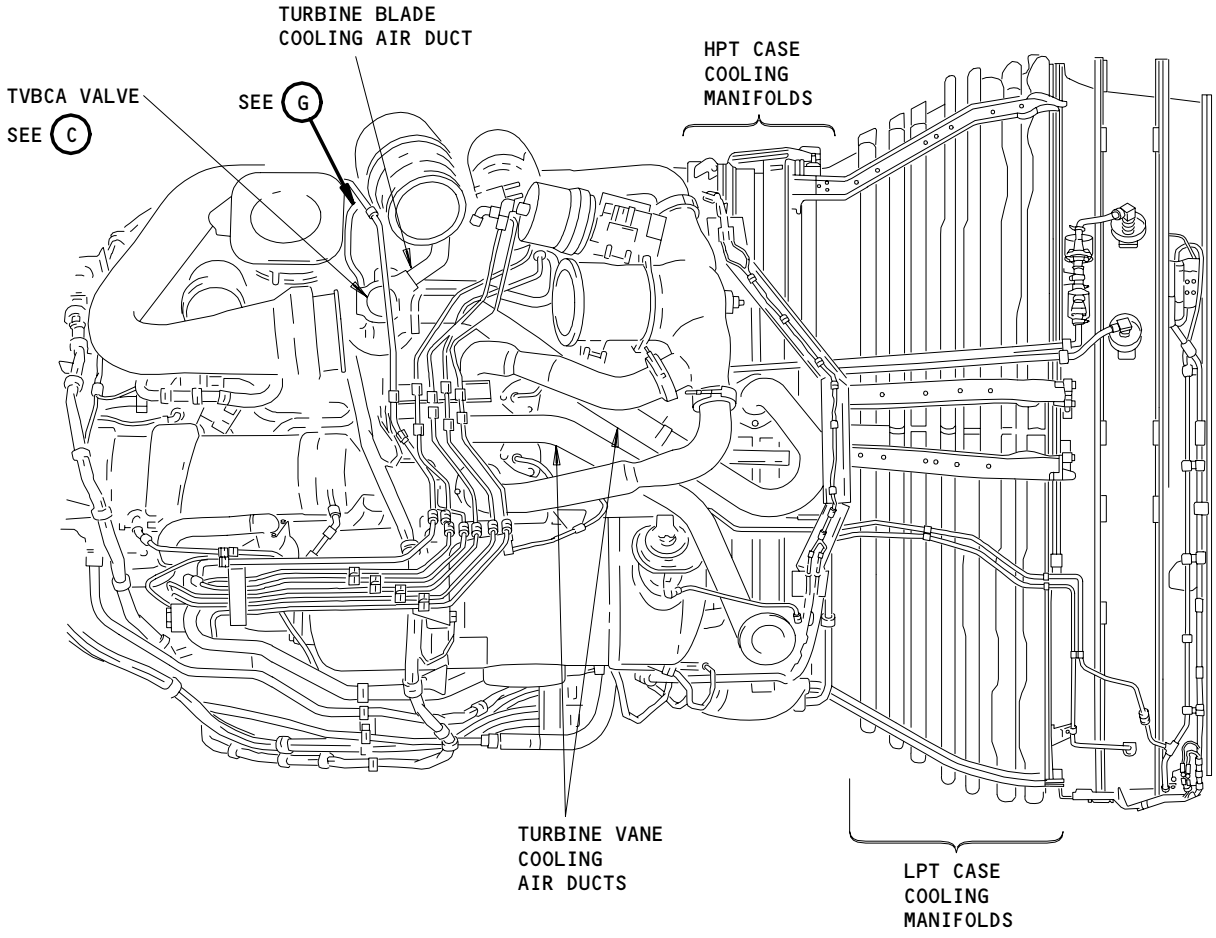
TURBINE COOLING SYSTEM - DESCRIPTION AND OPERATION

1. General
   A. The turbine cooling system is used to increase the performance of the engine. The turbine cooling system controls the blade tip clearances in the high and low pressure turbines (HPT and LPT).
   B. Fan discharge air is used by the turbine cooling system to decrease the temperature of the external turbine case and the internal vane and blades.
   C. The turbine case cooling (TCC) includes an air valve actuator, control cable, inlet duct, air shutoff valves, collectors, and manifolds for the HPT and LPT.
   D. ENGINES WITHOUT PHASE 3;
      The turbine vane and blade cooling includes an air valve position switch, air valve filter, air valve solenoid, air valves and air ducts.
   E. ENGINES WITH PHASE 3;
      The turbine vane and blade cooling system includes an air valve filter, air valve solenoids, air valves and air ducts.
2. Component Details (Fig. 1 and 2)
   A. Turbine Case Cooling (TCC) Air Valve Actuator
      (1) The air valve actuator for the TCC is on the HPC front case at the 2 o'clock position.
      (2) The air valve actuator has a dual-coil torque motor, pilot valve, piston rod, and dual linear variable differential transformers (LVDT).
      (3) The position of the piston rod in the air valve actuator is controlled by hydraulic pressure.
      (4) The dual linear variable differential transformers (LVDT) get the position of the piston rod, and transmit the signal back to the EEC. This is an indication of the positions of the TCC air shutoff valve.
   B. Turbine Case Cooling (TCC) Air Valve Control Cable
      (1) The control cable for the TCC air valve is connected between the air valve actuator and the mechanical linkage of the air shutoff valve for the HPT TCC.
      (2) The control cable transmits the linear motion of the piston in the TCC air valve actuator to the TCC air shutoff valves.
      (3) The control cable is a push-pull flex cable in a hard sheath. The control cable has an adjustable aft end.
   C. HPT and LPT Turbine Case Cooling (TCC) Air Shutoff Valves
      (1) The air shutoff valves for the HPT and LPT turbine case cooling (TCC) are installed on the LPT case at the 2 o'clock position.
      (2) The two shutoff valves, HPT and LPT, are mechanically operated, fully-modulated, butterfly-type valves. They control the cooling airflow from the fan discharge to the manifolds around the turbine cases.
      (3) The HPT TCC air shutoff valve controls cooling air to the HPT case manifold.
      (4) The LPT TCC air shutoff valve controls cooling air to the LPT case manifold.
   D. HPT and LPT Turbine Case Cooling (TCC) Manifolds
      (1) The HPT TCC manifold is installed around the HPT case.

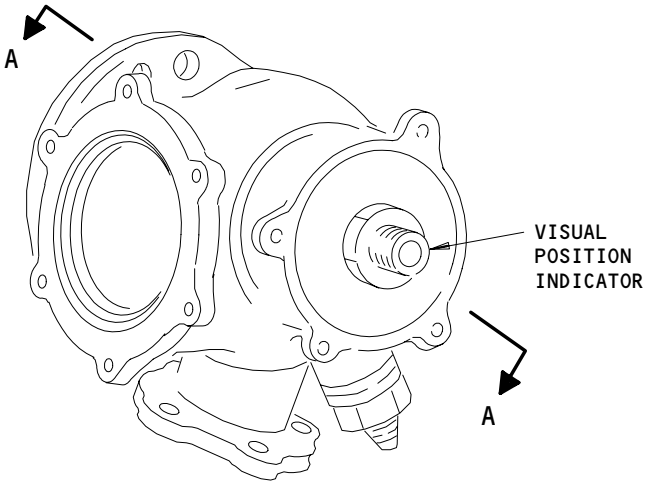


Turbine Cooling System Component Location
Figure 1 (Sheet 1)



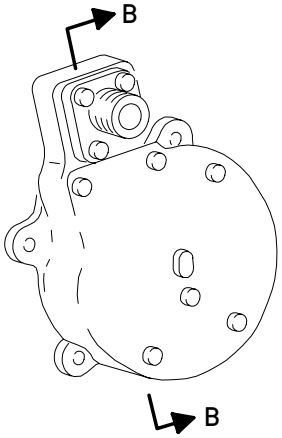


Turbine Cooling System Component Location
Figure 1 (Sheet 2)



TVBCA VALVE

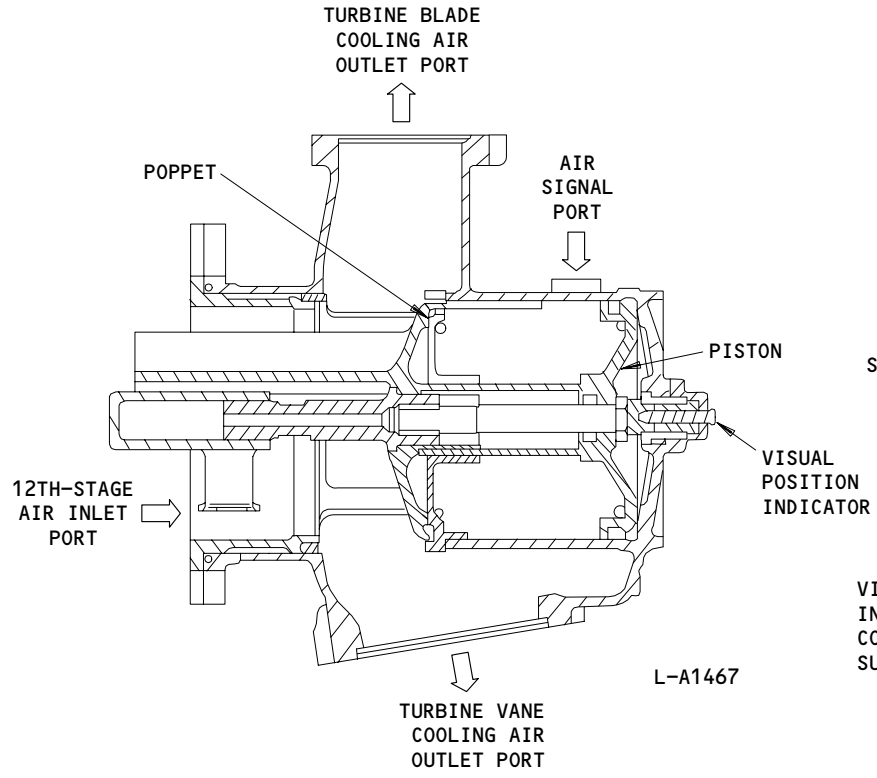
C



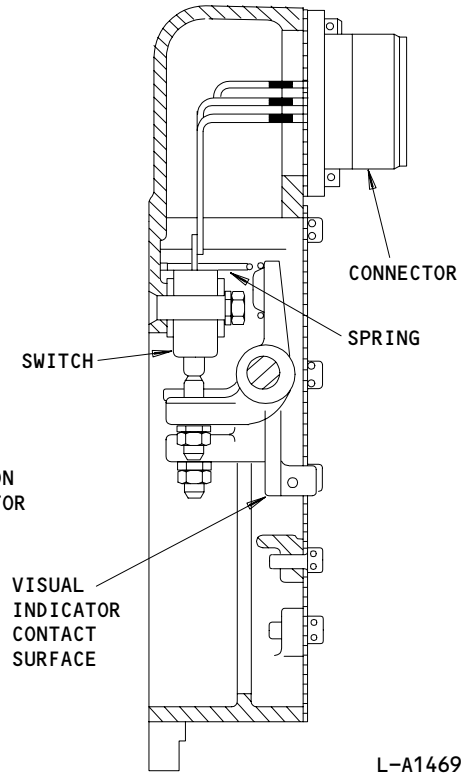
L-A2751

TVBCA VALVE
POSITION SWITCH

D 1

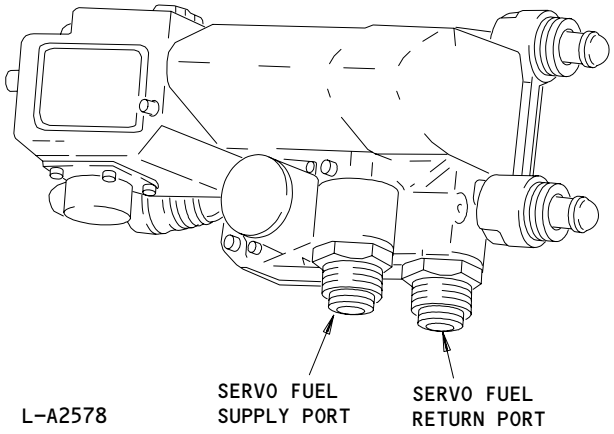


TVBCA VALVE CROSS-SECTIONAL VIEW
A-A



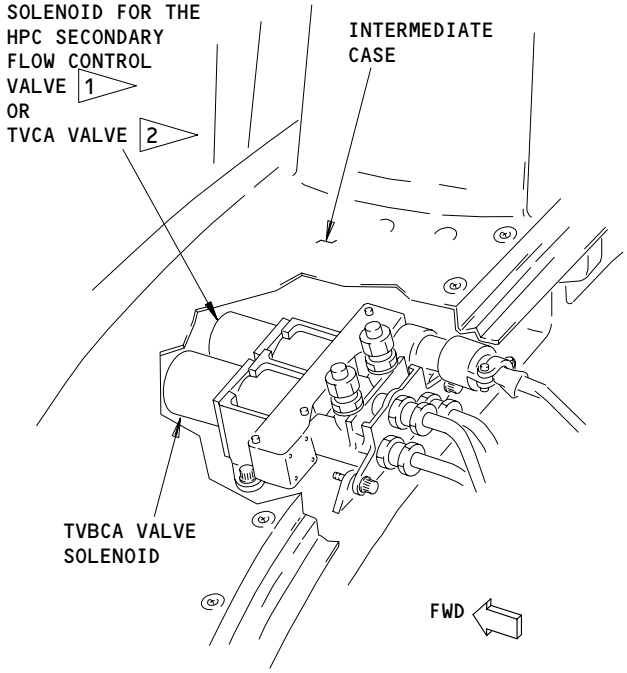
TVBCA VALVE POSITION SWITCH
CROSS-SECTIONAL VIEW
B-B

Turbine Cooling System Component Location
Figure 1 (Sheet 3)



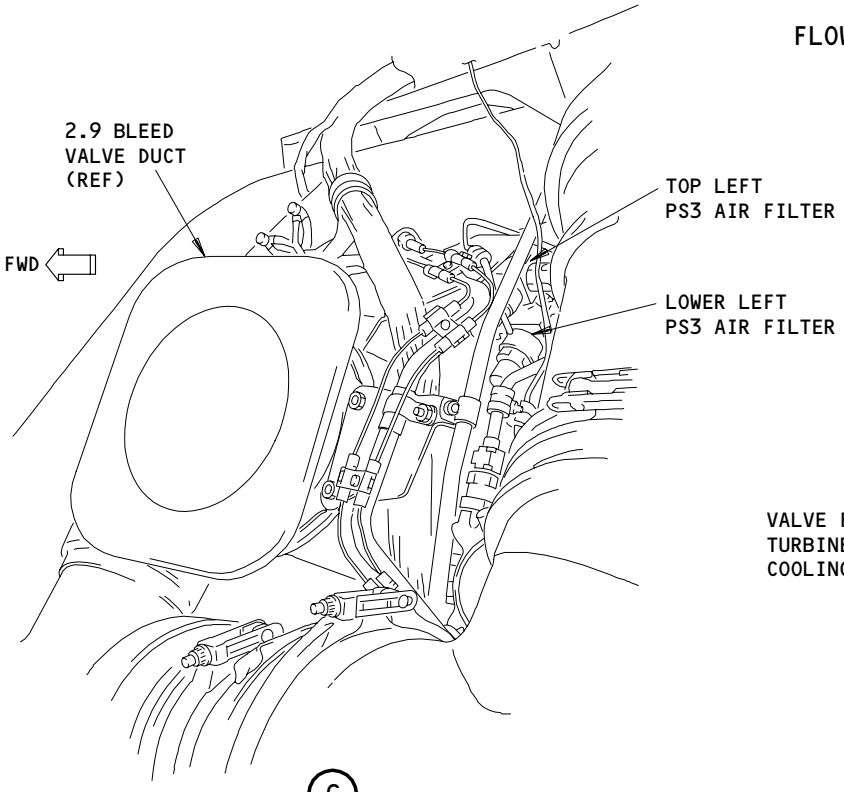
TURBINE CASE COOLING AIR VALVE ACTUATOR

(E)

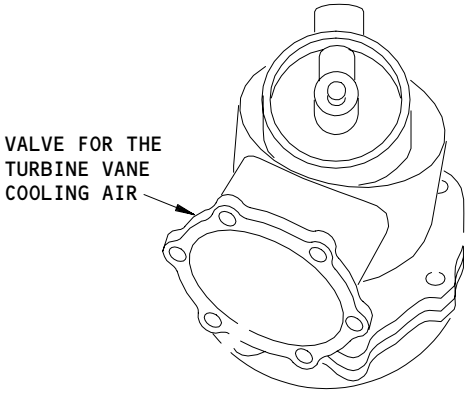


HPC SECONDARY FLOW CONTROL OR TVCA VALVE AND TVBCA VALVE SOLENOID

(F)



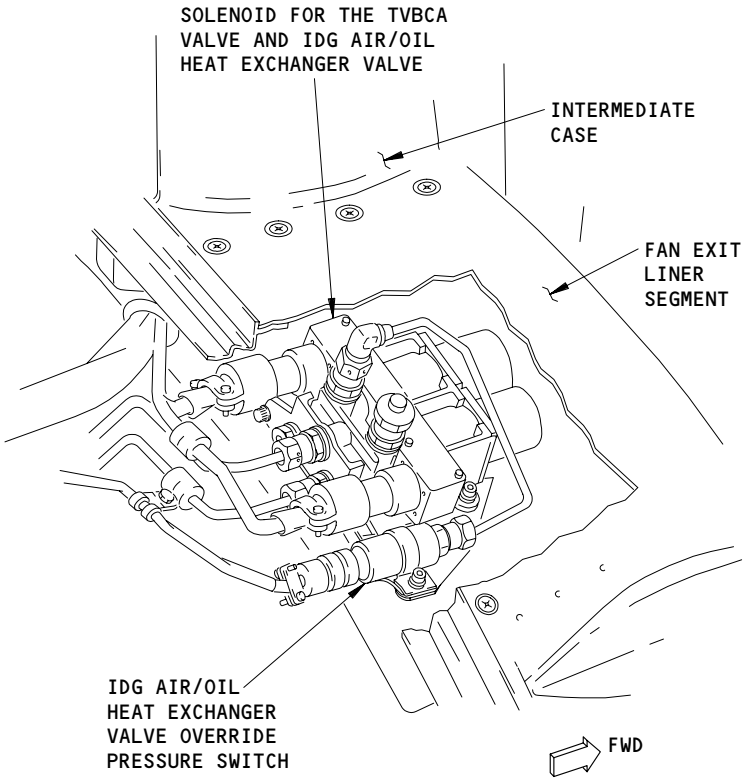
(G)



TVCA VALVE

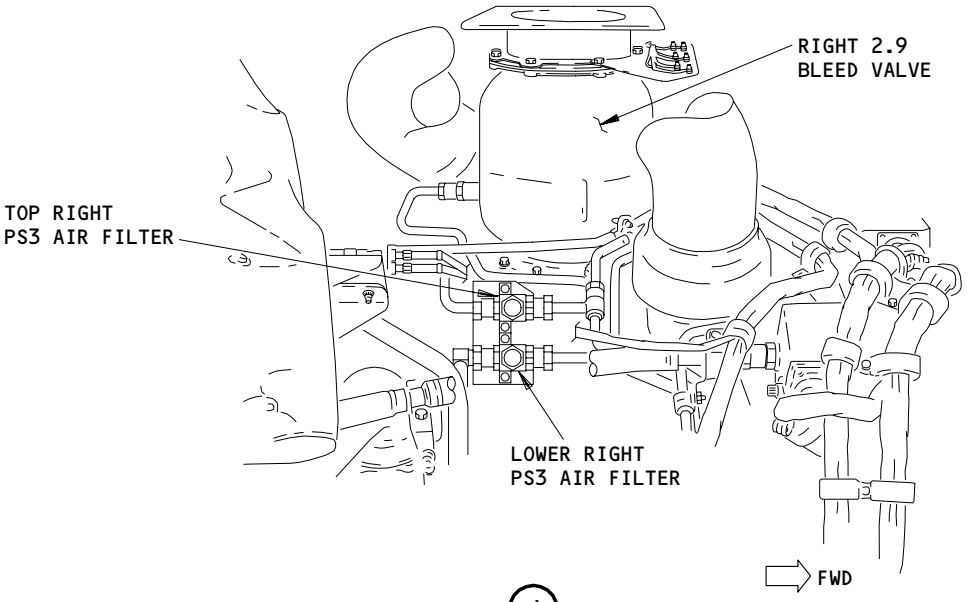
(H) 2

Turbine Cooling System Component Location
Figure 1 (Sheet 4)



SOLENOID FOR THE TVBCA VALVE
AND IDG/AIR OIL HEAT EXCHANGER VALVE

I



J

Turbine Cooling System Component Location
Figure 1 (Sheet 5)

(2) The LPT TCC manifold is installed around the LPT case.
(3) The TCC manifolds have air spray holes which point in the direction of the turbine case. This applies a fan air spray against the turbine case for the best cooling condition.

E. TVBCA Valve and TVCA Valve Solenoid
(1) ENGINES WITHOUT PHASE 3;
The air valve solenoid for turbine vane and blade cooling is installed on the rear left face of the intermediate case at the 10 o'clock position. It is in the same housing with the solenoid for the HPC secondary flow control valve.
(2) ENGINES WITH PHASE 3;
The left solenoid controls the left TVBCA valve and the TVCA valve on the right side. The right solenoid controls the right TVBCA valve (and the IDG/Air Oil Heat Exchanger valve). The air valve solenoids for the turbine vane and blade cooling are installed on the aft face of the intermediate case at the 10 and 1:00 o'clock positions.
(3) The air valve solenoids for the turbine vane and blade cooling are electrically operated by the EEC and supplies pneumatic pressure to operate the turbine vane and blade cooling air valves.
(4) When energized, the air valve solenoid permits pressure flow from the diffuser case to close the air valves for the turbine vane and blade cooling.
(5) When electrical power is removed, the air valve solenoid stops the pressure flow and, at the same time, bleeds the two valve pneumatic chambers to the nacelle area.

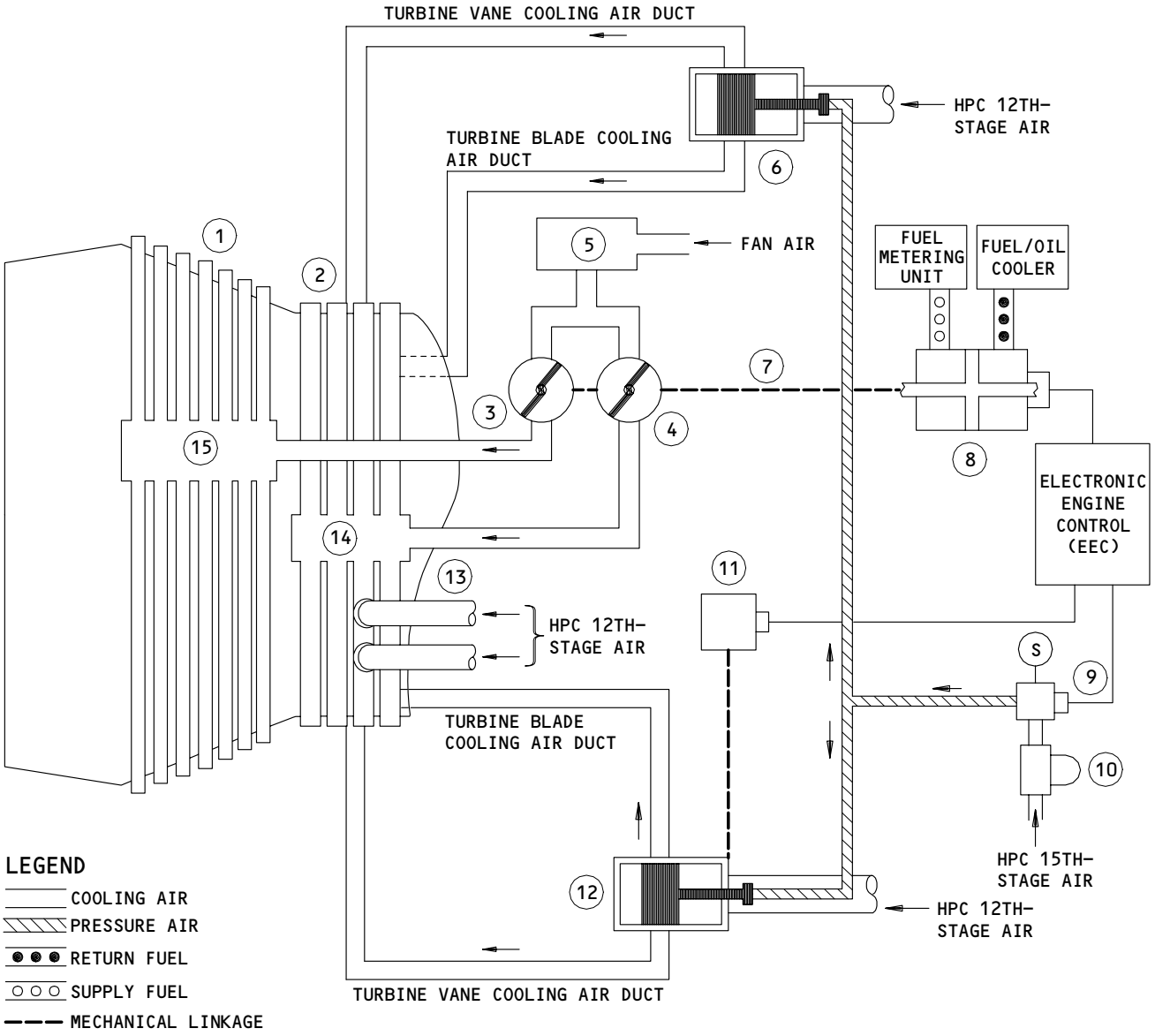
F. Turbine Vane and Blade Cooling Air Valves
(1) The air valves for turbine vane and blade cooling are installed on the HPC rear case at the 9:30 and 3 o'clock positions.
(2) The air valves are pneumatically operated, poppet-type air shutoff valves. They are spring-loaded open and used to open and close the ducts for cooling air flow to the vane and blade outlet ports.
(3) The solenoid controlled 15th-stage high compressor air supplies pressure to close the air valves.
(4) The two air valves have visual position indication pins.

G. Turbine Vane Cooling Air Valve (Phase 3 only)
   (1) The TVCA valve controls the flow of 12th-stage HPC air to the HPT 2nd-stage turbine vanes.
   (2) There is one TVCA valve installed on the HPC aft case at the 2 o'clock position. The valve includes a flange mounted outlet port (vane), one threaded servo port, and a visual position indicator.
   (3) The valve is a normally open, pneumatically operated, poppet-type air shutoff valve. 15th-stage HPC air is used to close the valve and stop the airflow to the vane outlet port. The visual position indicator pin is retracted below the surface of the indicator body when the shutoff valve is fully closed. When air pressure is removed, the shutoff valve moves to the fully open position and the visual position indicator pin extends above the surface of the body.

H. TVBCA Valve Position Switch (Engines without Phase 3)
   (1) The position switch is on the right air valve for turbine vane and blade cooling, on the HPC rear case at the 3 o'clock position.
   (2) The position switch supplies the EEC with a feedback signal which shows the open/closed condition of the air valve.
   (3) Because the location of the position switch is above the position indication pin of the air valves, the position switch also has a visual position indication pin.

3. Operation

A. Functional Description (Fig. 1 and 2)
   (1) Turbine Case Cooling System (Fig. 1)
      (a) As a function of altitude and high rotor speed (N2), the EEC controls hydraulic pressure to the TCC air valve actuator. The hydraulic pressure is supplied from the fuel pump, and controls the position of the actuator piston.
      (b) The movement of the actuator piston is transmitted to the HPT and LPT TCC air shutoff valves by the control cable of the TCC air valve. This control cable is connected to the shutoff valve linkage which mechanicaly controls the position of the air shutoff valves.
      (c) Each air shutoff valve is controlled by the mechanical valve linkage, which starts to open the LPT TCC air shutoff valve before the HPT TCC air shutoff valve. If electrical power, hydraulic pressure, or mechanical connection decreases, the air shutoff valves will close.
      (d) The position of these air shutoff valves is monitored by a dual linear variable differential transformer (LVDT) which finds the position of the actuator piston. The LVDT signal is fed back to the EEC.
      (e) The fan air is put through the cooling inlet duct to the HPT and LPT TCC air shutoff valves.
      (f) If the air shutoff valve for the HPT TCC is open, fan air goes to the HPT TCC collector and manifolds.
      (g) If the air shutoff valve for the LPT TCC is open, fan air goes to the LPT TCC collector and manifolds.
      (h) The collectors supply the air to the applicable manifolds. The manifolds supply the air around the turbine cases to the air spray holes for turbine case cooling.

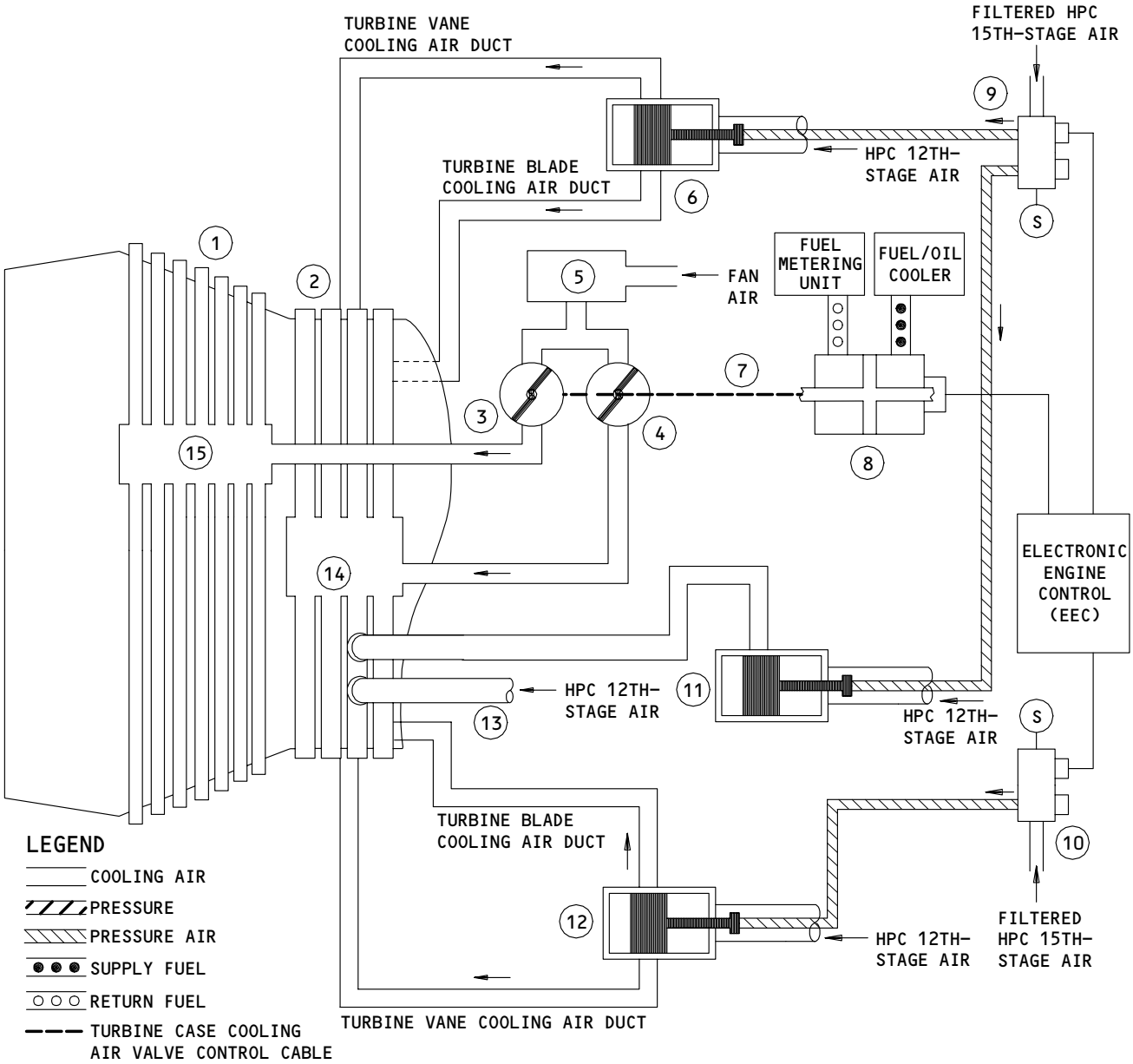


1. LPT CASE COOLING MANIFOLDS (7 AIR TUBES)
2. HPT CASE COOLING MANIFOLDS (4 AIR TUBES)
3. HPT CASE COOLING AIR SHUTOFF VALVE
4. LPT CASE COOLING AIR SHUTOFF VALVE
5. TURBINE CASE COOLING AIR INLET DUCT
6. LEFT TURBINE VANE AND BLADE COOLING AIR VALVE
7. TURBINE CASE COOLING AIR VALVE CONTROL CABLE
8. TURBINE CASE COOLING AIR VALVE ACTUATOR
9. HPC SECONDARY FLOW CONTROL VALVE AND TURBINE VANE AND BLADE COOLING AIR VALVE SOLENOID
10. TURBINE VANE AND BLADE COOLING AIR VALVE FILTER
11. TURBINE VANE AND BLADE COOLING AIR VALVE POSITION SWITCH
12. RIGHT TURBINE VANE AND BLADE COOLING AIR VALVE
13. TURBINE VANE COOLING AIR DUCTS
14. HPT CASE COOLING COLLECTOR
15. LPT CASE COOLING COLLECTOR

Turbine Cooling System Simplified Schematic
Figure 2 (Sheet 1)

EFFECTIVITY
ENGINES WITHOUT PHASE 3

E72049



1. LPT CASE COOLING MANIFOLDS (7 AIR TUBES)
2. HPT CASE COOLING MANIFOLDS (4 AIR TUBES)
3. HPT CASE COOLING AIR SHUTOFF VALVE
4. LPT CASE COOLING AIR SHUTOFF VALVE
5. TURBINE CASE COOLING AIR INLET DUCT
6. LEFT TURBINE VANE AND BLADE COOLING AIR VALVE
7. TURBINE CASE COOLING AIR VALVE CONTROL CABLE
8. TURBINE CASE COOLING AIR VALVE ACTUATOR
9. TURBINE VANE COOLING AIR VALVE AND TURBINE VANE AND BLADE COOLING AIR VALVE SOLENOID
10. TURBINE VANE AND BLADE COOLING AIR VALVE SOLENOID
11. TURBINE VANE COOLING AIR VALVE
12. RIGHT TURBINE VANE AND BLADE COOLING AIR VALVE
13. TURBINE VANE COOLING AIR DUCTS
14. HPT CASE COOLING COLLECTOR
15. LPT CASE COOLING COLLECTOR

Turbine Cooling System Simplified Schematic
Figure 2 (Sheet 2)

(2) Turbine Vane and Blade Cooling System (Fig. 2)

(a) The 12th-stage air is bled from the HPT rear case through four ducts.

(b) ENGINES WITHOUT PHASE 3;
When the engine is in operation, the cooling air flows continuously through two of the ducts. The airflow through the other two ducts is controlled by the air valves for turbine vane and blade cooling. This permits 50% of the cooling air to be stopped at a lower thrust to get better engine performance.

(c) ENGINES WITH PHASE 3;
Cooling air from the 12th-stage HPC flows to the 2nd-stage HPT vanes and blades. The cooling airflow through the blade cooling air ducts and through two vane cooling air ducts is controlled by two TVBCA valves. The cooling airflow through one of the other two cooling air ducts is controlled by the TVCA valve. The airflow through the other vane cooling air duct is continuous.

(d) As a function of altitude and high rotor speed (N2), the EEC controls the air valve solenoids for turbine vane and blade cooling.

(e) When the air valve solenoid is energized by 28 volts dc, air pressure from the diffuser case is supplied to the air valves.

(f) The air pressure goes into the servo port and puts pressure on the valve piston. As a result, a poppet connected to the piston is moved against the seat. This closes the air valve and stops the airflow to the blade and vane outlet ports.

(g) When the air valve solenoid does not have electrical power, it stops the pressure airflow. At the same time, the air valve solenoid supplies the pneumatic chambers of the air valves to the nacelle area.

(h) When the air valve is fully closed, a visual indicator pin is retracted into the air valve body. When the air valve is fully open, the visual indicator pin will extend from the air valve body.

(i) ENGINES WITHOUT PHASE 3;
The right air valve operates the position switch of the air valve for turbine vane and blade cooling. This position switch supplies the EEC with a feedback signal which shows when the air valve is closed.

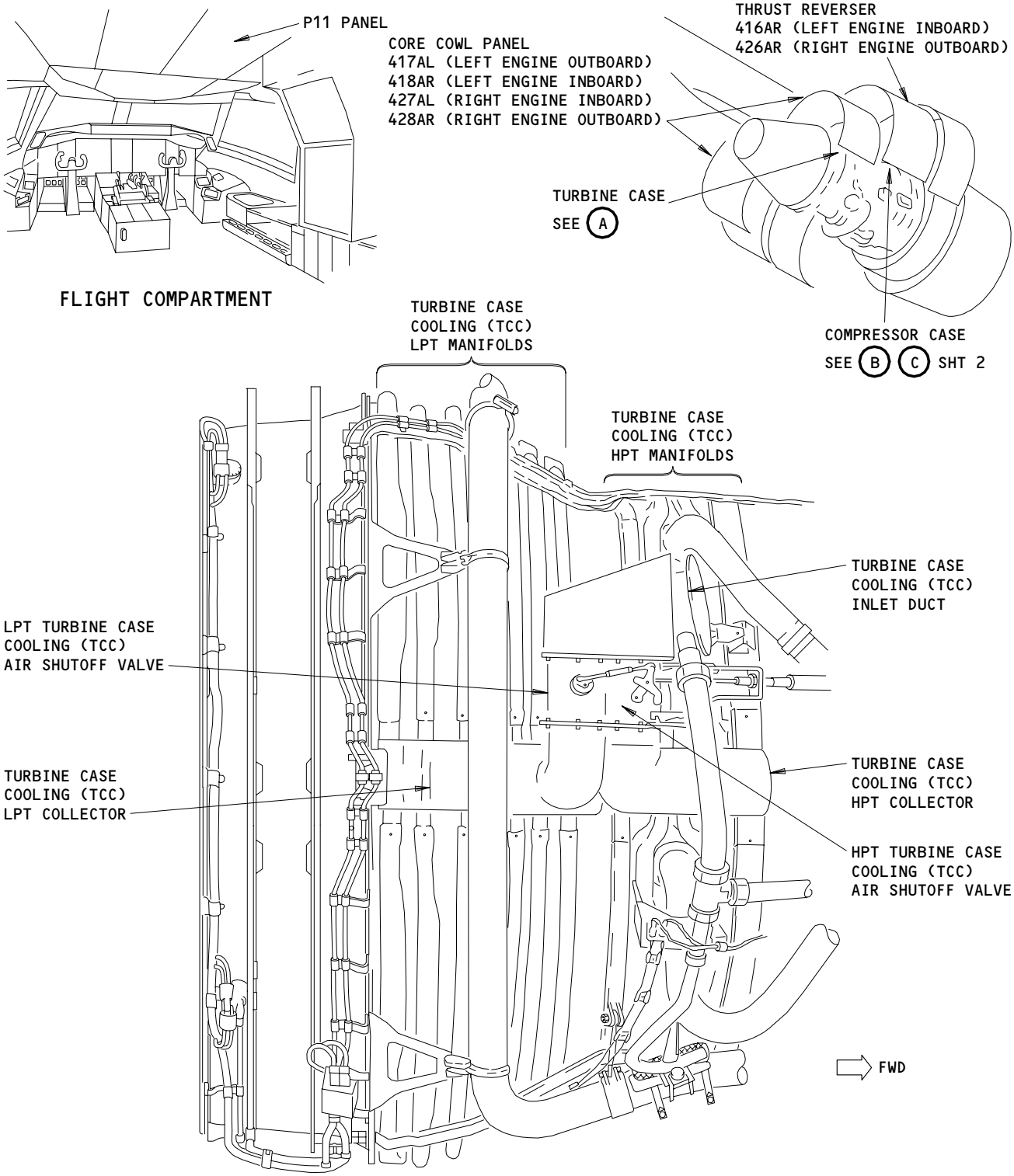
(j) The 12th-stage air goes through the ducts to the HPT 2nd-stage turbine vanes and outer air seal to decrease the temperature.
(k) Also the air valves control some 12th-stage air to help 15th-stage cooling air. These two cooling airs decrease the temperature of the HPT disks and 2nd-stage turbine blades.

TURBINE COOLING SYSTEM

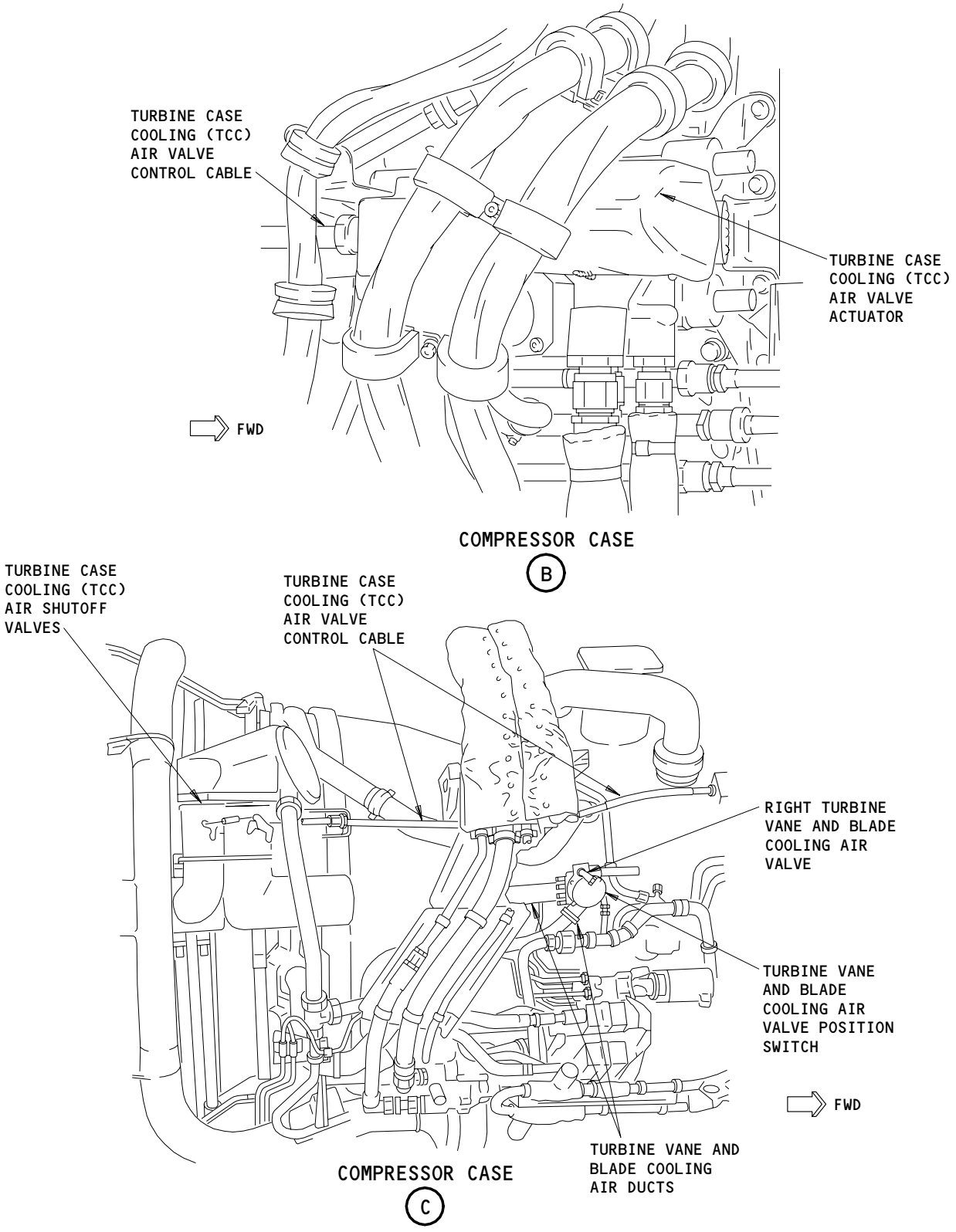
COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	REFERENCE
CIRCUIT BREAKERS	1		FLT COMPT, P11	
L ENG CH A PERF SOL, C1465		1	11L3	*
L ENG CH B PERF SOL, C1466		1	11L4	*
R ENG CH A PERF SOL, C1467		1	11L30	*
R ENG CH B PERF SOL, C1468		1	11L31	*
ACTUATOR - TURBINE CASE COOLING (TCC) AIR VALVE	2	2	416AL,426AL, THRUST REVERSER	75-24-05
CABLE - TURBINE CASE COOLING (TCC) AIR VALVE CONTROL	2	2	416AR,426AR, THRUST REVERSER	75-24-11
COLLECTOR - TURBINE CASE COOLING (TCC) HPT	1	2	418AR,428AR, CORE COWL PANEL	75-24-06
COLLECTOR - TURBINE CASE COOLING (TCC) LPT	1	2	418AR,428AR, CORE COWL PANEL	75-24-08
CONTROL - (REF 73-21-00, FIG. 101) ELECTRONIC ENGINE, M7198				
DUCT - TURBINE CASE COOLING (TCC) INLET	1	2	418AR,428AR, CORE COWL PANEL	75-24-12
DUCTS - TURBINE VANE AND BLADE COOLING AIR	2	2	416AR,426AR, THRUST REVERSER	75-24-02
DUCTS - TURBINE VANE AND BLADE COOLING AIR	3	2	415AL,425AL, THRUST REVERSER	75-24-02
FILTER - TURBINE VANE AND BLADE COOLING AIR VALVE	3	2	415AL,425AL, THRUST REVERSER	75-24-14
MANIFOLDS - TURBINE CASE COOLING (TCC) HPT	1	8	417AL,418AR,427AL,428AR, CORE COWL PANELS	75-24-07
MANIFOLDS - TURBINE CASE COOLING (TCC) LPT	1	14	417AL,418AR,427AL,428AR, CORE COWL PANELS	75-24-09
SOLENOID - (REF 75-33-00, FIG. 101) HPC SECONDARY FLOW CONTROL VALVE, TURBINE VANE AND BLADE COOLING AIR VALVE				
SWITCH - TURBINE VANE AND BLADE COOLING AIR VALVE POSITION	2	2	416AR,426AR, THRUST REVERSER	75-24-13
VALVE - HPT TURBINE CASE COOLING (TCC) AIR SHUTOFF	1	2	418AR,428AR, CORE COWL PANEL	75-24-03
VALVE - LPT TURBINE CASE COOLING (TCC) AIR SHUTOFF	1	2	418AR,428AR, CORE COWL PANEL	75-24-04
VALVE - TURBINE VANE AND BLADE COOLING AIR	2	2	416AR,426AR, THRUST REVERSER	75-24-01
VALVE - TURBINE VANE AND BLADE COOLING AIR	3	2	415AL,425AL, THRUST REVERSER	75-24-01

* SEE THE WDM EQUIPMENT LIST

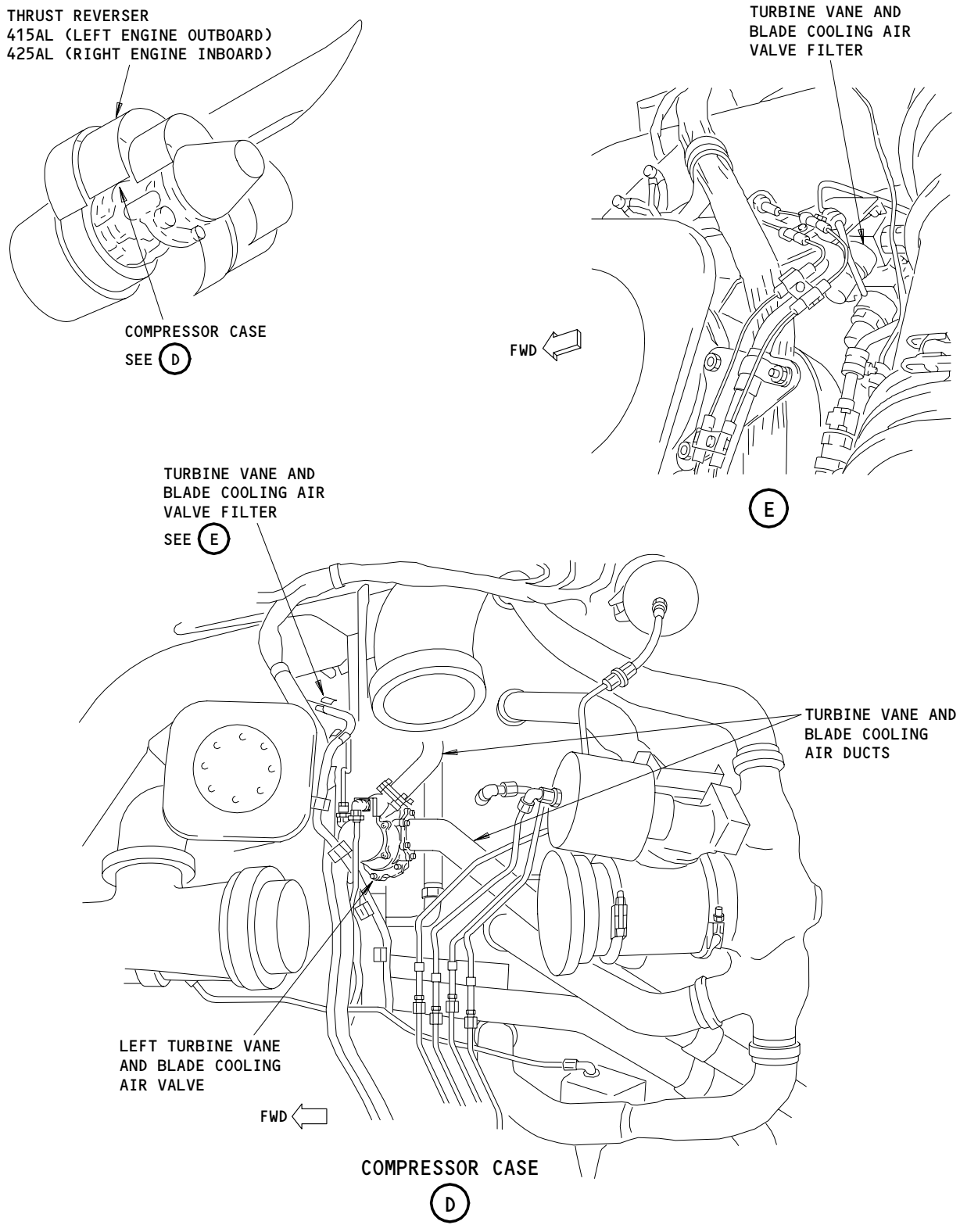
Turbine Cooling System - Component Index
Figure 101



Turbine Cooling System – Component Location
Figure 102 (Sheet 1)



Turbine Cooling System - Component Location (Details from Sht 1)
Figure 102 (Sheet 2)



Turbine Cooling System – Component Location
Figure 102 (Sheet 3)

TURBINE COOLING SYSTEM - MAINTENANCE/PRACTICES

1. General
   A. This procedure gives instructions for the removal of one of the four cooling air ducts for the turbine vane and blade if it shows cracks.
   B. This procedure also tells you how to install blank-off covers to the cooling air system. You can operate the engine for a maximum of 50 hours or 5 cycles, whichever is less, with one of the four air ducts removed and blank-off covers installed.
   C. For the engines with a borescope plug in the rear elbow of the lower left cooling air ducts, do not remove this cooling air duct and install the blank-off covers.

TASK 75-24-00-042-001-N00

2. Do the Deactivation Procedure for the Turbine Cooling System
   A. Equipment
      (1) Covers - Blank-off, Round (No. 1) - PWA 85986, Pratt & Whitney, East Hartford, CT
      (2) Covers - Blank-off, Flat-Sided (No. 2) - PWA 85986, Pratt & Whitney, East Hartford, CT
   B. References
      (1) AMM 75-24-02/401, Turbine Vane and Blade Cooling Air Ducts
   C. Access
      (1) Location Zones
          411 Left Engine
          421 Right Engine

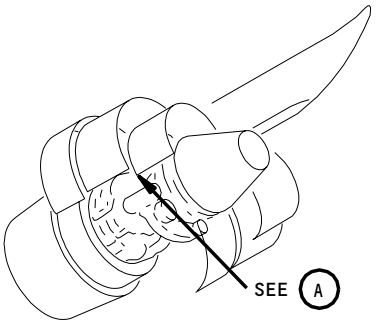
      (2) Access Panels
          415AL Fan Reverser (Left), Left Engine
          416AR Fan Reverser (Right), Left Engine
          417AL Core Cowl (Left), Left Engine
          418AR Core Cowl (Right), Left Engine
          425AL Fan Reverser (Left), Right Engine
          426AR Fan Reverser (Right), Right Engine
          427AL Core Cowl (Left), Right Engine
          428AR Core Cowl (Right), Right Engine

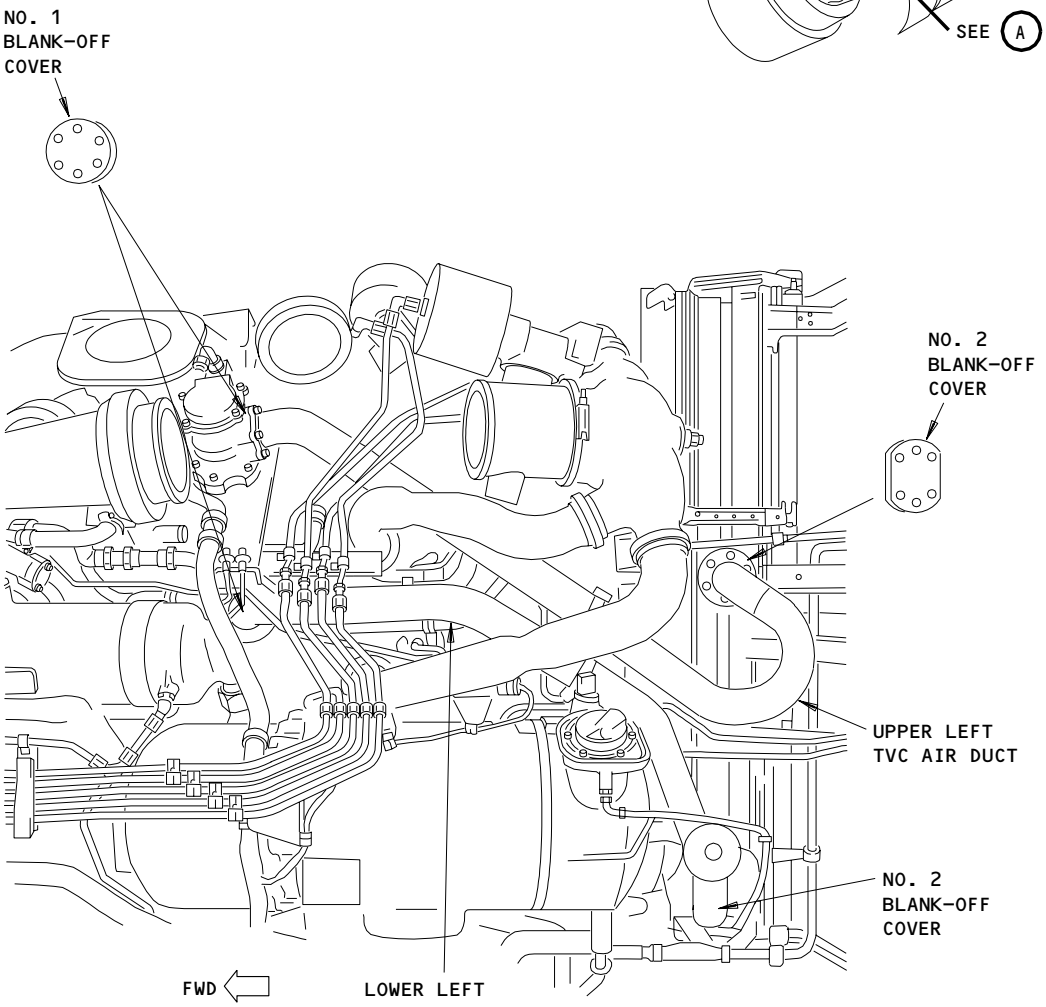
   D. Isolate the Turbine Cooling System (Fig. 201 and 202)

      S 042-002-N00
      (1) If a cooling air duct for the turbine vane and blade is found to have a crack while the aircraft is away from a maintenance base, isolate the turbine cooling system with the steps that follow:

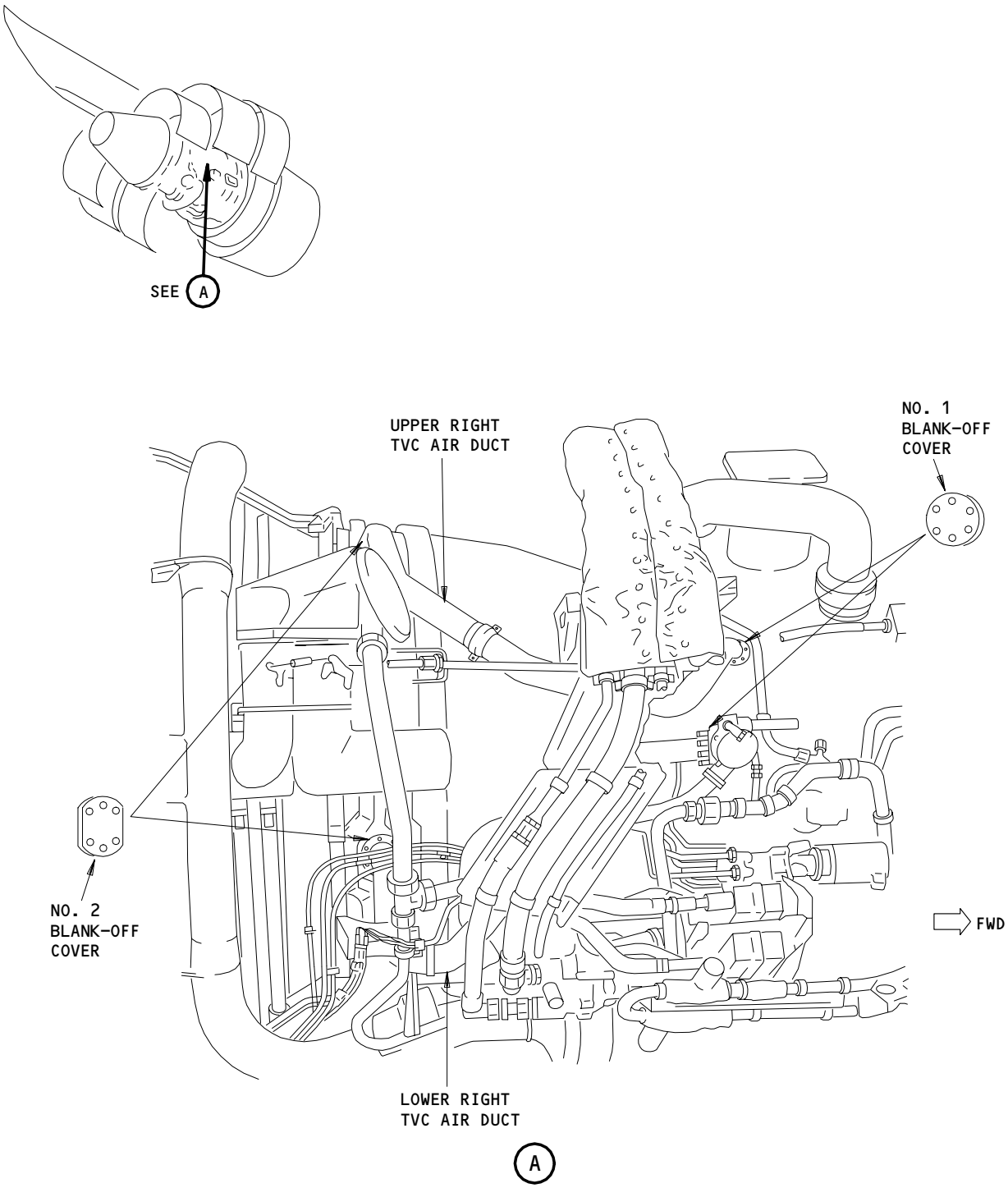
          NOTE: Operate the engine for a maximum of 50 hours or 5 cycles, whichever is less, with the turbine cooling system isolated.

          (a) Remove the cooling air duct that has a crack in it (AMM 75-24-02/401).





Left Side TVC Air Ducts
Figure 201



Right Side TVC Air Ducts
Figure 202

604974

(b) Do the steps that follow to install the No. 1 blank-off cover to the cooling air valve for the turbine vane and blade or to the compressor case:
1) Lubricate the threads of the bolts with engine oil.
2) Attach the No. 1 blank-off cover to the cooling air valve for the turbine vane and blade or to the compressor case with the bolts.
a) Tighten the bolts to 85-95 pound-inches (9.6-10.7 newton-meters).

(c) Do the steps that follow to install the No. 2 blank-off cover to the turbine case:
1) Lubricate the threads of the bolts with engine oil.
2) Attach the No. 2 blank-off cover to the turbine case with the bolts.
a) Tighten the bolts to 180-200 pound-inches (20.3-22.6 newton-meters).

TURBINE COOLING SYSTEM - ADJUSTMENT/TEST

1. General
   A. This procedure gives the instructions to adjust the control cable for the turbine case cooling (TCC) and the turnbuckle linkage.
   B. The instructions include the steps for the partial and the complete rigging of the system.
   C. The partial rig is used for the conditions that follow:
      (1) After the replacement of the TCC HPT air shutoff valve.
      (2) After the replacement of the TCC LPT air shutoff valve.
      (3) After the replacement of the TCC air valve actuator.
      (4) For a check of all of the TCC control system.
   D. The complete rig is used for the conditions that follow:
      (1) If you cannot rig the TCC control system with the partial rig procedure.
      (2) After the replacement of the TCC air valve control cable.
   E. The actuator, idler arm, and lever arms are kept in rigging position during this procedure. For the partial rig this is done with undersized rigging pins and for the complete rig with standard rigging pins.

TASK 75-24-00-825-001-N00

2. Adjustment - Turbine Cooling System
   A. Equipment
      (1) The equipment that follows is Pratt & Whitney equipment:
      Pratt & Whitney, Commercial Products Division,
      400 Main Street,
      East Hartford, CT 06108.
      (a) Rigging Pin - PWA 86069, undersized (2 are necessary for the partial rig only)
      (b) Rigging Pin - PWA 85465 (3 are necessary)

      NOTE: The PWA 85465 rigging pin can be contained in the PWA 85675 rigging pin kit.

      (c) Positioning Bolt/Machine Screw Pusher - PWA 101418

      NOTE: This is the same part as the Positioning Bolt shown below. It is a standard hex head bolt No. 8-32, 1.5 inch (38 mm) minimum thread length. Either the PWA 101418 or a standard hex head bolt can be used for this procedure.

      (2) Positioning Bolt - Standard hex head bolt No. 8-32, 1.5 inch (38.1 mm) minimum thread length, commercially available
   B. Consumable Materials
      (1) D00137 Engine Oil - PWA 521
      (2) G02334 Lockwire - AS3214-02

C. References
(1) AMM 71-00-00/501, Power Plant
(2) AMM 71-11-04/201, Fan Cowl Panels
(3) AMM 71-11-06/201, Core Cowl Panels
(4) AMM 78-31-00/201, Thrust Reverser System

D. Access
(1) Location Zones
411 Left Engine
421 Right Engine

(2) Access Panels
414AR Fan Cowl Panel (Right), Left Engine
416AR Thrust Reverser (Right), Left Engine
418AR Core Cowl Panel (Right), Left Engine
424AR Fan Cowl Panel (Right), Right Engine
426AR Thrust Reverser (Right), Right Engine
428AR Core Cowl Panel (Right), Right Engine

E. Prepare to Adjust the Turbine Cooling System

S 015-002-N00
(1) Open the right fan cowl panel (AMM 71-11-04/201).

S 045-003-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(2) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 015-004-N00
(3) Open the right core cowl panel (AMM 71-11-06/201).

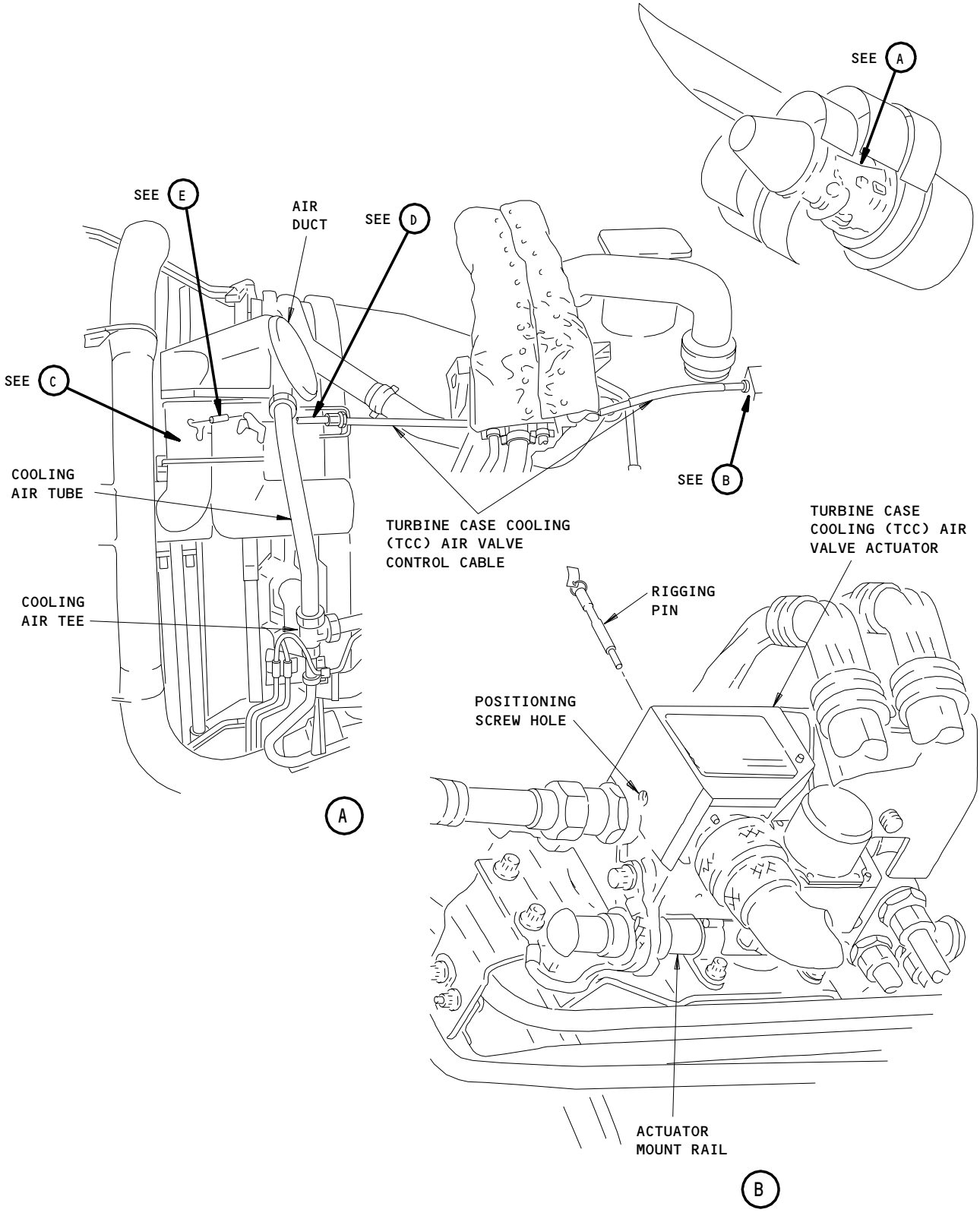
S 015-005-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

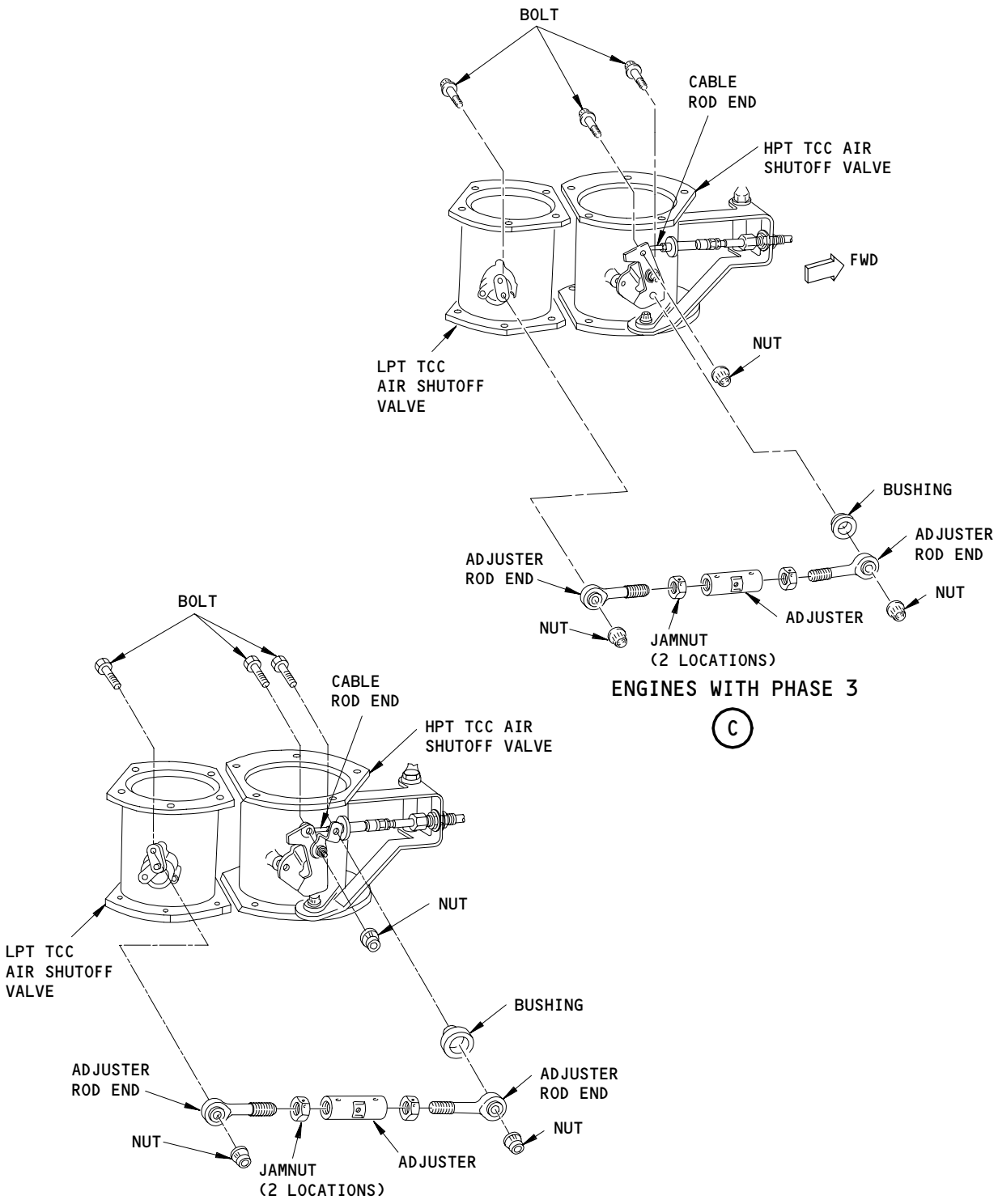
(4) Open the right thrust reverser (AMM 78-31-00/201).

F. Adjust the TCC control system - partial rig with undersized rigging pins.

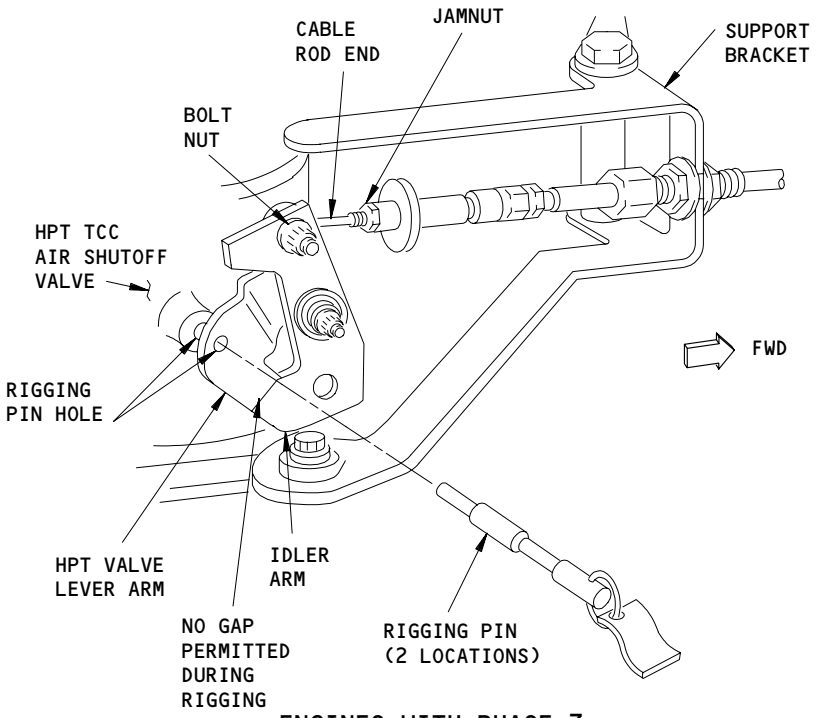
S 825-051-N00
(1) Adjust the TCC control system.



Turbine Cooling System Adjustment
Figure 501 (Sheet 1)

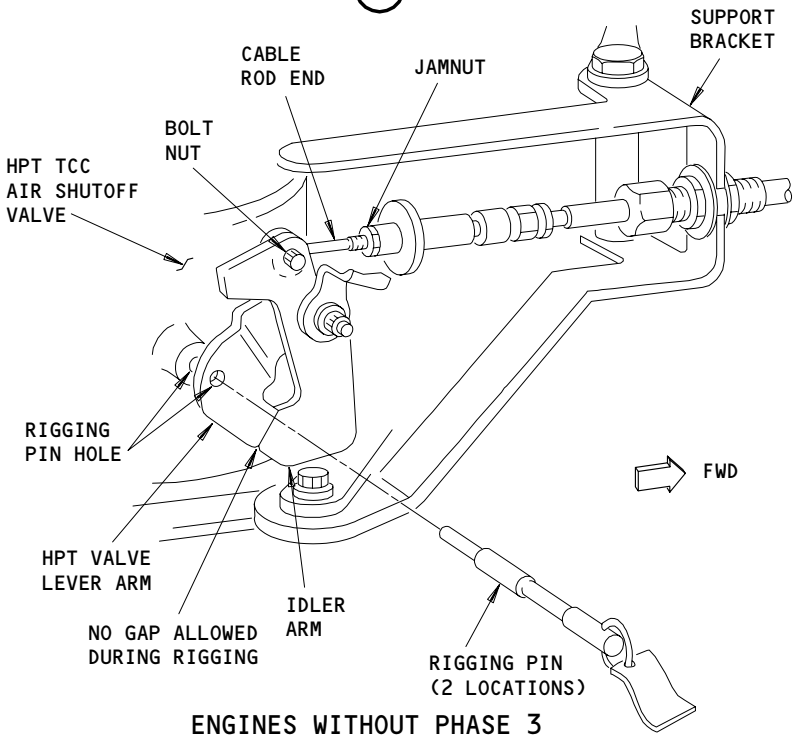


Turbine Cooling System Adjustment
Figure 501 (Sheet 2)



ENGINES WITH PHASE 3

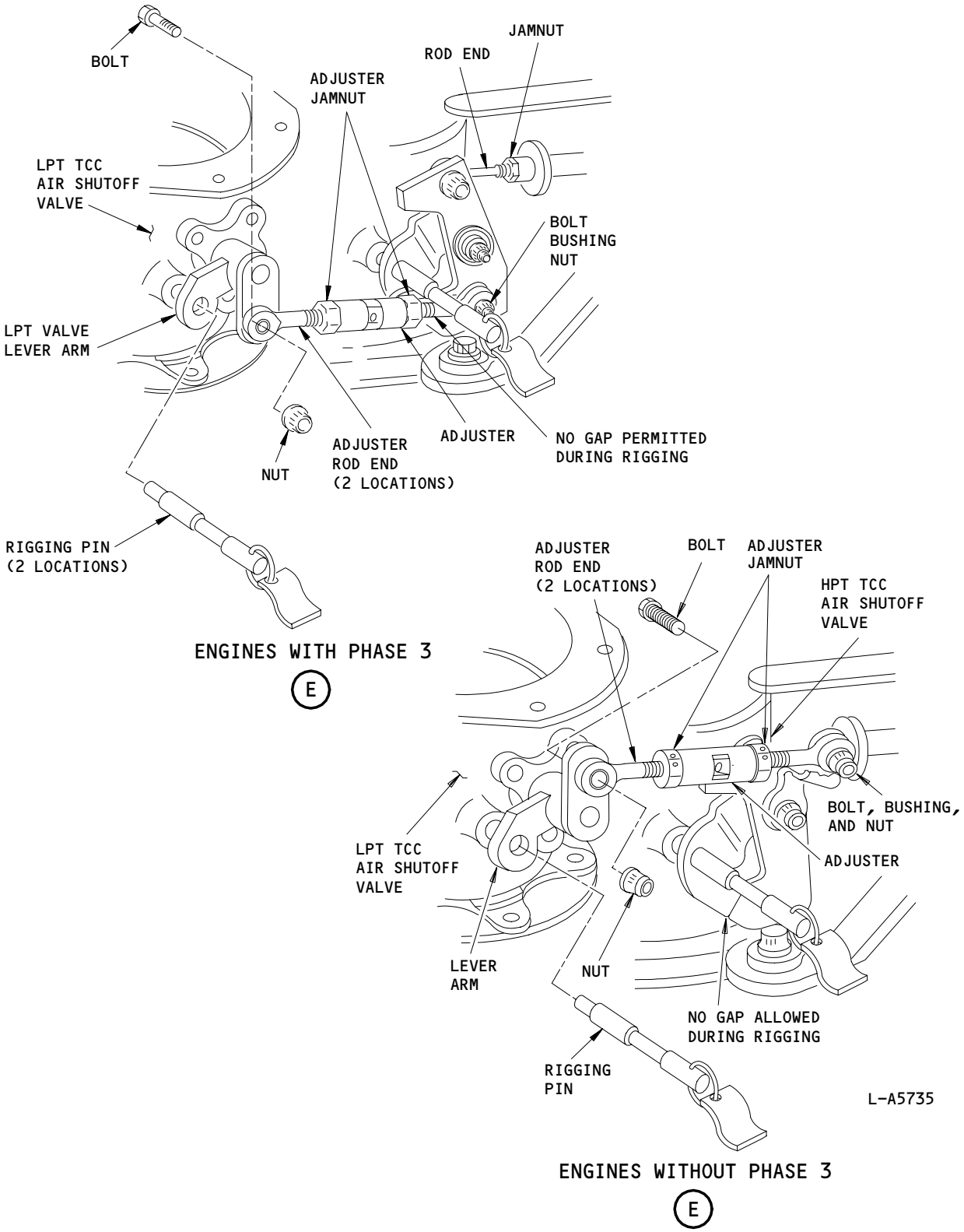
D



ENGINES WITHOUT PHASE 3

D

Turbine Cooling System Adjustment
Figure 501 (Sheet 3)



Turbine Cooling System Adjustment
Figure 501 (Sheet 4)

CAUTION: IF YOU USE A LONGER POSITIONING BOLT OTHER THAN THE SPECIFIED BOLT LENGTH, DO NOT TURN THE POSITIONING BOLT UNTIL IT TOUCHES THE BOTTOM. IF THE LONGER POSITIONING BOLT TOUCHES THE BOTTOM, IT CAN CUASE DAMAGE TO THE ACTUATOR.

(a) Install a positioning bolt into the threaded positioning hole on the rear of the TCC air valve actuator.

NOTE: The positioning bolt is a quality standard hexhead bolt with 8-32 by 1.5 inch (38.1 mm) thread length. With a 1.5 inch (38.1 mm) length bolt and when the rig pin touches the bottom, approximately 0.125 inch (3.175 mm) of the threads will show.

(b) Turn the positioning bolt in until the piston shaft rig hole aligns with the rigging hole in the TCC air valve actuator.

(c) Install a PWA 85465 rigging pin in the rigging hole.

1) Feel the PWA 85465 rigging pin to make sure that it is fully engaged into the piston shaft rigging hole.

(d) Install a PWA 86069 rigging pin through the HPT valve lever arm and into the rigging hole on the HPT TCC air shutoff valve.

NOTE: Make sure you hold the HPT valve lever arm against the idler arm during the complete rigging procedure.

1) If you cannot install the PWA 86069 rigging pin into the rigging hole, adjust the TCC control system with the complete rigging procedure.
2) If you can install the PWA 86069 rigging pin into the rigging hole, keep it installed and continue as follows.

(e) Install a PWA 86069 rigging pin through the LPT valve lever arm and into the rigging hole on the LPT TCC air shutoff valve.

1) If you can install the PWA 86069 rigging pin into the rigging hole, do the steps that follow (the adjustment of the turbine cooling system is satisfactory):

CAUTION: MAKE SURE ALL THREE RIGGING PINS AND THE POSITIONING BOLT ARE REMOVED FROM THE ENGINE. IF THE RIGGING PINS OR THE POSITIONING BOLT ARE NOT REMOVED, DAMAGE TO THE ENGINE CAN OCCUR.

a) Remove all three rigging pins from the TCC control system.
b) Remove the positioning bolt from the rear of the actuator.

2) If you cannot install the PWA 86069 rigging pin into the rigging hole, continue as follows.

(f) Remove the bolt and the nut that attach the adjuster rod end to the LPT valve lever arm.
(g) Align the LPT valve lever arm with the rigging pin hole in the LPT TCC air shutoff valve.
(h) Install the PWA 86069 rigging pin.
(i) Loosen the adjuster jamnuts.
(j) Turn the adjuster to align the rod end with the bolt hole in the LPT valve lever arm.
(k) Make sure you can see the threads of both of the rod ends through the inspection holes in the adjuster.
(l) Lubricate the threads of the bolt for the adjuster rod end with engine oil.
(m) Attach the rod end to the LPT valve lever arm with the bolt and the nut.

NOTE: You must install the bolt from the inner side of the LPT lever arm.

1) Tighten the nut to 36-40 pound-inches (4.1-4.5 newton-meters).

(n) Tighten the adjuster jamnuts to 14-16 pound-inches (1.6-1.8 newton-meters).
1) Safety the jamnuts with lockwire.

CAUTION: MAKE SURE ALL THREE RIGGING PINS AND THE POSITIONING BOLT ARE REMOVED FROM THE ENGINE. IF THE RIGGING PINS OR THE POSITIONING BOLT ARE NOT REMOVED, DAMAGE TO THE ENGINE CAN OCCUR.

(o) Remove all three rigging pins.
(p) Remove the positioning bolt from the rear of the actuator.

G. Adjust the TCC control system - complete rig with standard rigging pins.

S 825-052-N00

(1) Adjust the TCC control system.
(a) If the control cable of the HPT TCC air shutoff valve was not replaced or disconnected, do the steps that follow:
1) Remove the bolt and the nut that attach the rod end of the control cable to the idler arm.
2) Remove the bolts, nuts, and the bushing that attach the rod ends of the adjuster.

CAUTION: IF YOU USE A LONGER POSITIONING BOLT OTHER THAN THE SPECIFIED BOLT LENGTH, DO NOT TURN THE POSITIONING BOLT UNTIL IT TOUCHES THE BOTTOM. IF THE LONGER POSITIONING BOLT TOUCHES THE BOTTOM, IT CAN CAUSE DAMAGE TO THE ACTUATOR.

(b) Install a positioning bolt into the threaded positioning hole on the rear of the TCC air valve actuator.

NOTE: The positioning bolt is a quality standard hexhead with a 8-32 by 1.5 inch (38.1 mm) thread length. With a 1.5 inch (38.1 mm) length bolt and when the rig pin touches the bottom, approximately 0.125 inch (3.175 mm) of the bolt threds will show.

(c) Turn the positioning bolt in to align the piston shaft rigging hole with the rigging hole in the TCC air valve actuator.
(d) Install PWA 85465 rigging pin in the rigging hole.
1) Feel the PWA 85465 rigging pin to make sure it is fully into the piston shaft rigging hole.

(e) Align the rigging pin hole in the HPT valve lever arm with the hole in the HPT TCC air shutoff valve.
(f) Install the PWA 85465 rigging pin.
(g) Pull the cable rod end rearward until the cable rod end and the bolt hole on the idler arm align.

NOTE: Make sure you hold the HPT valve lever arm aginst the idler arm during the complete rigging procedure.

1) If the bolt hole aligns, install the bolt that attaches the cable rod end to the idler arm.

NOTE: You must install the bolt from the inner side of the LPT valve lever arm.

2) If the bolt hole does not align, do the steps that follow:
a) Loosen the rod end jamnut.
b) Adjust the cable rod end to align with the bolt hole.
c) Tighten the rod end jamnut to 32-36 pound-inches (3.6-4.1 newton-meters).
d) Safety the rod end jamnut with lockwire.

(h) Lubricate the threads of the bolt with engine oil.
(i) Attach the cable rod end to the HPT valve lever arm with the bolt and the nut.

NOTE: Make sure to install the cable rod end and the head of the bolt to the inner side of the idler arm.

1) Tighten the nut to 36-40 pound-inches (4.1-4.5 newton-meters).

(j) Align the rigging pin hole in the LPT valve lever arm with the hole in the LPT TCC air shutoff valve.
(k) Install the PWA 85465 rigging pin.
(l) Lubricate the threads of the bolt with engine oil.
(m) Install the forward adjuster rod end with the bolt, bushing and nut.

NOTE: Make sure to install the bolt from the inner side and the bushing between the idler arm and the adjuster rod end.

1) Tighten the nut to 14-16 pound-inches (1.4-1.8 newton-meters).

(n) Pull the cable rod end rearward until the bolt holes of the end of the rear adjuster rod and the LPT lever arm align.
  1) If the bolt hole aligns, do the steps that follow:
    a) Install the bolt from the inner side of the idler arm.
    b) Attach the adjuster rod end to the bolt.
    c) Lubricate the threads of the bolt with engine oil.
    d) Install the nut on the bolt.
    e) Tighten the nut to 36-40 pound-inches (4.1-4.5 newton-meters).
  2) If the bolt hole does not align, do the steps that follow:
    a) Loosen the adjuster jamnuts.
    b) Turn the adjuster to align the rod end with the bolt hole of the LPT valve lever arm.

      NOTE: Make sure you can see the threads of both of the rod ends through the inspection holes in the adjuster.

    c) Lubricate the threads of the bolt with engine oil.
    d) Attach the rod end to the idler arm with the bolt and the nut.
    e) Tighten the nut to 36-40 pound-inches (4.1-4.5 newton-meters).
    f) Tighten the adjuster jamnuts to 14-16 pound-inches (1.6-1.8 newton-meters).
    g) Safety the adjuster jamnuts with lockwire.

CAUTION: MAKE SURE ALL RIGGING PINS AND THE POSITIONING BOLT ARE REMOVED FROM THE ENGINE. IF THE RIGGING PINS OR THE POSITIONING BOLT ARE NOT REMOVED, DAMAGE TO THE ENGINE CAN OCCUR.

(o) Remove all rigging pins.
(p) Remove the positioning bolt from the rear of the TCC air valve actuator.

H. Return the Aicraft to Its Usual Condition.

S 415-043-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Close the right thrust reverser (AMM 78-31-00/201).

S 415-044-N00

(2) Close the right core cowl panel (AMM 71-11-06/201).

S 415-045-N00

(3) Close the right fan cowl panel (AMM 71-11-04/201).

S 445-046-N00

(4) Do the activation procedure for the thrust reversers (AMM 78-31-00/201).

S 715-047-N00

(5) Do the test of the turbine cooling system that is shown in the Plant Test Reference Table (AMM 71-00-00/501).

TURBINE COOLING SYSTEM - INSPECTION/CHECK

TASK 75-24-00-206-001-N00

1. Do an Inspection of the Turbine Cooling System

A. Equipment

(1) Air pressure source - adjustable from 100 to 500 psi.

B. References

(1) AMM 71-11-04/201, Fan Cowl Panels
(2) AMM 71-11-06/201, Core Cowl Panels
(3) AMM 72-00-00/601, Engine - General
(4) AMM 75-24-00/201, Turbine Cooling System
(5) AMM 75-24-00/501, Turbine Cooling System
(6) AMM 75-24-01/401, Turbine Vane and Blade Cooling Air Valves
(7) AMM 75-24-02/401, Turbine Vane and Blade Cooling Air Ducts
(8) AMM 75-24-03/401, Turbine Case Cooling (TCC) Air Shutoff Valve (HPT)
(9) AMM 75-24-04/401, Turbine Case Cooling (TCC) Air Shutoff Valve (LPT)
(10) AMM 75-24-05/401, Turbine Case Cooling (TCC) Air Valve Actuator
(11) AMM 75-24-11/401, Turbine Case Cooling (TCC) Air Valve Control Cable
(12) AMM 75-33-03/401, HPC Secondary Flow Control Valve, Turbine Blade and Vane Cooling Air Valve Solenoid
(13) AMM 78-31-00/201, Thrust Reverser System

C. Access

(1) Location Zones

411 Left Engine
421 Right Engine

(2) Access Panels

417AL Core Cowl Panel (Left), Left Engine
418AR Core Cowl Panel (Right), Left Engine
427AL Core Cowl Panel (Left), Right Engine
428AR Core Cowl Panel (Right), Right Engine

D. Prepare to do the Inspection of the Turbine Cooling System

S 016-002-N00

(1) Open the fan cowl panels (AMM 71-11-04/201).

S 046-003-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO YOU OR DAMAGE TO EQUIPMENT.

(2) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 016-004-N00

(3) Open the core cowl panels (AMM 71-11-06/201).

S 016-005-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT COULD OCCUR.

(4) Open the thrust reversers (AMM 78-31-00/201).

E. Do the Inspection of the Turbine Cooling System (Fig. 601 and 602)

S 216-006-N00

(1) Examine the condition and correct installation of the air valves and ducts of the turbine vane and blade.

S 216-007-N00

(2) Examine the condition and correct installation of the cooling air solenoid of the turbine vane and blade.

S 216-008-N00

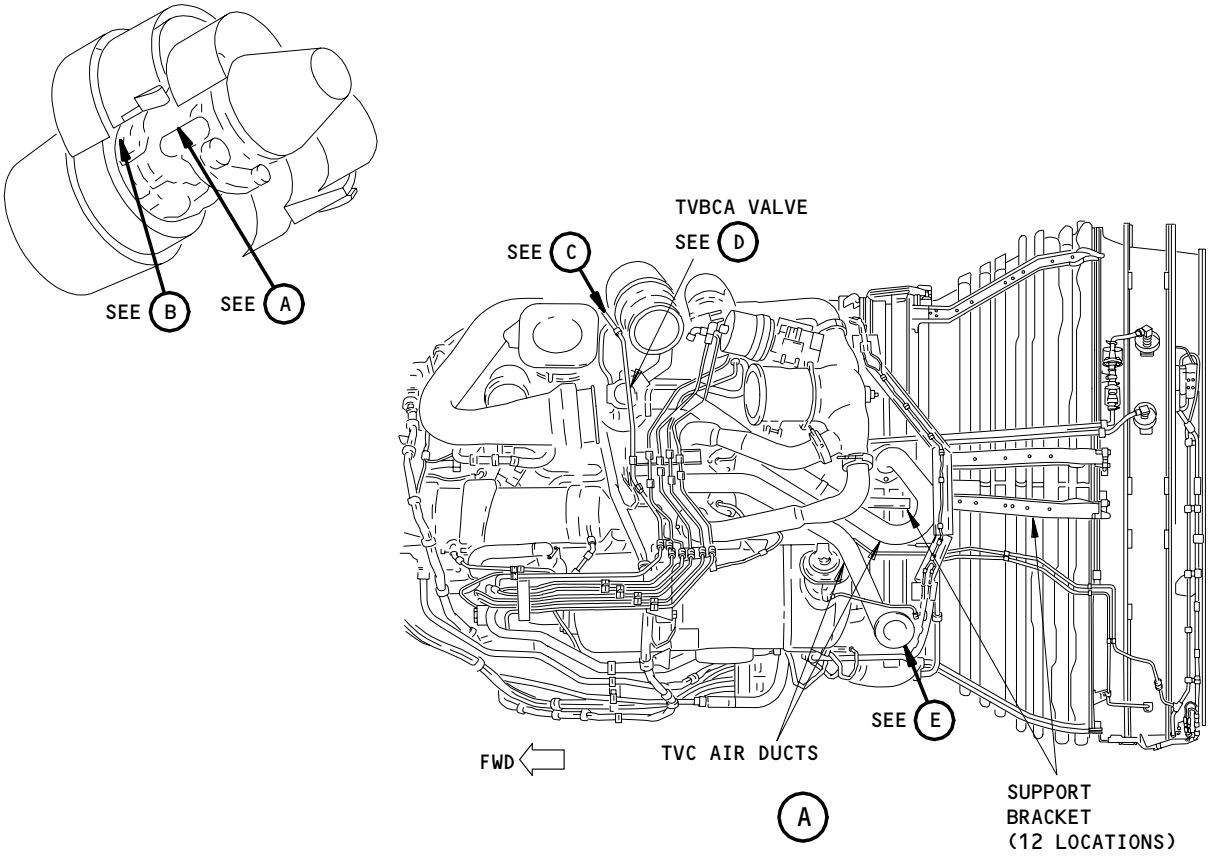
(3) Examine the condition and correct installation of the air valve actuator of the turbine case cooling.

S 216-009-N00

(4) Examine the position indication pin on the Turbine Vane and Blade Cooling Air (TVBCA) valve.

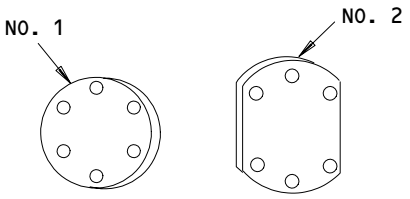
NOTE: Valves are spring loaded open when not in operation.

(a) A pin that is fully extended shows that the cooling air valve is fully open (normal conditions).
(b) A pin that is fully in shows the cooling air valve in a closed position.

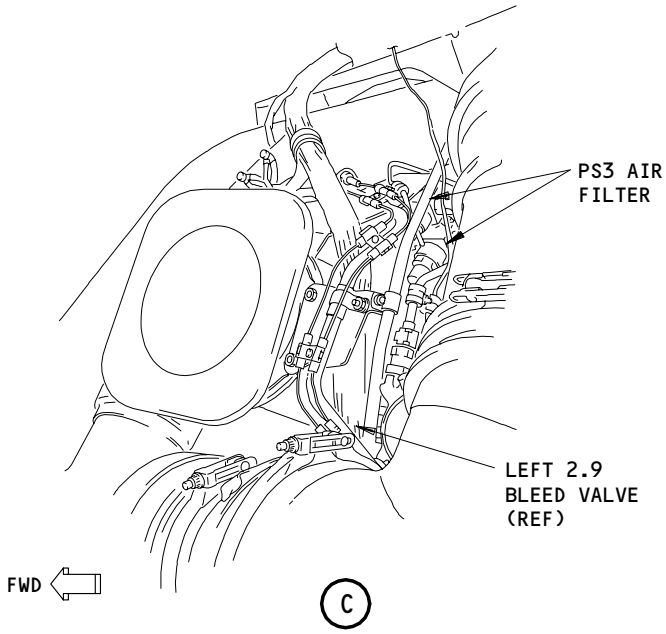


Turbine Cooling System (Left Side)
Figure 601 (Sheet 1)

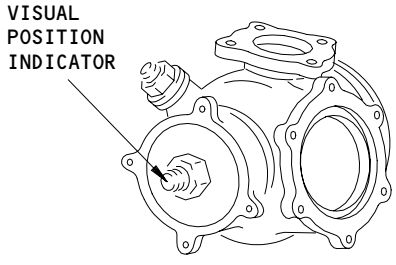
E93849



PWA 85986
COVERS FOR A
REMOVED TVCA DUCT

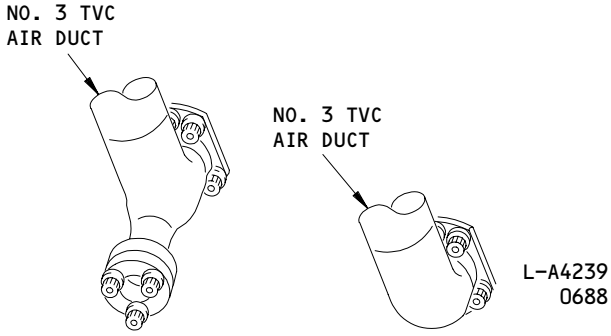


C



LEFT TVBCA VALVE

D

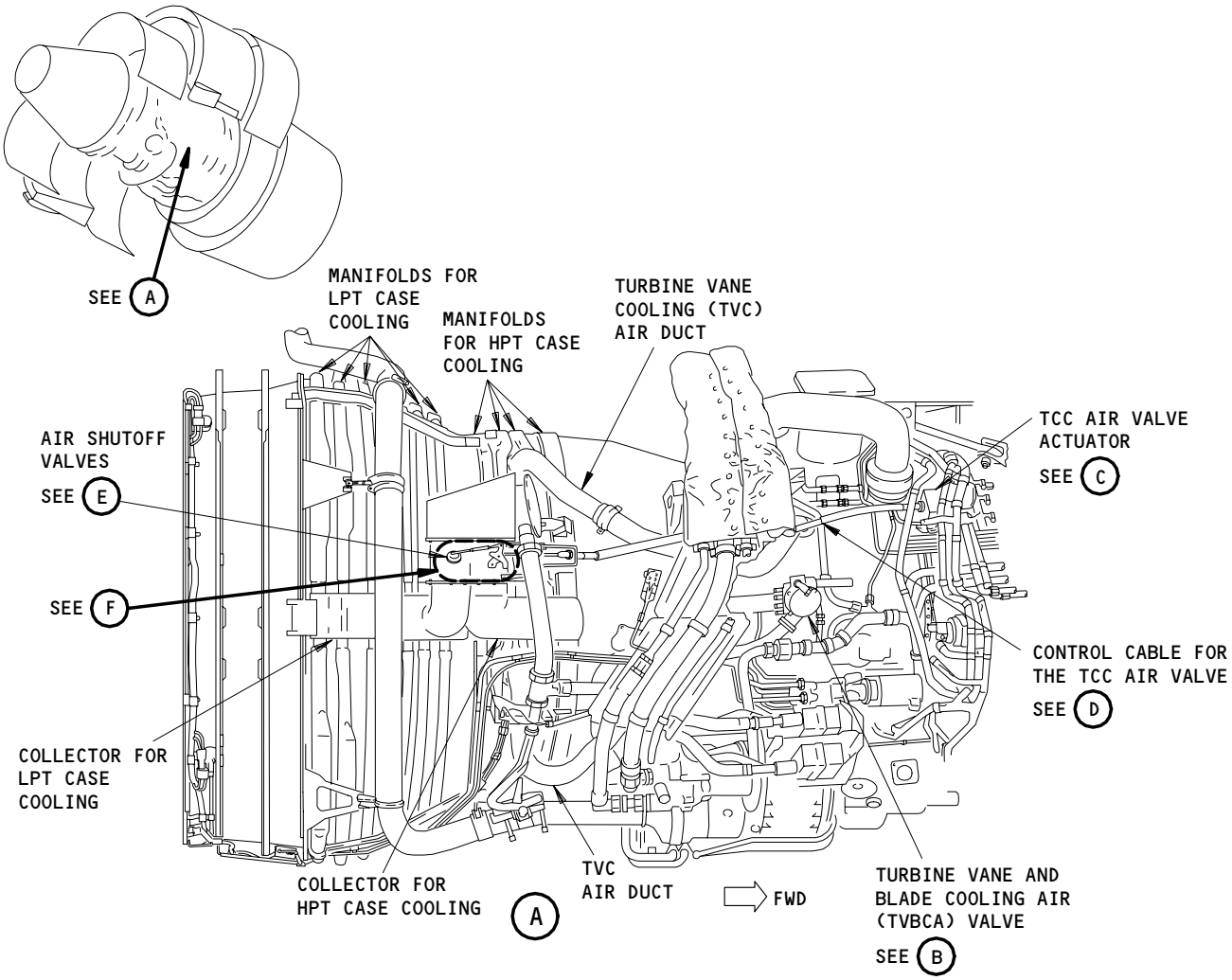


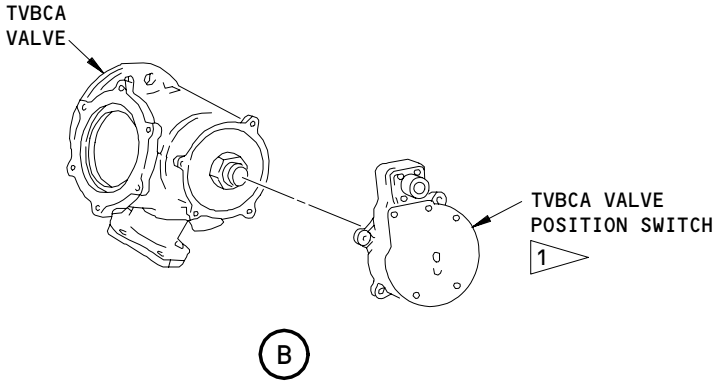
ENGINES WITH
BORESCOPE PLUG

ENGINES WITHOUT
BORESCOPE PLUG

E

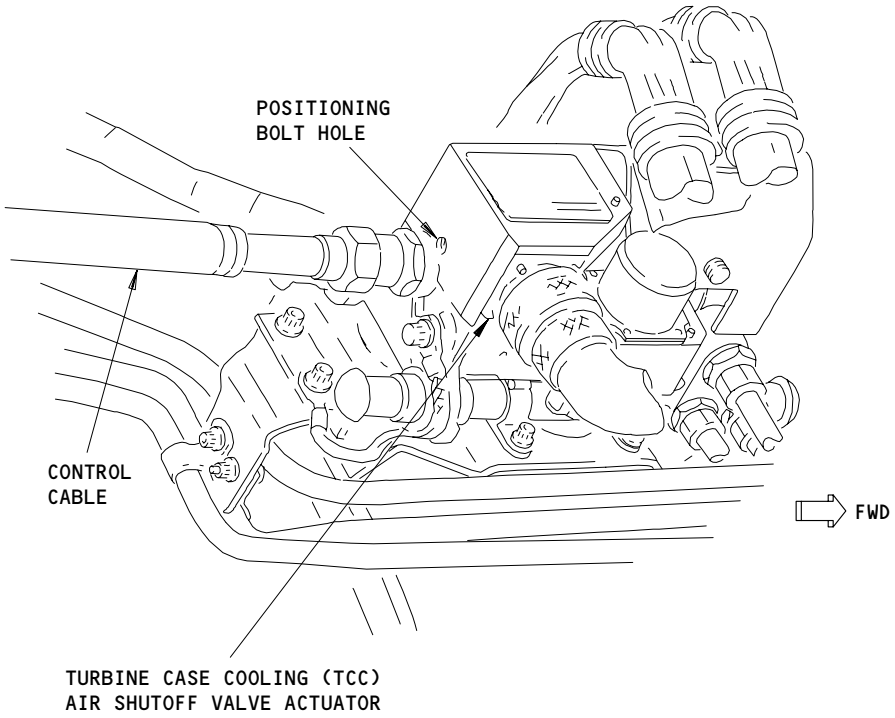
Turbine Cooling System (Left Side)
Figure 601 (Sheet 2)

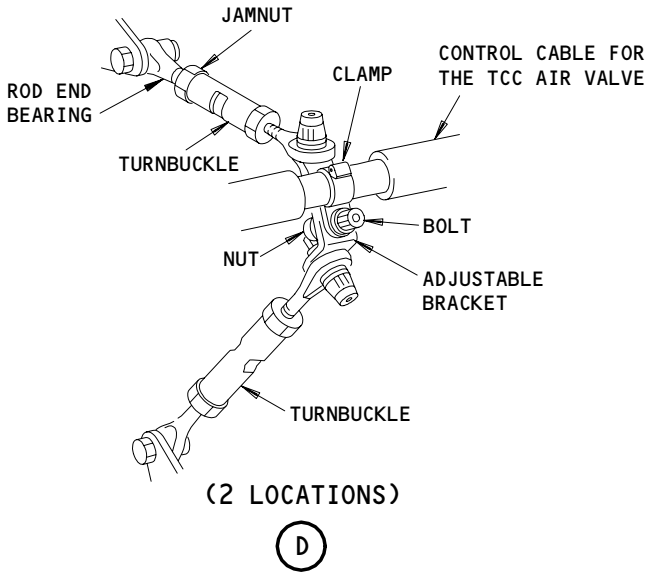




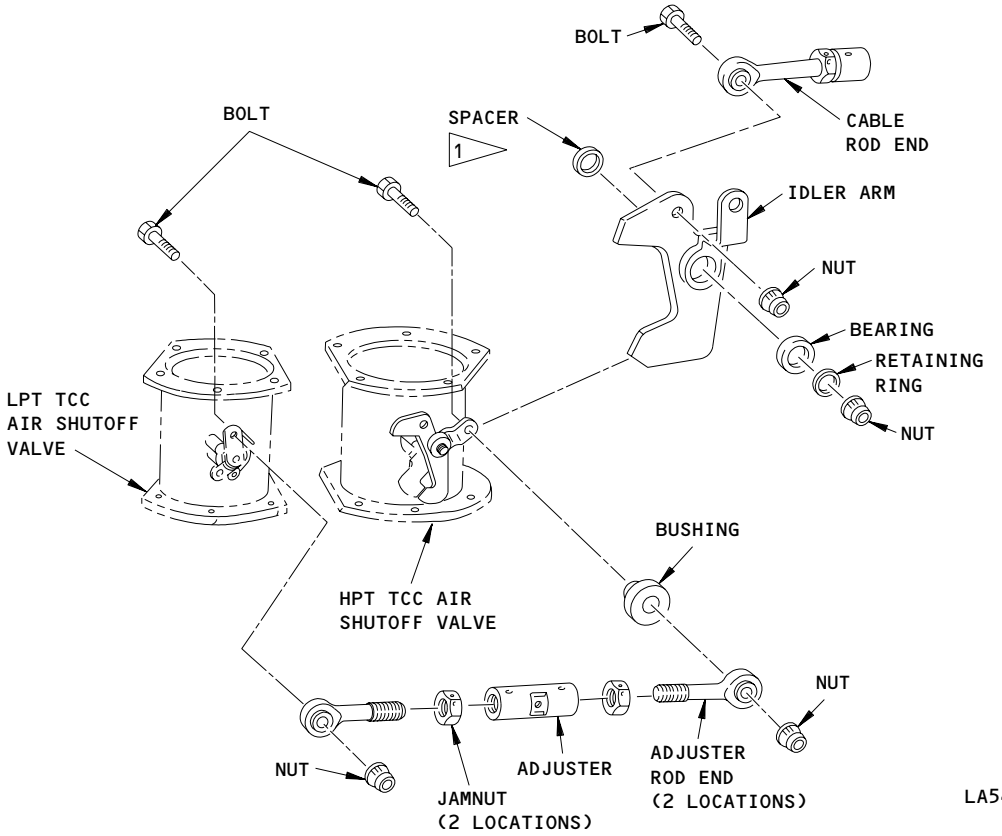
1 ENGINES WITHOUT PHASE 3

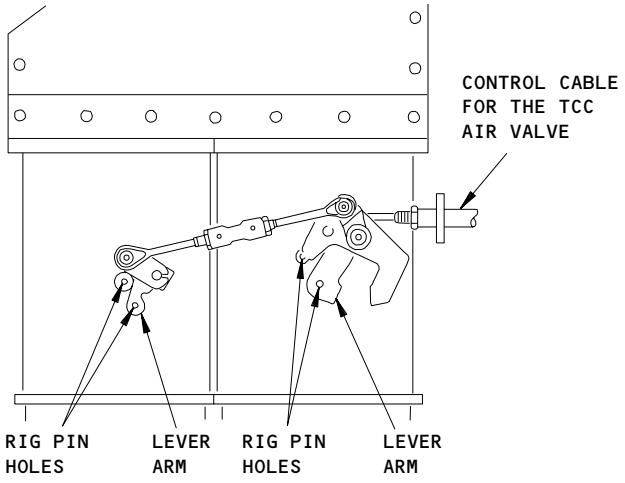
Turbine Cooling System (Right Side)
Figure 602 (Sheet 1)





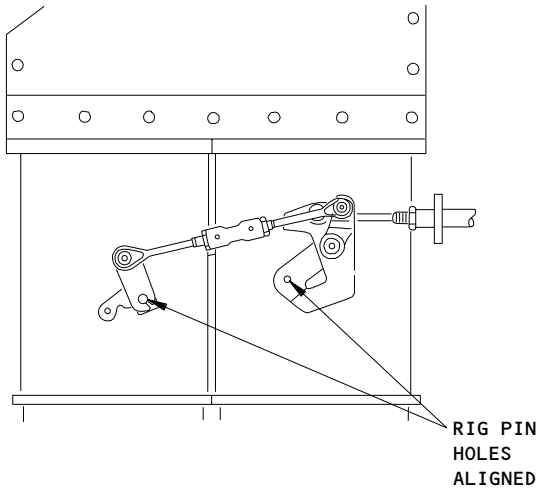
Turbine Cooling System (Right Side)
Figure 602 (Sheet 2)





TCC AIR SHUTOFF VALVES
FULLY CLOSED POSITION

F

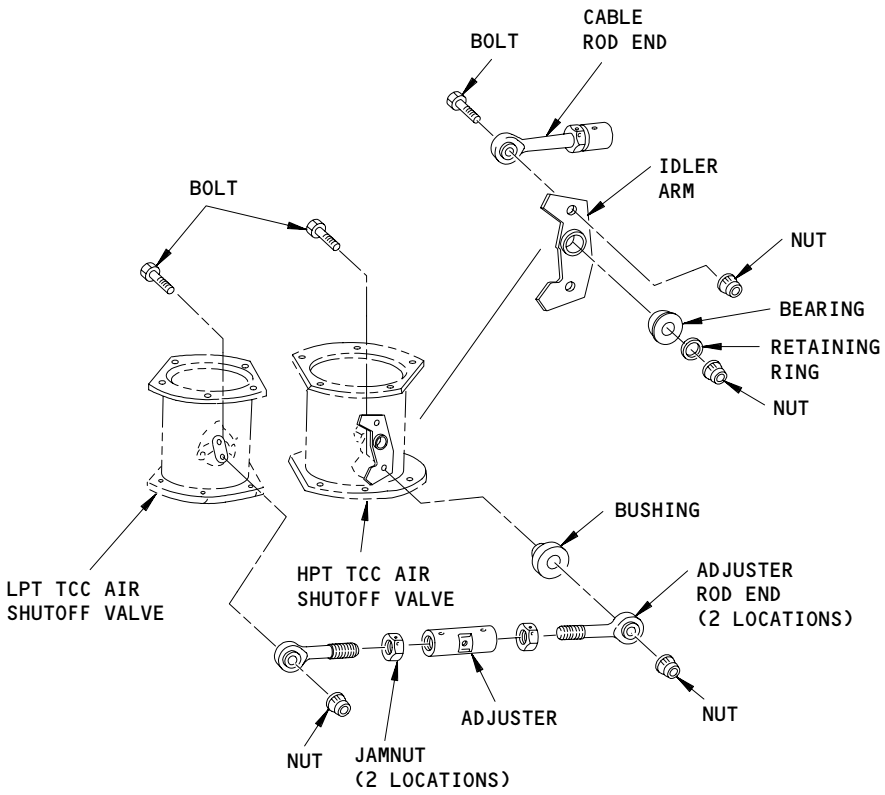


TCC AIR SHUTOFF VALVES
FULLY OPEN POSITION

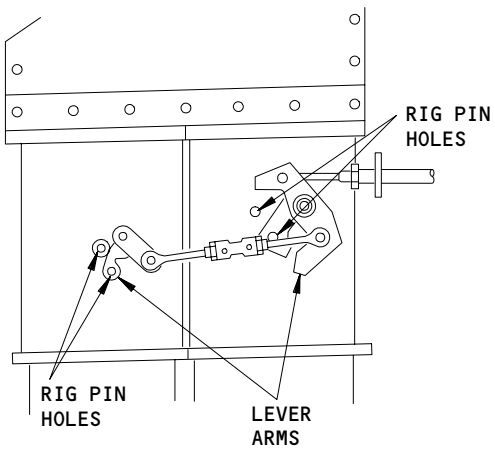
F

1 ENGINES PRE-PW-SB 75-74

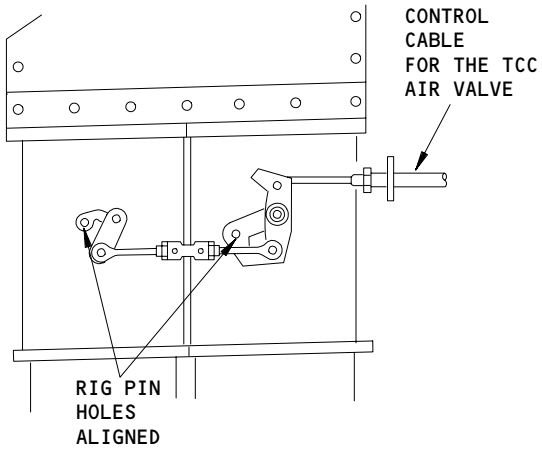
Turbine Cooling System (Right Side)
Figure 602 (Sheet 3)



(E)



TCC AIR SHUTOFF VALVES
FULLY CLOSED POSITION



TCC AIR SHUTOFF VALVES
FULLY OPEN POSITION

(F)

Turbine Cooling System (Right Side)
Figure 602 (Sheet 4)

(c) If the pin is not fully extended, the cooling air valve is not fully open.

TURBINE COOLING SYSTEM INSPECTION LIMITS	
LIMIT	NECESSARY ACTION
1. One cooling air valve in the closed position	Replace the cooling air valve at the subsequent possible time (AMM 75-24-01/401).
2. Two cooling air valves in the closed position	Replace the cooling air valve (AMM 75-24-01/401) or the air valve solenoid (AMM 75-33-03/401) as applicable before the next flight. If a replacement is not found, you can operate the engine for 50 hours or 5 cycles, the lesser of the two, to permit the airplane to return to a maintenance base.

(d) ENGINES WITHOUT PHASE 3 AND PRE-PW-SB 75-91;
ENGINES WITHOUT PHASE 3, PRE-PW-SB 75-116 AND PRE-PW-SB 75-120;
ENGINES WITHOUT PHASE 3, POST-PW-SB 72-504 AND PRE-PW-SB 75-121;
Do the following functional test of the Turbine Vane and Blade Cooling Air (TVBCA) Valve Soleniod.
1) The indicators on the TVBCA valves must be extended. If the indicators are not extended, the valves have failed and must be replaced before you continue with the functional inspection.

2) Loosen the tube clamp on the 15th stage air supply tube (AA22) that is closest to the TVBCA valve soleniod.
3) Disconnect the 15th stage air supply tube (AA22) from the center connector on the TVBCA valve solenoid.
4) Connect a flex hose to the TVBCA valve soleniod at the 15th stage air supply port.
   a) Use a number 7 Aero-Equip fitting.
5) Apply a pressure of 100 - 500 psi (689.5 - 3447.4 kPa) to pressurize the TVBCA valve soleniod.

   NOTE: Use filtered shop air or a portable pressure bottle.

6) While the TVBCA valve soleniod is pressurized, examine the position indicators on the TVBCA valves and make sure they have not retracted (AMM 75-33-00/601).
7) If the position indicators are retracted (not fully extended) the TVBCA valve soleniod has failed.

   NOTE: With the TVBCA valve soleniod de-engergized, air should not flow to the TVBCA valve. The position indicators will then be in the extended (not retracted) position.

   a) Refer to PW SB 75-101 for engine disposition.
8) Remove the flex line from the TVBCA valve soleniod.
9) Connect the 15th stage air supply tube (AA22) to the center connector on the TVBCA valve solenoid.
   a) Torque the tube nut to 225 - 250 pound-inches (25.4 - 28.2 newton-meters).
10) Tighten the tube clamp on the 15th stage air supply tube (AA22) which is closest to the TVBCA soleniod valve.

S 226-010-N00

(5) Do a check of the control system for turbine case cooling.

NOTE: This inspection is used to do a general inspection and to make sure of the steps that follow:
- The linkage and valves operate freely.
- To find any secondary damage caused by a known defective component.
- To find the cause of damage to a component.

(a) Remove the bolt and nut that attach the cable rod end to the idler arm.

(b) Manually pull the cable rod end rearward.

S 966-011-N00

(6) If the cable rod end is disconnected from the control cable, replace the control cable (AMM 75-24-11/401) because the shear pin is defective.

S 216-012-N00

(7) Continue with the steps that follow to examine the control system of the TCC:
   (a) Remove the two bolts, nuts, and the front bushing that attach the adjuster to the HPT valve lever arm.
   (b) Examine the bearings on the adjuster rod end for damage and if they turn freely in the adjuster rod ends.
   (c) If necessary, replace the adjuster rod ends with the steps that follow:
      1) Remove the lockwire from the applicable jamnut.
      2) Loosen the jamnut.
      3) Replace the adjuster rod end and jamnut.
         a) Tighten the jamnut to 14-16 pound-inches (1.4-1.8 newton-meters).

S 826-013-N00

(8) If the adjuster rod ends were replaced, adjust the turbine cooling system (AMM 75-24-00/501).

S 216-014-N00

(9) Examine the idler arm for damage and see if it turns freely on the valve shaft.
   (a) If necessary, replace the idler arm or bearing as follows:
      1) Remove the nut that attaches the idler arm with the bearing and retaining ring.
         a) Remove the idler arm.
      2) ENGINES PRE-PW-SB 75-74;
         Do the steps that follow:

a) Install the nut to keep the spacer on the valve shaft.
b) Tighten the nut with your hand.

3) Remove the retaining ring and bearing from the idler arm.
a) Replace the defective part.

4) Install the retaining ring and bearing to the idler arm.

5) Remove the nut from the shaft.

6) ENGINES PRE-PW-SB 75-74;
Install the idler arm with the spacer in position.

7) ENGINES POST-PW-SB 75-74 OR PHASE 3;
Install the idler arm.

8) Lubricate the threads of the nut, which attaches the idler arm, with oil.

9) Install the nut on the valve shaft.

10) Tighten the nut to 36-40 pound-inches (4.1-4.5 newton-meters).

S 826-015-N00

(10) If the idler arm or bearing was replaced, adjust the turbine cooling system (AMM 75-24-00/501).

S 826-016-N00

(11) Manually turn the HPT and the LPT valve lever arm clockwise to the fully open position.

S 866-017-N00

(12) Release the HPT and the LPT valve lever arm.
(a) Make sure the HPT and LPT TCC air shutoff valves go back to the fully closed position.

S 966-018-N00

(13) If the HPT or the LPT valve lever arm does not function correctly, replace the HPT or LPT TCC air shutoff valve (AMM 75-24-03/401 or AMM 75-24-04/401), as applicable.

S 216-045-N00

(14) If the control cable or the actuator for the TCC air shutoff valve cannot move, remove the actuator (AMM 75-24-05/401) and do the steps that follow:
(a) Use a soft drift and manually push the piston shaft into the actuator.

(b) If the piston shaft does not move freely or does not come back, replace the actuator.
(c) Manually push and pull the control cable for the full movement.

S 826-046-N00
(15) If you think the adjustment of the system is incorrect, do a check of the rigging (AMM 75-24-00/501).

S 426-047-N00
(16) Install the adjuster assembly:
(a) Install the bushing (flange out) to the outer side of the bolt hole on the idler arm.
(b) Set the adjuster assembly to the HPT valve lever arm and the idler arm.
(c) Lubricate the threads of the bolts with oil.
(d) Attach the adjuster assembly with the bolts and nuts.

NOTE: Install the bolts from the inside of the idler arm.

1) Tighten the nuts to 36-40 pound-inches (4.1-4.5 newton-meters).

S 426-048-N00
(17) Attach the cable rod end to the inner side of the idler arm with the bolt and nut.

NOTE: Install the bolt from the inner side of the rod end.

(a) Tighten the bolts to 36-40 pound-inches (4.1-4.5 newton-meters).

S 216-030-N00
(18) Visually examine the inside of the TCC air inlet duct.
(a) Make sure the TCC blank-off plate between the upper support bracket and the TCC air inlet duct is removed.
(b) ENGINES WITH HSD EEC 791100-4-035 AND ON;
Make sure the TCC metering plate between the upper support bracket and the TCC air inlet duct is removed.

(c) ENGINES WITHOUT HSD EEC 791100-4-035 AND ON;
Make sure the TCC metering plate between the upper support bracket and the TCC air inlet duct is installed.

S 226-023-N00

(19) Do the inspection of the TCA cooling manifolds and supply tubes:

(a) Examine the TCA manifolds and supply tubes for damage. Make sure any damage is within the in-service limits that are given in the table below:

Inspect For	In-Service Limits
Corrosion and Stains	Permitted if it can be removed by light polishing with crocus cloth.
Loose Tube Nuts	None Permitted
Loose or Broken Lockwire	None Permitted
Nicks, Scratches, Chafing and Pitting	0.003 inch (0.076 mm) maximum depth permitted in all locations.
Dents (without sharp edges or corners)	Permitted if the tube outer diameter is not decreased by more than 20 percent at each location. No dents permitted within 0.25 inch (6.35 mm) from the tube ferrule.
Dents (with sharp edges or corners) corners)	None permitted

(b) Visually examine the TCA manifolds and tubes for cracks. If you find cracks, use the table below to find the applicable action required:

Limit	Neccesary Action
A crack less than 270 degrees around the edge of the tube or 6-inches (152.4 mm) in length; no hole in the crack and no record of high nacelle temperature or fire warnings on the flight before.	Replace the damaged tube before the next flight (AMM 75-24-05/401). If a replacement tube is not immediately available and the aircraft is not at a maintenance base, it is permitted to isolate the damaged tube (AMM 75-24-00/201). Operate the engine for a maximum of 50 hours or 5 cycles, whichever is less.
A crack of more than 270 degrees around the edge of the tube or 6-inches (152.4 mm) in length; or when there is a hole in the crack of any size and there was a high nacelle temperature or fire warning on the flight before.	Remove the engine for inspection of the HPT immediately. If the aircraft is not at a maintenance base; Replace the damaged tube and operate the engine for a maximum of 50 hours or 5 cycles, whichever is less, to return the aircraft to a maintenance base for an engine change and HPT inspection.

S 226-050-N00

(20) Do the inspection of the TCC manifolds and supply tubes:

(a) Examine the TCC manifolds and supply tubes for damage. Make sure any damage is within the in-service limits that are given in the table below:

NOTE: This inspection procedure does not require tube removal in order to inspect and verify acceptable tube condition. Air system tube dents are to be considered acceptable for continued service if, visually, the tube OD is seen to not be decreased by more than 20 percent at any particular location.

Inspect For	In-Service Limits
Cracks	Up to 180 degrees circumferentially or 6.0 inches (152.400 mm) axially if the crack is stopped drilled and does not permit air to blow on the case or flange. Up to 2 cracks per tube or collector. If tubes are found crackes, the TCC system tubes must be inspected for loose and worn clamps. Loose clamps must be tightened and worn clamps must be replaced before the next flight. Cracked tubes must be replaced at the next A-check.
Holes	Up to 0.05 inch (1.270 mm) diameter permitted if the air exiting the hole does not blow directly on the turbine case or flange. Up to 4 holes per tube or collector. Tubes with holes that are more than 0.05 inch (1.270 mm) must be replaced at the next A-check.
Corrosion and Stains	Permitted without restriction.
Loose Tube Nuts	None Permitted
Loose or Broken Lockwire	None Permitted
Nicks, Scratches, Chafing and Pitting	Nicks, scratches, chafing and pitting is permitted with no limit until air leakage occurs. If there is air leakage, treat it as a hole.
Dents (without sharp edges or corners)	Permitted if the tube outer diameter is not decreased by more than 20 percent at each location. No dents permitted within 0.25 inch (6.35 mm) from the tube ferrule.
Dents (with sharp edges or corners) corners)	Dents with or without sharp edges or corners are permitted with no limit as long as the tubing outer diameter is not decreased by more than 20 percent at each location. Tubes dented more than 20 percent must be replaced at the next A-check.

S 226-052-N00

(21) Examine the TCC manifolds and supply tube supports and clamps.

(a) Evidence of looseness, cracks or damage to cushion material is acceptable within limits specified below.

NOTE: The cushion material for the TCC manifolds and tubes are located at all support locations, 360 degrees around the low pressure turbine and high pressure turbine cases.

1) Looseness of supports or clamps attached to the manifolds is not acceptable and must be corrected.
2) Inspect supports and clamps for cracks. None are acceptable.
3) Inspect clamps for damage to cushion material. Any extent is acceptable unless looseness or chafing occur.

S 226-051-N00

(22) Do an inspection of TCC and TCA manifold and tube clearance.

(a) Examine the TCC and TCA air system manifolds and tubes for 0.125 inch (3.175 mm) minimum clearance to adjacent tubes or structures.
1) The minimum clearance between any two adjacent tubes or between one single tube and any other adjacent engine part shall be 0.125 inch (3.175 mm) unless othwerwise specified. Exceptions to this clearance requirement are permitted at specific locations where adjacent tubes are clipped together or where other local constraints will prevent tube contact at clearance below the 0.125 inch (3.175 mm) minimum.
2) Minimum clearance refers only to clearance relative to tube and not to fittings or other attached hardware.

(b) Make sure the TCA manifolds and tubes are correctly attached at all support locations.
1) Replace all worn clamps.
2) Tighten all loose clamp and bracket attaching bolts.

(c) Examine all manifold and tube connections, manifold-to-component connections and tube-to-case-boss connections for leaks and or loose connections.
1) No leaks or loose connections are permitted.
2) Repair as necessary.

S 216-025-N00

(23) Examine the electrical harnesses.

(a) Examine the electrical harnesses for damage and loose connectors.
1) Replace the electrical harnesses and connectors as necessary.

F. Return the Aircraft to its Usual Condition

S 416-026-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT COULD OCCUR.

(1) Close the thrust reversers (AMM 78-31-00/201).

S 416-027-N00

(2) Close the core cowl panels (AMM 71-11-06/201).

S 446-028-N00

(3) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

S 416-029-N00

(4) Close the fan cowl panels (AMM 71-11-04/201).

TASK 75-24-00-716-032-N00

2. Do an Inspection of the Linkage for the Turbine Cooling System

A. Equipment

(1) Positioning bolt - Standard hex head bolt No. 8-32, 1.5 inch (38.1 mm) thread of minimum length, commercially available.

B. References

(1) AMM 71-11-04/201, Fan Cowl Panels
(2) AMM 71-11-06/201, Core Cowl Panels
(3) AMM 78-31-00/201, Thrust Reverser System

C. Access

(1) Location Zones

417	L Power Plant Core Cowl
418	L Power Plant Core Cowl
427	R Power Plant Core Cowl
428	R Power Plant Core Cowl

(2) Access Panels

417AL	Core Cowl (Left)
418AR	Core Cowl (Right)
427AL	Core Cowl (Left)
428AR	Core Cowl (Right)

D. Prepare to Do the Inspection of the Linkage

S 016-040-N00

(1) Open the fan cowl panels (AMM 71-11-04/201).

S 046-041-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO YOU OR DAMAGE TO EQUIPMENT.

(2) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 016-042-N00

(3) Open the core cowl panels (AMM 71-11-06/201).

S 016-043-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT COULD OCCUR.

(4) Open the thrust reversers (AMM 78-31-00/201).

E. Do an Inspection of the Linkage for the Turbine Cooling System (Fig. 602)

NOTE: When you do the engine shutdown, the air shutoff valves are in the fully closed position.

S 496-033-N00

(1) Install the positioning bolt in the positioning bolt hole at the rear of the actuator.
   (a) While you install the positioning bolt, look at the linkage to make sure it moves freely and each lever arm moves off the closed stop to the open position.
   (b) Install the positioning bolt a minimum of one inch into the actuator.

S 096-034-N00

(2) Remove the positioning bolt from the actuator.
   (a) While you remove the positioning bolt, look at the linkage to make sure it moves freely and the lever arms go back to the fully closed position.

S 966-035-N00

(3) If the linkage does not operate correctly, repair or replace the linkage as it is necessary.

F. Put the airplane back to its initial condition

S 416-036-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT COULD OCCUR.

(1) Close the thrust reversers (AMM 78-31-00/201).

S 416-037-N00

(2) Close the core cowl panels (AMM 71-11-06/201).

S 416-038-N00

(3) Close the fan cowl panels (AMM 71-11-04/201).

S 446-039-N00

(4) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

TURBINE VANE AND BLADE COOLING AIR VALVES - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks. One task is to remove the Turbine Vane and Blade Cooling Air (TVBCA) valve. The other task is to install the TVBCA valves. Unless the task refers to the left or right side, then the task is the same for both sides.

TASK 75-24-01-004-001-N00

2. Remove the Turbine Vane and Blade Cooling Air Valves
   A. References
      (1) AMM 36-11-01/401, Pneumatic Duct
      (2) AMM 36-11-06/401, Air Supply Intermediate Pressure Check Valve
      (3) AMM 36-11-18/401, Air Supply Pressure Regulating Valve
      (4) AMM 71-11-04/201, Fan Cowl Panels
      (5) AMM 71-11-06/201, Core Cowl Panels
      (6) AMM 75-24-13/401, Turbine Vane and Blade Cooling Air Valve Position Switch
      (7) AMM 78-31-00/201, Thrust Reverser System
   B. Access
      (1) Location Zones
          411 Left Engine
          421 Right Engine

      (2) Access Panels
          413AL/414AR Fan Cowl Panel, Left Engine
          415AL/416AR Thrust Reverser, Left Engine
          417AL/418AR Core Cowl Panel, Left Engine
          423AL/424AR Fan Cowl Panel, Right Engine
          425AL/426AR Thrust Reverser, Right Engine
          427AL/428AR Core Cowl Panel, Right Engine

   C. Prepare to Remove the Turbine Vane and Blade Cooling Air Valves

      S 014-002-N00
      (1) Open the fan cowl panels (AMM 71-11-04/201).

      S 044-003-N00

      WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

      (2) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

      S 014-004-N00
      (3) Open the core cowl panels (AMM 71-11-06/201).

S 014-005-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT COULD OCCUR.

(4) Open the thrust reversers (AMM 78-31-00/201).

D. Procedure

S 014-054-N00

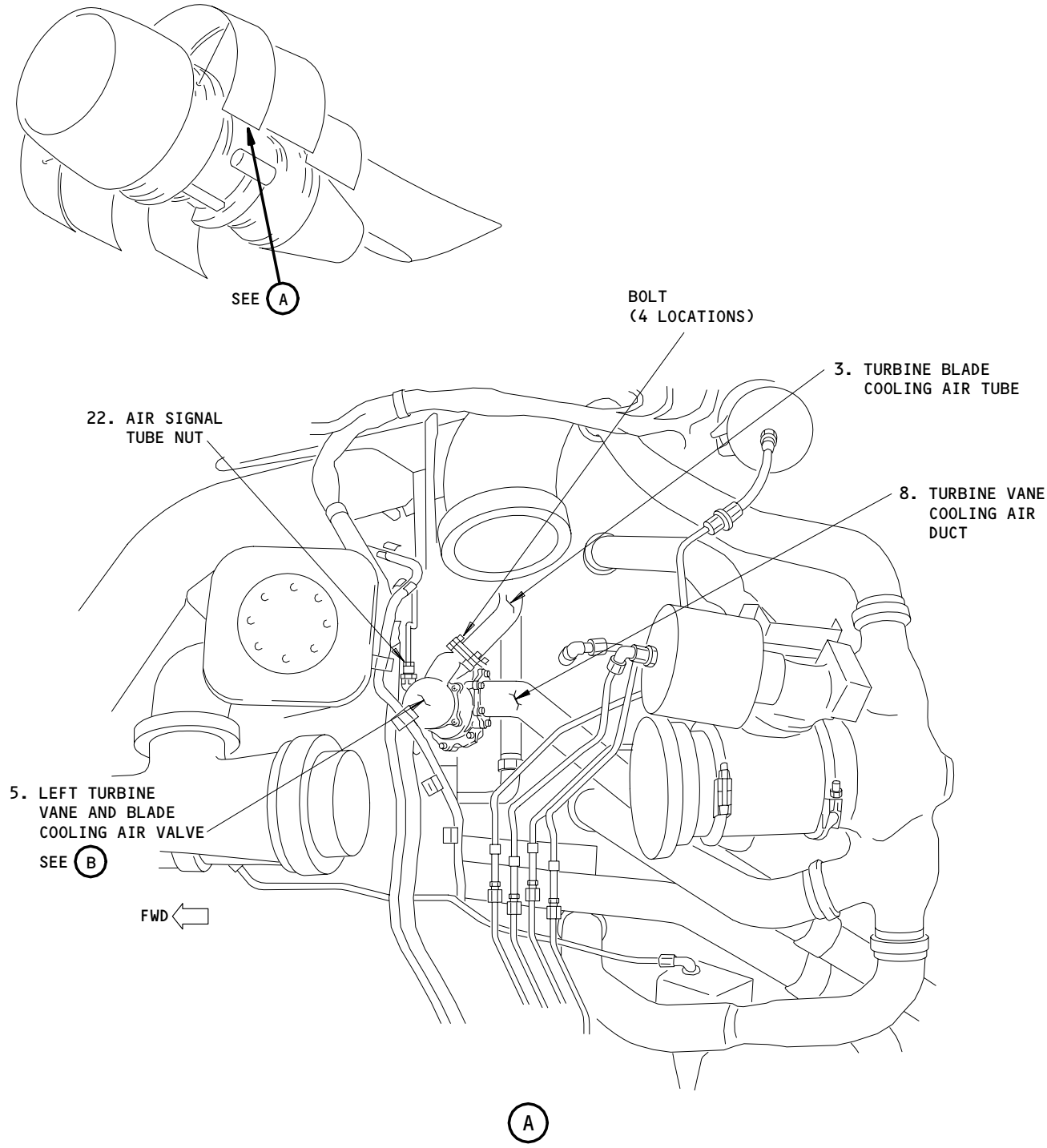
(1) For the left cooling air valve, remove the components that follow:
   (a) Pressure Regulating Valve (AMM 36-11-18/401).
   (b) Intermediate to High Pressure Tee (AMM 36-11-01/401).
   (c) Intermediate Pressure Check Valve (AMM 36-11-06/401).

S 014-056-N00

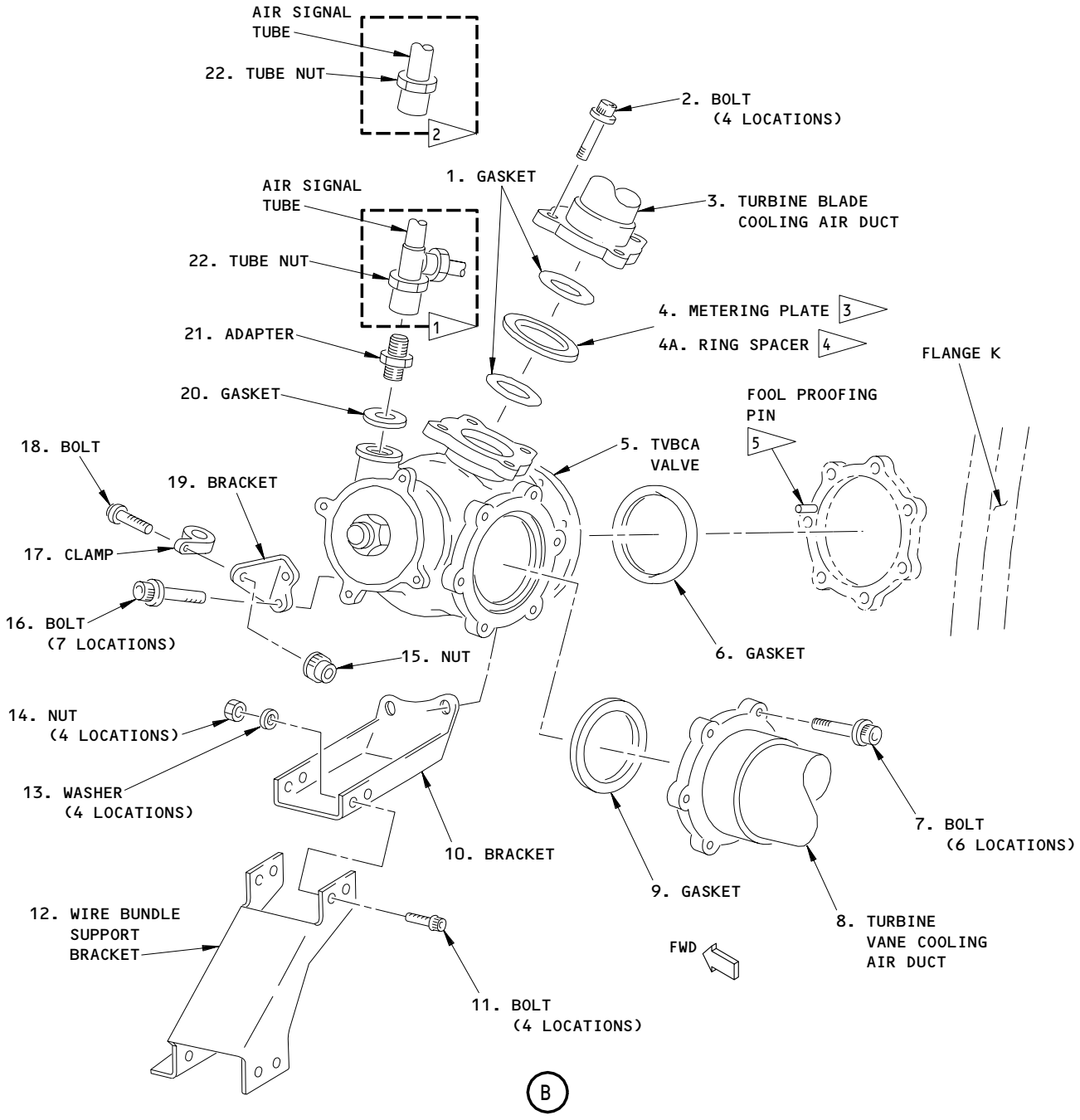
(2) For the right cooling air valve, remove the position switch on the Turbine Vane and Blade Cooling Air (TVBCA) valve (AMM 75-24-13/401).

S 024-057-N00

(3) Remove the Turbine Vane and Blade Cooling Air Valves (Fig. 401 and 402):
   (a) Remove the lockwire or safety cable and ferrule from the tube nut (22) of the air signal tube.
   (b) Disconnect the tube nut (22) of the air signal tube.
   (c) Remove the bolts (7) which attach the flange of the cooling air duct for the turbine vane to the TVBCA valve.
   (d) For the right TVBCA valve, also remove the bracket (33).
      1) Discard the metal gasket (9).
   (e) Remove the bolts (2) which attach the cooling air duct for the turbine blade to the flange of the TVBCA valve.
   (f) For the right TVBCA valve, also remove the bracket (32).
   (g) Remove the metering plate (4) or the ring spacer (4A) and the metal gaskets (1).
      1) Discard the metal gaskets (1).

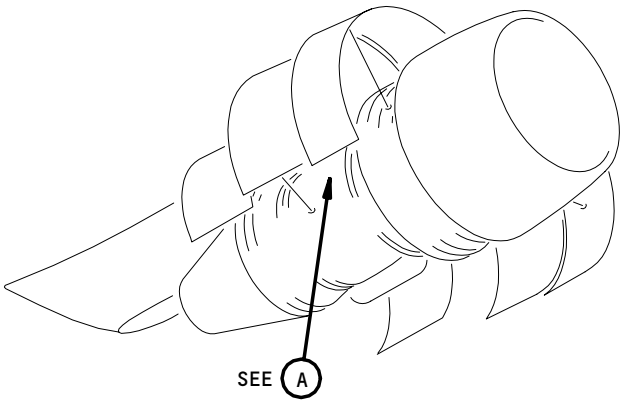


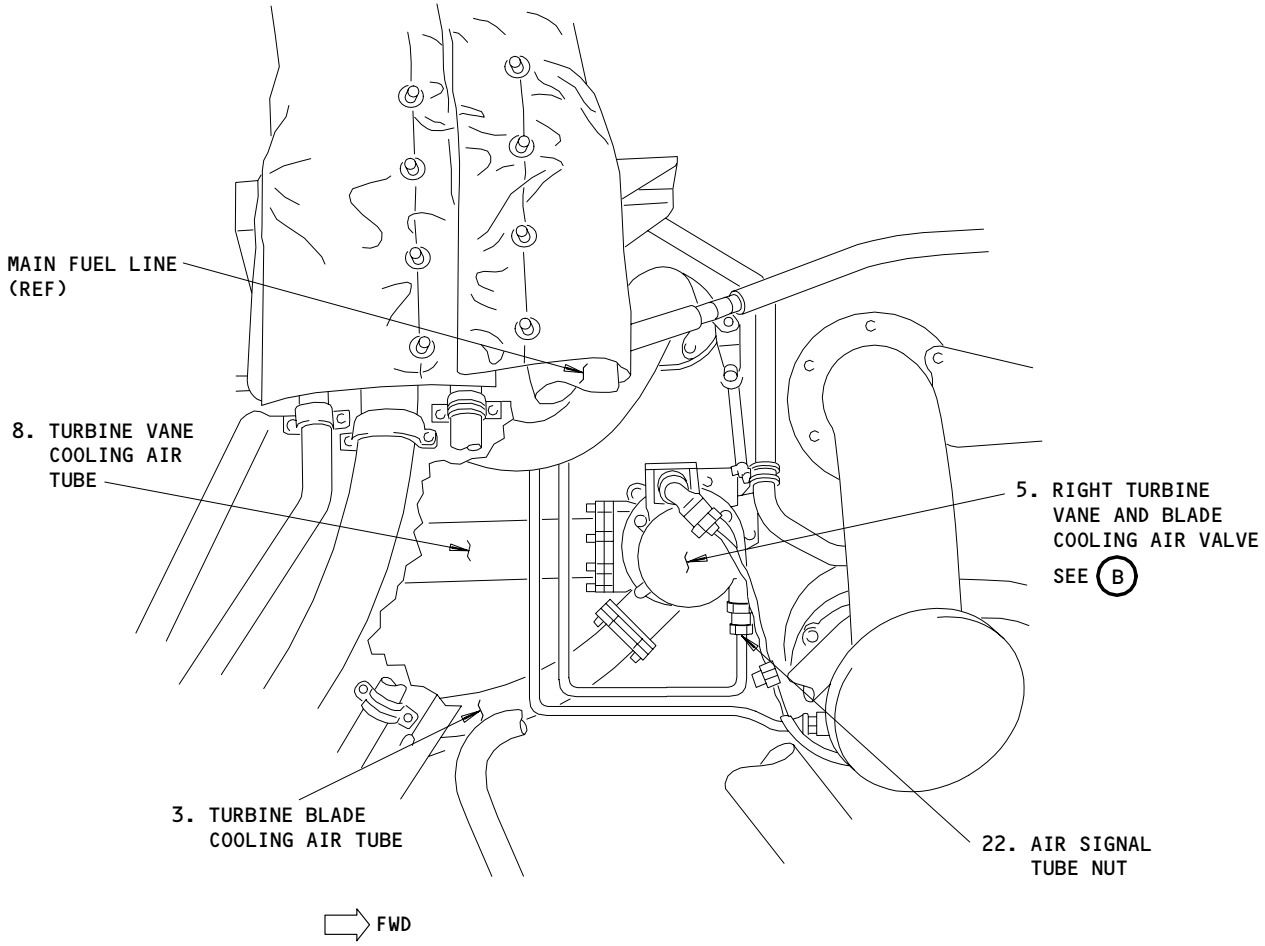
Turbine Vane and Blade Cooling Air Valve Installation (Left Side)
Figure 401 (Sheet 1)



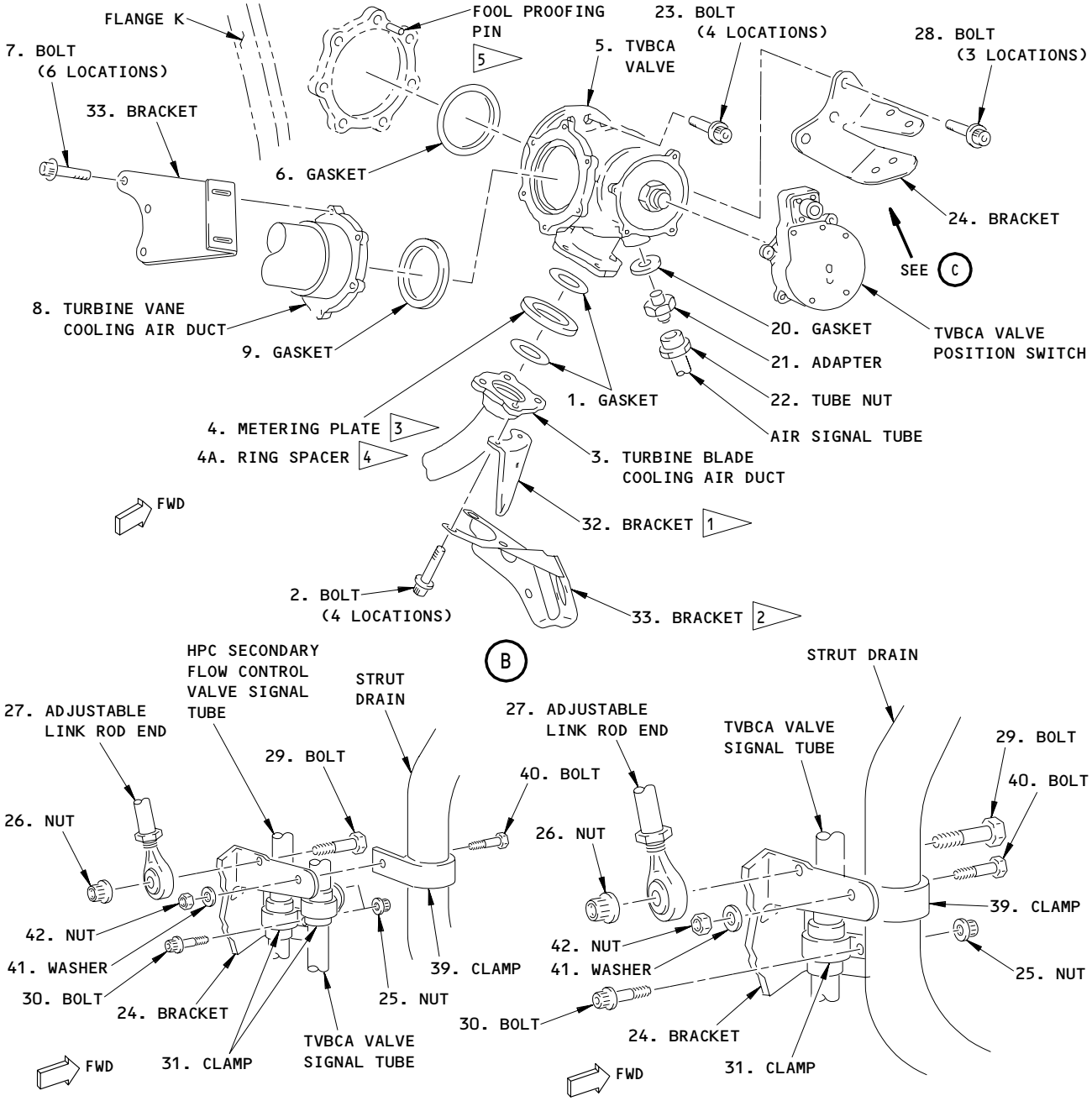
1 ENGINES PRE-PW-SB 75-91
2 ENGINES POST-PW-SB 75-91
3 ENGINES PRE-PW-SB 72-537 OR POST-PW-SB 72-627
4 ENGINES POST-PW-SB 72-537 OR PRE-PW-SB 72-627
5 ENGINES POST-PW-SB 72-755

Turbine Vane and Blade Cooling Air Valve Installation (Left Side)
Figure 401 (Sheet 2)





Turbine Vane and Blade Cooling Air Valve Installation (Right Side)
Figure 402 (Sheet 1)



1 > ENGINES PRE-PW-SB 73-164
2 > ENGINES POST-PW-SB 73-164
3 > ENGINES PRE-PW-SB 72-537 OR POST-PW-SB 72-627
4 > ENGINES POST-PW-SB 72-537 OR PRE-PW-SB 72-627
5 > ENGINES POST-PW-SB 75-755

Turbine Vane and Blade Cooling Air Valve Installation (Right Side)
Figure 402 (Sheet 2)

2) Keep the metering plate (4) or ring spacer (4A).

(h) For the right TVBCA valve (5), do these steps to remove the parts that attach to the bracket (24) installed to the flange.
1) Remove the bolt (29) and nut (26) that attach the adjustable link rod end (27) to the bracket (24).
2) Remove the bolt (40), nut (42), and washer (41) that attach the strut drain clamp (39) to the bracket (24).
3) Remove the bolt (30) and nut (25) that attach the tube clamps (31) to the bracket (24).

(i) For the left TVBCA valve (5), remove the bolts (11), nuts (14), and washers (13) which attach the support bracket (12) to the bracket (10).

(j) For the left TVBCA valve (5), remove the bolt (18) and nut (15) which attach the tube clamp (17) to the bracket (19) attached to the flange.

(k) For the left TVBCA valve, remove the bolts (16) which attach the valve and the brackets (10, 19) to the valve boss on the engine HPC case.

NOTE: Use a standard 5/16 inch, 12 point torque adapter, with a length of approximately 2 9/16 inch (65.088 mm), to remove the cooling air valve.

1) Discard the gasket (6).

(l) For the right TVBCA valve, remove the bolts (23, 28) which attach the valve and the bracket (24) to the valve boss on the engine HPC case.

NOTE: Use a standard 5/16 inch, 12 point torque adapter, with a length of approximately 2 9/16 inch (65.088 mm), to remove the cooling air valve.

(m) Remove the TVBCA valve (5) from the engine.
1) Discard the metal valve gasket (6).

(n) Install protection caps on the cooling air ducts (3, 8), air signal tube, valve boss on the engine case, and the openings on the TVBCA valve (5).

S 024-058-N00

(4) If it is necessary to replace the cooling air-valve (5), do the steps that follow:

(a) Remove the adapter (21) for the air signal tube and the gasket (20) from the port on the TVBCA valve (5).

1) Discard the gasket (20).

(b) Install a protection cap on the opening in the TVBCA valve (5).

TASK 75-24-01-404-017-N00

3. Install the Turbine Vane and Blade Cooling Air Valves

A. Equipment

(1) M303, M305, or M307 Bergen Mechanical Crimper
Bergen Cable Technologies Inc
170 Gregg St
P.O. Box 1300
Lodi, NJ 07644-9982

B. Consumable Materials

(1) D00137 Engine Oil - PWA 521
(2) G02334 Lockwire - AS3214-02
(3) G02030 Paraffin Wax - PMC 9552
(4) G02332 Ferrule - P05-292 (Optional)
(5) G02335 Cable Safety - P05-291 (Optional)

C. Parts

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	1	Gasket	75-26-00	01	50
	5	TVBCA Valve	75-24-03	10	45
	6	Gasket			50
	9	Gasket	75-24-07	05	85
	20	Gasket	75-24-03	10	10

D. References
(1) AMM 36-11-01/401, Pneumatic Duct
(2) AMM 36-11-06/401, Air Supply Intermediate Pressure Check Valve
(3) AMM 36-11-18/401, Air Supply Pressure Regulating Valve
(4) AMM 70-50-00/201, Standard Torque Values
(5) AMM 71-00-00/501, Power Plant
(6) AMM 71-11-04/201, Fan Cowl Panels
(7) AMM 71-11-06/201, Core Cowl Panels
(8) AMM 75-24-13/401, Turbine Vane and Blade Cooling Air Valve Position Switch
(9) AMM 78-31-00/201, Thrust Reverser System

E. Access
(1) Location Zones
411 Left Engine
421 Right Engine

(2) Access Panels
413AL/414AR Fan Cowl Panel, Left Engine
415AL/416AR Thrust Reverser, Left Engine
417AL/418AR Core Cowl Panel, Left Engine
423AL/424AR Fan Cowl Panel, Right Engine
425AL/426AR Thrust Reverser, Right Engine
427AL/428AR Core Cowl Panel, Right Engine

F. Procedure (Fig. 401 and 402)

S 424-059-N00
(1) Remove the protective caps.

S 424-060-N00
(2) If it is necessary to install a new Turbine Vane and Blade Cooling Air (TVBCA) valve (5), do the steps that follow:

NOTE: if the engine has the ring case style compressor (SB PW 72-755), you must install a turbine vane and blade cooling air valve with the foolproofing pin hole to match the pin on the flange boss. If you do not the valve will not fit on the case.

(a) Install the new gasket (20) on the adapter (21) for the air signal tube.
(b) Lubricate the threads of the adapter (21) with engine oil.

(c) Install the adapter (21) in the port on the TVBCA valve (5).
1) Tighten the adapter (21) to 110-120 pound-inches (12.4-13.6 newton-meters).

S 424-061-N00

(3) Install the Turbine Vane and Blade Cooling Air Valves.
(a) Install the new metal valve gasket (6) on the valve boss.
1) Attach the metal valve gasket (6) with paraffin wax.
(b) For the left TVBCA valve (5), do the steps that follow:
1) Put the TVBCA valve (5) and the brackets (10, 19) on the valve boss.
2) Lubricate the threads of the bolts (16) with engine oil.

CAUTION: WHEN YOU USE A TORQUE ADAPTER, THE TORQUE ON THE BOLTS IS LARGER THAN SHOWN BY THE TORQUE WRENCH. IT IS NECESSARY TO ADJUST THE TORQUE VALUES OR DAMAGE TO THE BOLT COULD OCCUR. REFER TO THE STANDARD PRACTICES (AMM 70-50-00/201).

3) Tighten the bolts (16), from one corner to the opposite corner, to 85-95 pound-inches (9.6-10.7 newton-meters).

NOTE: Use a 5/16 inch, 12 point standard torque adapter, approximately 2-9/16 inch (65 mm) in length, to tighten the bolts.

a) Without loosening, tighten the bolts (16) again until the necessary torque is kept.
4) Attach the support bracket (12) for the wire bundle to the bracket (10) on the TVBCA valve flange with the bolts (11), washers (13), and nuts (14).
5) Tighten the nuts (14).
(c) For the right TVBCA valve (5), do the steps that follow:
1) Put the TVBCA valve (5) and the bracket (24) on the valve boss.

2) Lubricate the threads of the bolts (23, 28) with engine oil.

CAUTION: WHEN YOU USE A TORQUE ADAPTER, THE TORQUE ON THE BOLTS IS LARGER THAN SHOWN BY THE TORQUE WRENCH. IT IS NECESSARY TO ADJUST THE TORQUE VALUES OR DAMAGE TO THE BOLT CAN OCCUR. REFER TO THE STANDARD PRACTICES (AMM 70-50-00/201).

3) Tighten the bolts (23, 28) from one corner to the opposite corner, to 85-95 pound-inches (9.6-10.7 newton-meters).

NOTE: Use a 5/16 inch, 12 point standard torque adapter, approximately 2-9/16 inch (65 mm) in length, to tighten the bolts.

a) Without loosening, tighten the bolts (23, 28) again until the necessary torque is kept.

4) Lubricate the threads of the bolts (29, 30, and 40) with engine oil.
5) Install the bolt (29) and nut (26) which attach the adjustable link rod end (27) to the bracket (24) on the TVBCA valve flange.
6) Install the bolt (30) and nut (25) that attach the tube clamps (31) to the bracket (24).
7) Tighten the bolts (29, 30) to 36-40 pound-inches (4.1-4.5 newton-meters).
8) Install the bolt (40), washer (41), and nut (42) that attach the strut drain clamp (39) to the bracket (24).
a) Tighten the bolt (40).

(d) For the left TVBCA valve (5), do the steps that follow:
1) Lubricate the threads of the bolt (18) with engine oil.
2) Install the bolt (18) and nut (15) which attach the tube clamp (17) to the bracket (19) found on the TVBCA valve flange.
3) Tighten the bolt (18) to 36-40 pound-inch (4.1-4.5 newton-meters).

(e) Connect the turbine vane cooling air duct (8) to the TVBCA valve (5) with the steps that follow:
1) Put the new gasket (9) between the flange of the turbine vane cooling air duct and the TVBCA valve flange.
2) Lubricate the threads of the bolts (7) with engine oil.
3) For the right TVBCA valve (5), attach the duct flange and bracket (33) to the TVBCA valve flange with the bolts (7).
4) Tighten the bolts (7), from one corner to the opposite corner, to 85-95 pound-inch (9.6-10.7 newton-meters).
a) Without loosening, tighten the bolts (7) again until the necessary torque is kept.

(f) Connect the turbine blade cooling air duct (3) to the TVBCA valve (5) with the steps that follow:
1) Put the new gaskets (1), with the metering plate (4) or the ring spacer (4A) between them, in the flange of the cooling air duct (3).
a) Attach the gaskets (1) and the metering plate (4) or the ring spacer (4A) with paraffin wax.
2) Lubricate the threads of the bolts (2) with engine oil.
3) Attach the duct flange, with the bracket (32) for the right TVBCA valve (5), to the TVBCA valve flange with the bolts (2).
4) Tighten the bolts (2), from one corner to the opposite corner, to 85-95 pound-inch (9.6-10.7 newton-meter).
a) Without loosening, tighten the bolts (2) again until the necessary torque is kept.

(g) Lubricate the threads of the adapter (21) with engine oil.

(h) Attach the tube nut (22) of the air tube to the adapter (21).
1) Tighten the tube nut (22) to 270-300 pound-inches (30.5-33.9 newton-meters).
2) Safety the tube nut (22) with the lockwire or the safety cable and safety cable ferrule.

S 414-063-N00

(4) For the right cooling air valve, install the position switch for the TVBCA valve (AMM 75-24-13/401).

S 414-064-N00

(5) After the installation of the left cooling air valve, install the components that follow:
(a) Pressure Regulating Valve (AMM 36-11-18/401).
(b) Intermediate to High Pressure Tee (AMM 36-11-01/401).

(c) Intermediate Pressure Check Valve (AMM 36-11-06/401).

G. Put the Aircraft Back to its Usual Condition

S 414-032-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT COULD OCCUR.

(1) Close the thrust reversers (AMM 78-31-00/201).

S 414-033-N00

(2) Close the core cowl panels (AMM 71-11-06/201).

S 414-034-N00

(3) Close the fan cowl panels (AMM 71-11-04/201).

S 444-035-N00

(4) Do the activation procedure for the thrust reversers (AMM 78-31-00/201).

TURBINE VANE COOLING AIR DUCTS - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks. One task is to remove the air ducts for the turbine vane cooling. The other task is to install the air ducts for the turbine vane cooling.

TASK 75-24-02-004-001-N00

2. Remove the Turbine Vane Cooling Air Ducts
   A. Equipment
      (1) Jackscrew - 0.190-32 thread, commercially available
   B. References
      (1) AMM 36-11-01/401, Pneumatic Duct
      (2) AMM 71-11-04/201, Fan Cowl Panels
      (3) AMM 71-11-06/201, Core Cowl Panels
      (4) AMM 78-31-00/201, Thrust Reverser System
   C. Access
      (1) Location Zones
          411 Left Engine
          421 Right Engine

      (2) Access Panels
          413AL Fan Cowl Panel (Left), Left Engine
          414AR Fan Cowl Panel (Right), Left Engine
          415AL Thrust Reverser (Left), Left Engine
          416AR Thrust Reverser (Right), Left Engine
          417AL Core Cowl (Left), Left Engine
          418AR Core Cowl (Right), Left Engine
          423AL Fan Cowl Panel (Left), Right Engine
          424AR Fan Cowl Panel (Right), Right Engine
          425AL Thrust Reverser (Left), Right Engine
          426AR Thrust Reverser (Right), Right Engine
          427AL Core Cowl (Left), Right Engine
          428AR Core Cowl (Right), Right Engine

   D. Prepare to Remove the Turbine Vane Cooling (TVC) Air Ducts

      S 014-002-N00
      (1) Open the fan cowl panels (AMM 71-11-04/201).

S 044-003-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(2) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 014-004-N00

(3) Open the core cowl panels (AMM 71-11-06/201).

S 014-005-N00

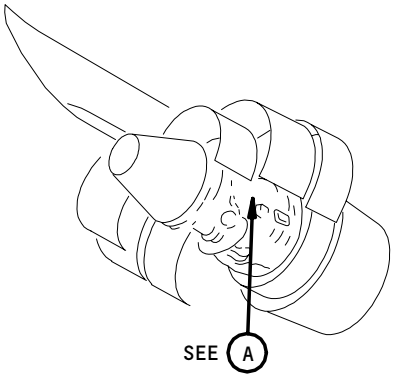
WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

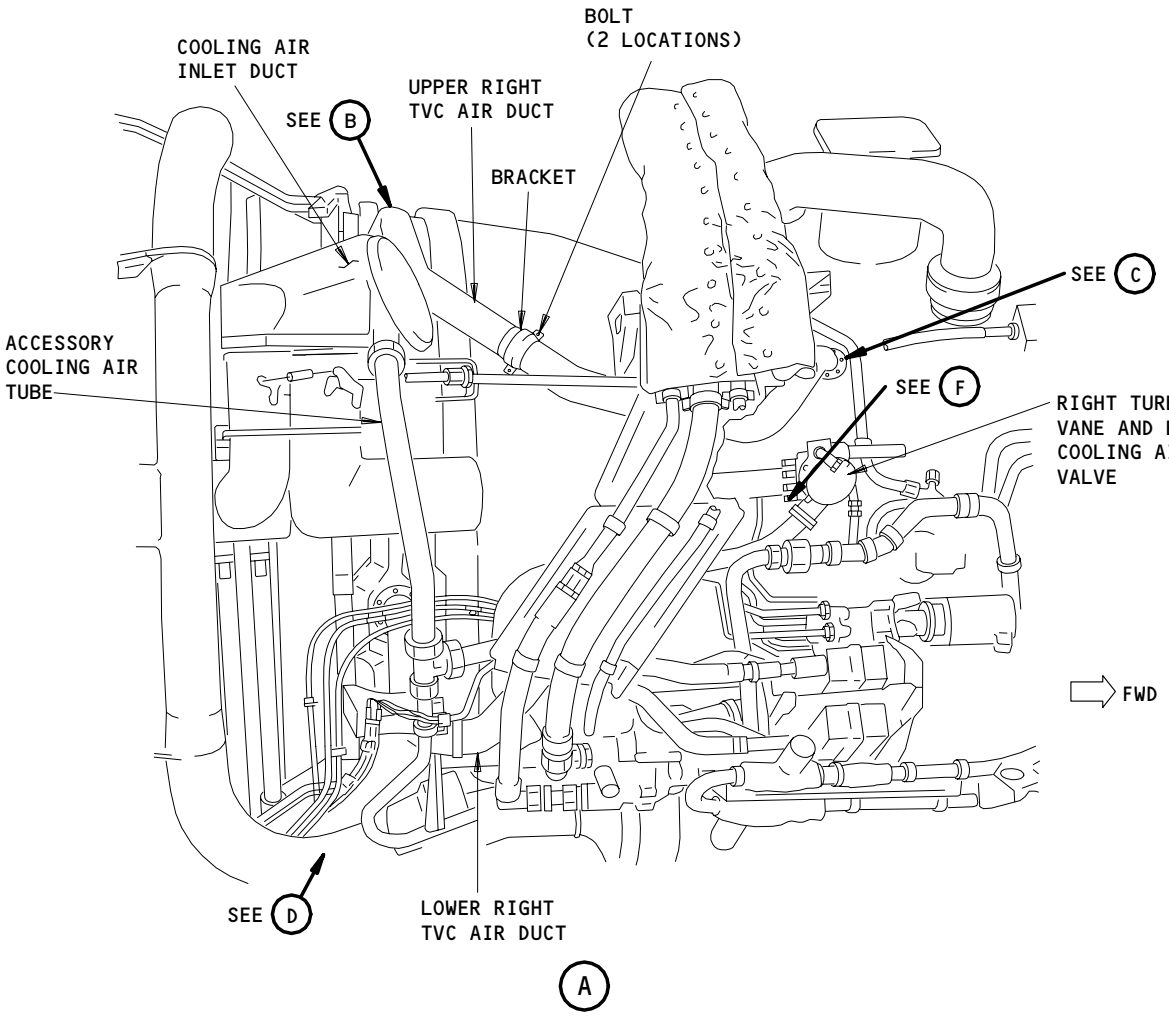
(4) Open the thrust reversers (AMM 78-31-00/201).

E. Remove the Turbine Vane Cooling (TVC) Air Ducts

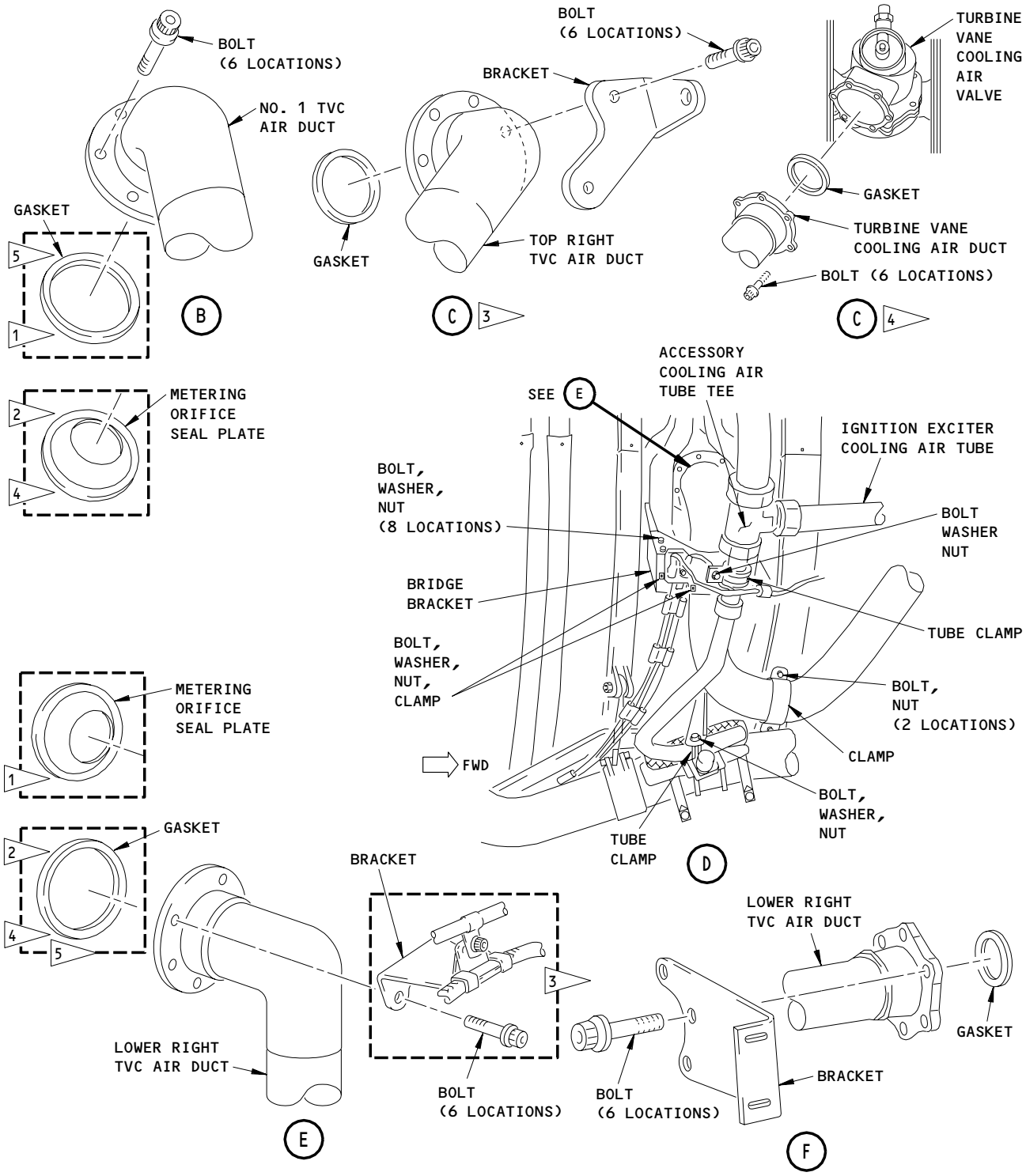
S 024-006-N00

(1) Remove the top right TVC Air Duct with the steps that follow (Fig. 401):
   (a) Remove the bolts which attach the rear flange of the TVC air duct to the boss on the HPT case.
   (b) ENGINES WITHOUT PHASE 3 CHANGES;
   Remove the bolts which attach the front flange of the TVC air duct and the bracket to the boss on the HPC case.
   (c) ENGINES WITH PHASE 3 CHANGES;
   Remove the bolts that attach the front flange of the cooling air duct to the flange of the turbine vane cooling air valve on the HPC case.
   (d) Remove the bolts and duct clamp which attach the TVC air duct to the support on the diffuser case.
   (e) Remove the TVC air duct from the engine.
      1) ENGINES WITHOUT PHASE 3 CHANGES;
      Discard the gasket on the boss on the HPC case.





Right Side TVC Air Ducts - Installation
Figure 401 (Sheet 1)



Right Side TVC Air Ducts - Installation
Figure 401 (Sheet 2)

2) ENGINES WITH PHASE 3 CHANGES;
Remove and discard the gasket from the front flange of the duct.
3) ENGINES WITHOUT PHASE 3 CHANGES AND PRE-PW-SB 72-315 OR POST-PW-SB 75-57;
Remove and discard the gasket on the boss on the HPT case.
4) ENGINES POST-PW-SB 72-315 OR WITH PHASE 3 CHANGES;
Remove and discard the metering orifice seal plate from the boss on the HPT case.

(f) Install the protection caps.

S 024-007-N00

(2) Remove the lower right TVC Air Duct with the steps that follow (Fig. 401):

(a) Remove the tube for the accessory cooling air with the steps that follow:
1) Disconnect the tube nut which attaches the tube to the inlet duct for the accessory cooling air.
2) Remove the bolts which attach the tube clamps to the brackets.
3) Disconnect the cooling air tube for the ignition exciter from the tee.
4) Remove the tube from the engine.

(b) Remove the bolts which attach the fire detector clamps to the bridge bracket.

(c) Remove the bolts which attach the bridge bracket to the Flange M and N brackets.

(d) Remove the bridge brackets from the engine.

(e) Remove the bolts which attach the rear flange of the TVC air duct and the bracket to the boss on the HPT case.

(f) Remove the bolts which attach the front flange of the TVC air duct to the flange of the Turbine Vane and Blade Cooling Air (TVBCA) valve.

(g) Remove the bolts and the duct clamp which attach the TVC air duct to the Flange M bracket.

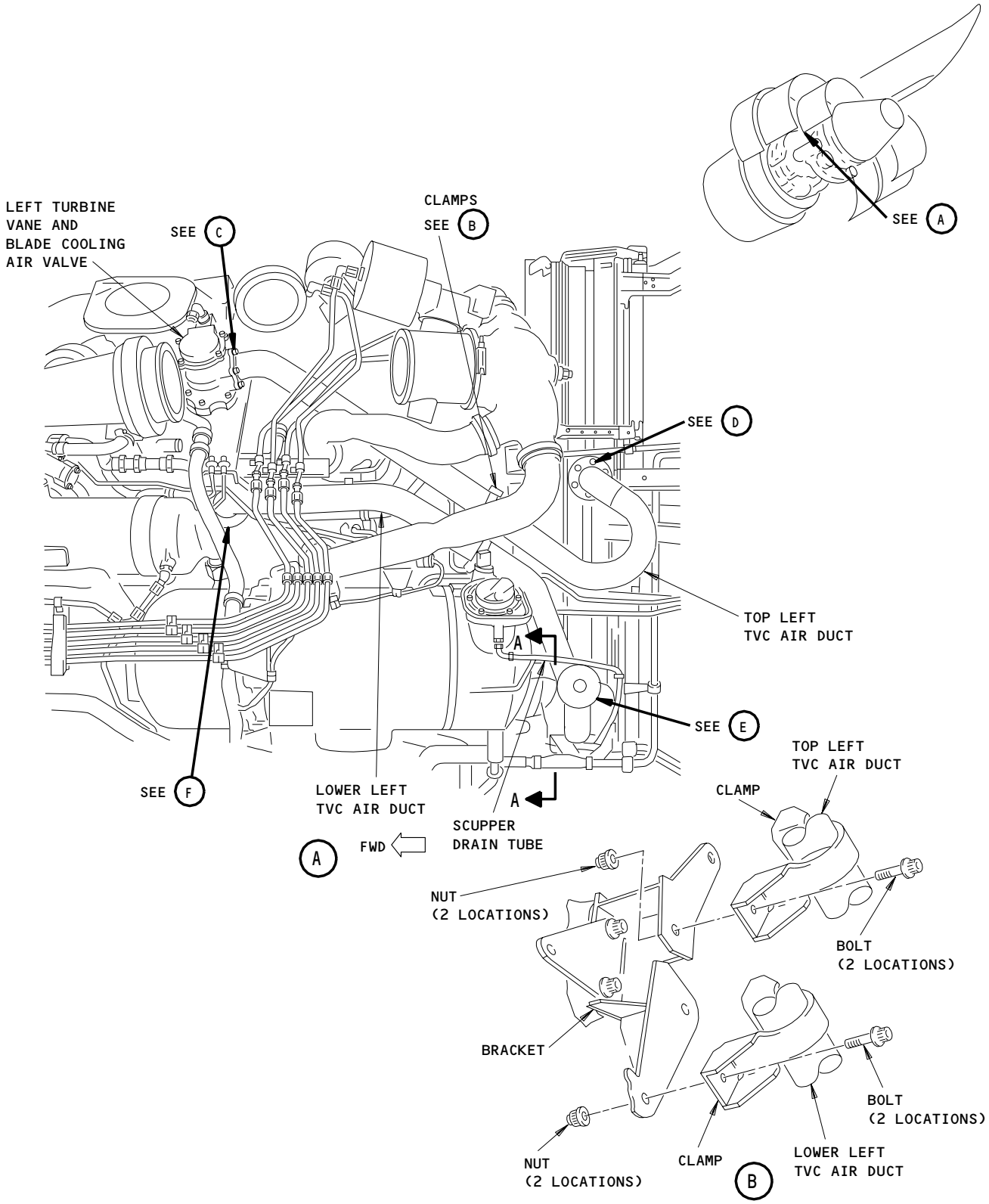
(h) Remove the TVC air duct from the engine.
1) Discard the gasket from the front of the duct.
2) ENGINES WITHOUT PHASE 3 CHANGES, PRE-PW-SB 72-315, OR PRE-PW-SB 75-57;
Discard the metering orifice seal plate from the rear of the duct.
3) ENGINES WITH PHASE 3 CHANGES, POST-PW-SB 72-315, OR POST-PW-SB 75-57;
Discard the gaskets from the rear of the duct.

(i) Install the protection caps.

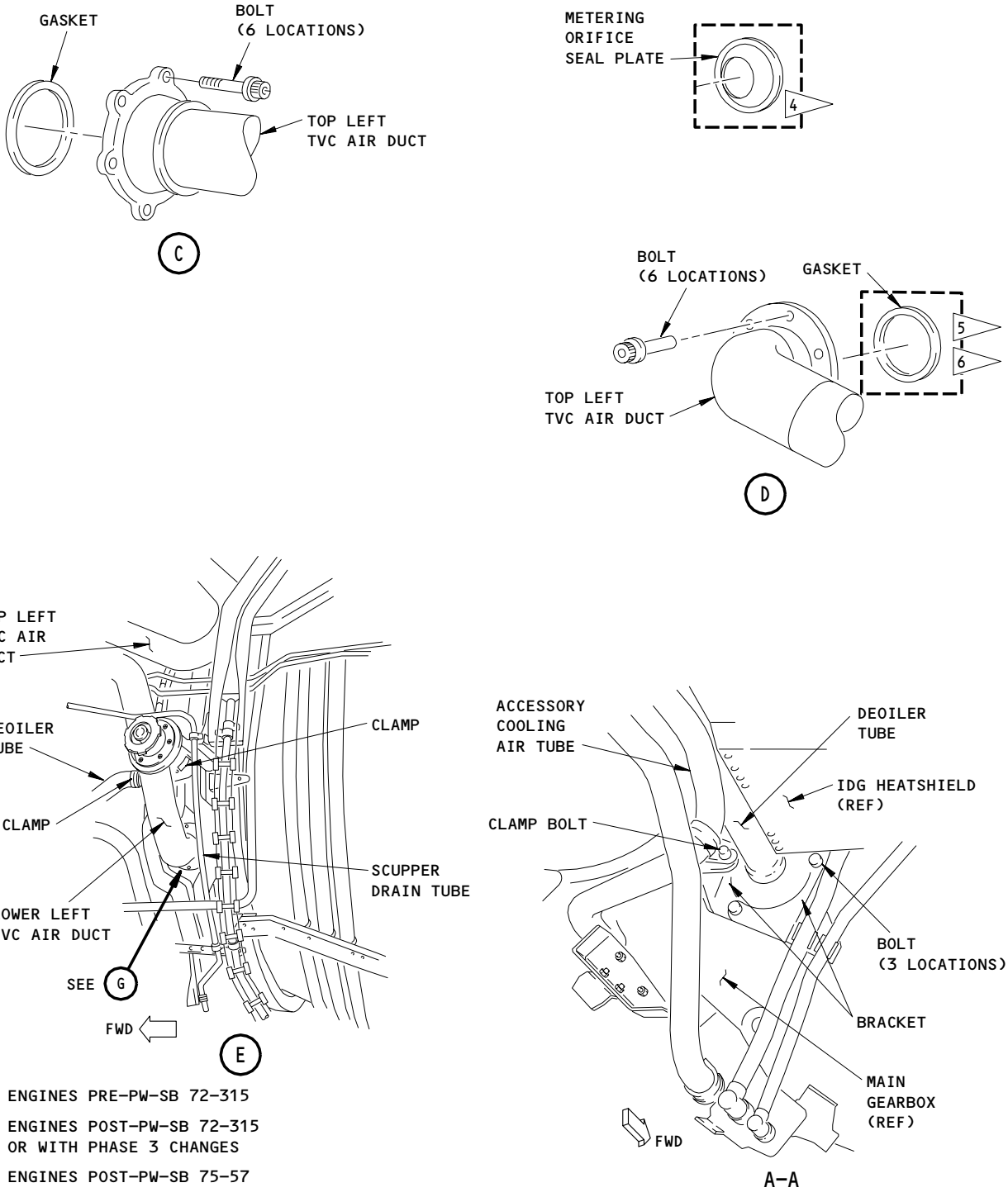
S 024-008-N00

(3) Remove the top left TVC Air Duct with the steps that follow (Fig. 402):

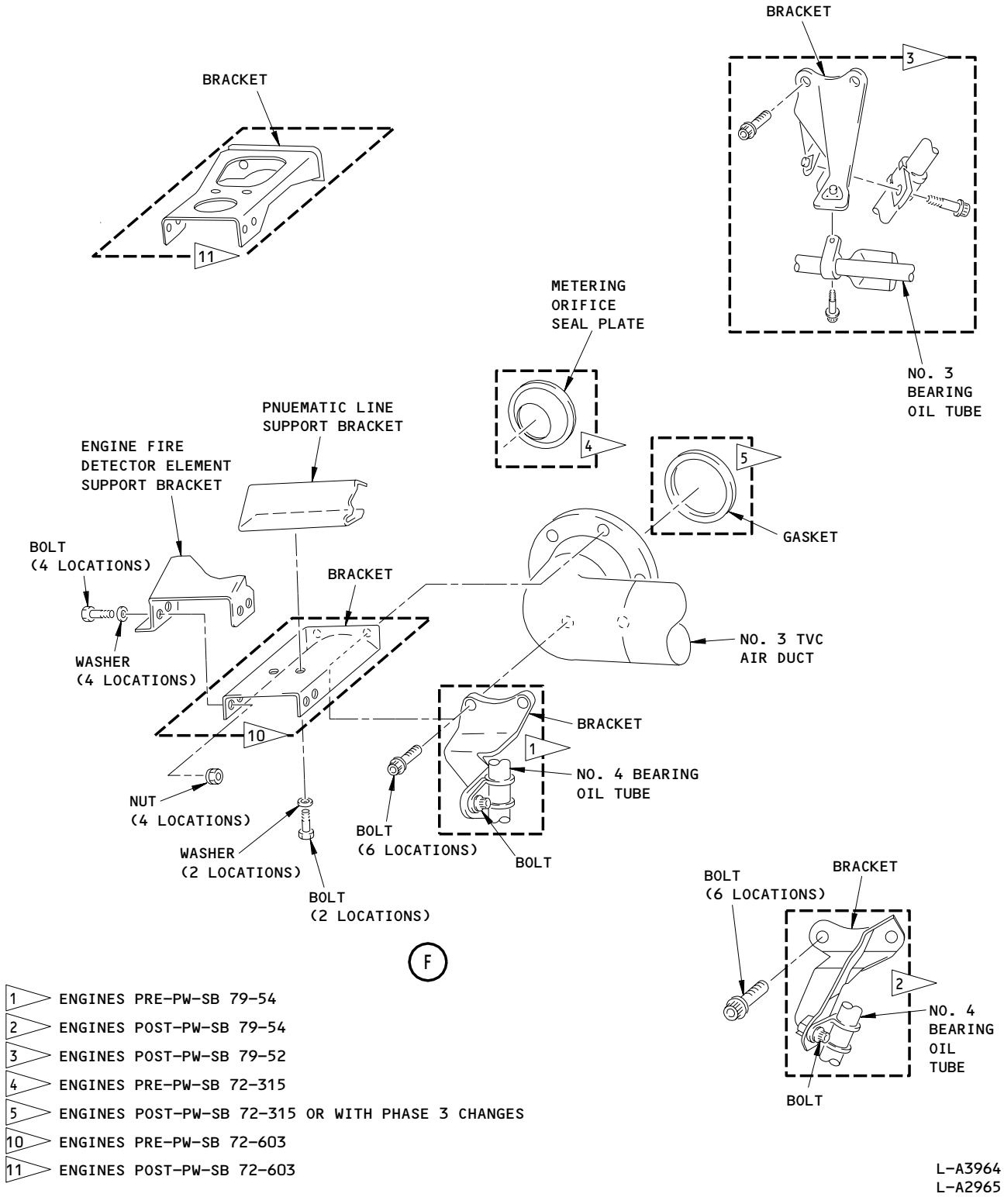
(a) Remove the intermediate to high pressure tee (AMM 36-11-01/401).



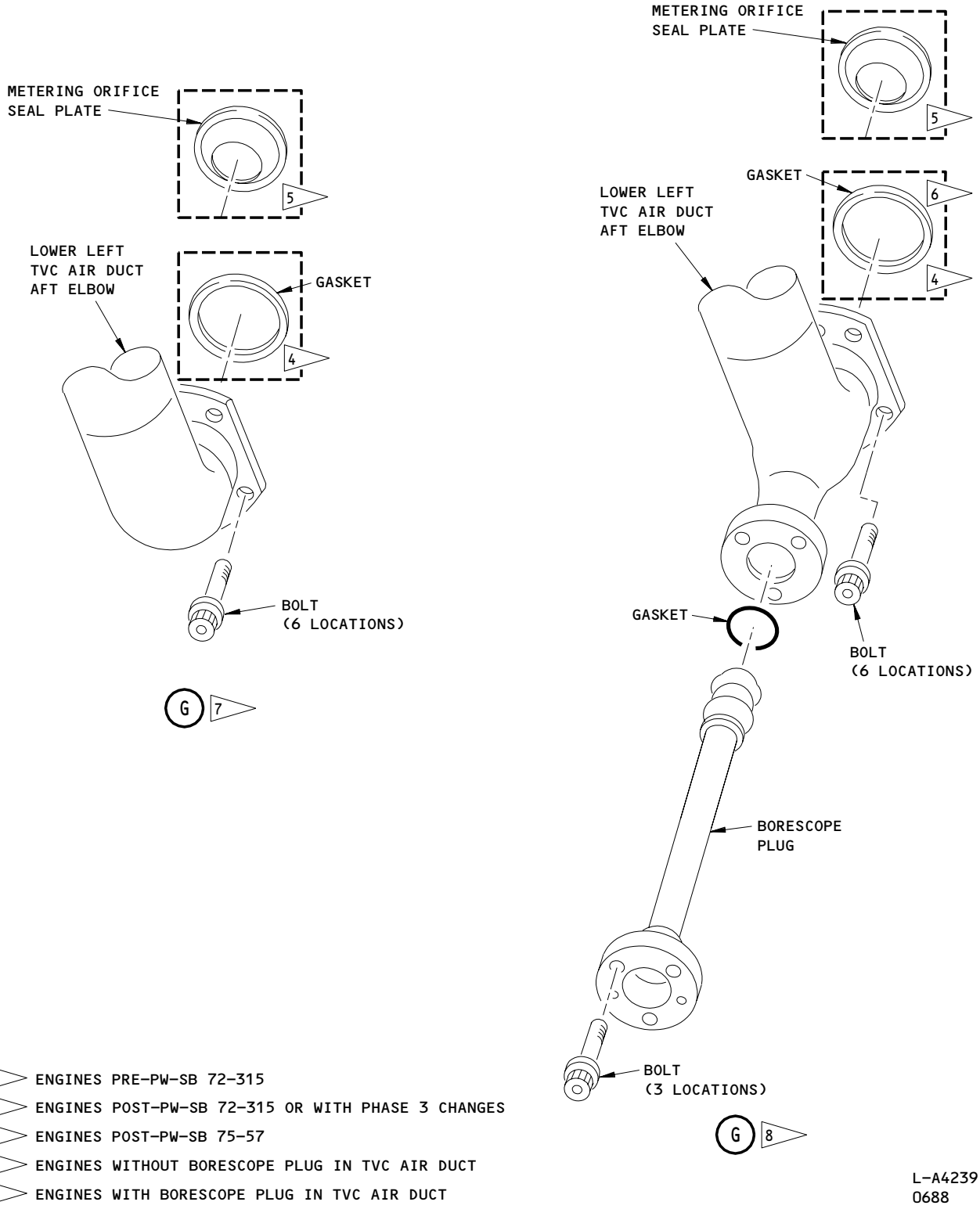
Left Side TVC Air Ducts - Installation
Figure 402 (Sheet 1)



Left Side TVC Air Ducts - Installation
Figure 402 (Sheet 2)



Left Side TVC Air Ducts - Installation
Figure 402 (Sheet 3)



Left Side TVC Air Ducts - Installation
Figure 402 (Sheet 4)

(b) Remove the bolts which attach the front flange of air duct to the flange of the valve for the turbine vane and blade cooling air.
(c) Remove the bolts which attach the rear flange of the TVC air duct to the boss on the HPT case.
(d) Remove the bolts and clamp which attach the TVC air duct to the bracket on the diffuser case.
(e) Remove the TVC air duct from the engine.
1) Discard the gasket on the front flange.
2) ENGINES WITHOUT PHASE 3 CHANGES, PRE-PW-SB 72-315, OR PRE-PW-SB 75-57;
Discard the metering orifice seal plate from the rear flange.
3) ENGINES WITH PHASE 3 CHANGES, POST-PW-SB 72-315, OR POST-PW-SB 75-57;
Discard the gasket from the rear flange.
(f) Install the protection caps.

S 024-009-N00

CAUTION: ON ENGINES WITH A BORESCOPE PLUG IN THE TVC AIR DUCT, YOU MUST REMOVE THE BORESCOPE PLUG BEFORE YOU REMOVE THE LOWER LEFT TVC AIR DUCT. IF YOU DO NOT REMOVE THE BORESCOPE PLUG, YOU CAN CAUSE DAMAGE TO THE BORESCOPE PLUG.

(4) Remove the lower left TVC Air Duct with the steps that follow (Fig. 402):
(a) Remove the scupper drain tube with the steps that follow:
1) Disconnect the scupper drain tube from the scupper drain elbow.
2) Remove the bolts and clamps which attach the scupper drain tube to the brackets.
3) Remove the scupper drain tube from the engine.
(b) ENGINES WITH A BORESCOPE PLUG IN THE TVC AIR DUCT;
Do the steps that follow:
1) Remove the bolts which attach the borescope plug to the flange on the aft elbow.
2) Use the jackscrew to remove the borescope plug.
a) Discard the gasket for the borescope plug.
(c) Disconnect the deoiler tube with the steps that follow:
1) Remove the bolts which attach the brackets and the deoiler tube to the main gearbox.
2) Loosen the clamp bolt which attaches the tube for the accessory cooling air to the bracket.
3) Remove the bolts and clamps which attach the deoiler tube to the brackets.
(d) Loosen the clamp bolt which attaches the No. 4 bearing oil tube to the bracket at the front flange of the TVC air duct.

(e) Loosen the clamp bolt which attaches the No. 3 bearing oil tube to the bracket at the front flange of the TVC air duct.

NOTE: The heat shield for the tube can stay with the clamp.

(f) Remove the bolts which attach the supports to the bracket at the front flange of the TVC air duct.
(g) ENGINES PRE-PW-SB 75-114;
Remove the lockwire and the bolts which attach the brackets and the front flange of the TVC air duct to the boss on the HPC case.
(h) ENGINES POST-PW-SB 75-114;
Remove the bolts which attach the brackets and the front flange of the TVC air duct to the boss on the HPC case.
(i) Remove the bolts which attach the rear flange of the TVC air duct to the boss on the HPT case.
(j) Remove the bolts and the clamp which attach the TVC air duct to the bracket on the diffuser case pad.
(k) Remove the TVC air duct from the engine.
1) ENGINES WITHOUT PHASE 3 CHANGES AND PRE-PW-SB 72-315;
Discard the metering orifice seal plate on the boss on the HPC case.
2) ENGINES WITH PHASE 3 CHANGES AND POST-PW-SB 72-315;
Discard the gasket on the boss on the HPC case.
3) ENGINES WITHOUT PHASE 3 CHANGES AND PRE-PW-SB 72-315 OR POST-PW-SB 75-57;
Discard the gasket on the boss on the HPT case.
4) ENGINES WITH PHASE 3 CHANGES OR POST-PW-SB 72-315 OR PRE-PW-SB 75-57;
Remove and discard the metering orifice seal plate from the boss on the HPT case.
(l) Install the protection caps.

TASK 75-24-02-404-011-N00

3. Install the Turbine Vane Cooling Air Ducts

A. Equipment
(1) M303, M305, or M307 Bergen Mechanical Crimper
Bergen Cable Technologies Inc
170 Gregg St
P.O. Box 1300
Lodi, NJ 07644-9982

B. Consumable Materials
(1) D00137 Engine Oil - PWA 521
(2) G02030 Paraffin Wax - PMC 9552
(3) G02334 Lockwire - AS3214-02
(4) G02332 Ferrule - P05-292 (Optional)
(5) G02335 Cable - Safety - P05-291 (Optional)

C. References
(1) AMM 36-11-01/401, Pneumatic Duct
(2) AMM 71-00-00/501, Power Plant
(3) AMM 71-11-04/201, Fan Cowl Panels

(4) AMM 71-11-06/201, Core Cowl Panels
(5) AMM 78-31-00/201, Thrust Reverser System

D. Access

(1) Location Zones

411 Left Engine
421 Right Engine

(2) Access Panels

413AL Fan Cowl Panel (Left), Left Engine
414AR Fan Cowl Panel (Right), Left Engine
415AL Thrust Reverser (Left), Left Engine
416AR Thrust Reverser (Right), Left Engine
417AL Core Cowl (Left), Left Engine
418AR Core Cowl (Right), Left Engine
423AL Fan Cowl Panel (Left), Right Engine
424AR Fan Cowl Panel (Right), Right Engine
425AL Thrust Reverser (Left), Right Engine
426AR Thrust Reverser (Right), Right Engine
427AL Core Cowl (Left), Right Engine
428AR Core Cowl (Right), Right Engine

E. Procedure (Fig. 401)

S 024-012-N00

(1) Install the top right TVC Air Duct with the steps that follow (Fig. 401):
(a) Remove the protection caps.
(b) ENGINES WITHOUT PHASE 3 CHANGES;
Attach the new gasket on the HPC boss with the paraffin wax.
(c) ENGINES WITH PHASE 3 CHANGES;
Attach a new gasket to the forward flange of the cooling air duct with paraffin wax.
(d) ENGINES WITHOUT PHASE 3 CHANGES AND PRE-PW-SB 72-315 OR POST-PW-SB 75-57;
Install a new gasket on the HPT boss with paraffin wax.
(e) ENGINES POST-PW-SB 72-315 OR WITH PHASE 3 CHANGES;
Install a new metering orifice seal plate, convex side out, on the HPT case at approximately the one o'clock position.
1) Attach the plate with paraffin wax to the HPT case.

(f) Put the TVC air duct into the engine.
(g) Lubricate the bolts, which attach the rear flange of the TVC air duct, with engine oil.
(h) Attach the rear flange of the TVC air duct to the HPT case with the bolts. Tighten the bolts by hand.

NOTE: Use the larger bolts at the rear flange.

(i) Lubricate the threads of the bolts, which attach the forward flange of the TVC air duct, with engine oil.

(j) ENGINES PRE-PW-SB 75-114;
Attach the forward flange and the bracket to the HPC case with the bolts. Tighten the bolts by hand.
(k) ENGINES POST-PW-SB 75-114;
Attach the forward flange and the bracket to the HPC case with the silver-plated bolts. Tighten the bolts by hand.
(l) Lubricate the threads of the bolts, which attach the clamp, with engine oil.
(m) Install the clamp on the TVC air duct at the support on the diffuser case with the bolts and nuts.
(n) Tighten the bolts, which attach the rear flange, to 180-200 pound-inches (20.3-22.6 newton-meters).
(o) Tighten the bolts, which attach the clamp, to 65-85 pound-inches (7.3-9.6 newton-meters).
(p) Tighten the bolts, which attach the forward flange and the bracket, to 85-95 pound-inches (9.6-10.7 newton-meters).
1) Without loosening, tighten the bolts again until the necessary torque is kept.
(q) Safety all the bolts with lockwire or safety cable and safety cable ferrule.

S 024-013-N00
(2) Install the lower right TVC Air Duct with the steps that follow (Fig. 401):
(a) Remove the protection caps.
(b) Attach a new gasket on the flange of the Turbine Vane and Blade Cooling Air (TVBCA) valve with paraffin wax.
(c) ENGINES WITHOUT PHASE 3 CHANGES, PRE-PW-SB 72-315, OR PRE-PW-SB 75-57;
Attach a new metering orifice seal plate, convex side out, to the HPT pad where the rear flange of the TVCA duct goes.
1) Attach the plate with paraffin wax.
(d) ENGINES WITH PHASE 3 CHANGES, POST-PW-SB 72-315, OR POST-PW-SB 75-57;
Attach a new gasket on the HPT pad where the rear flange of the TVCA duct goes.

(e) Put the TVC air duct in position at the HPT boss and to the rear of the TVBCA valve.
(f) Lubricate the threads of the bolts, which attach the rear flange of the TVC air duct, with engine oil.
(g) Attach the rear flange of the TVC air duct and the bracket to the HPT case with the bolts.

NOTE: Use the larger bolts at the rear flange.

(h) Lubricate the threads of the bolts, which attach the forward flange of the TVC air duct, with engine oil.
(i) Attach the forward flange and the bracket to the TVBCA valve with the bolts.

(j) Lubricate the threads of the bolts, which attach the clamp, with engine oil.
(k) Install the clamp on the TVC air duct at the bracket on the Flange M with the bolts and nuts.
1) Tighten the bolts to 85-95 pound-inches (9.6-10.7 newton-meters).
(l) Tighten the bolts at the forward flange to 85-95 pound-inches (9.6-10.7 newton-meters).
1) Without loosening, tighten the bolts again until the necessary torque is kept.
(m) Tighten the bolts, which attach the rear flange of the TVC air duct, to 180-200 pound-inches (20.3-22.6 newton-meters).
1) Without loosening, tighten the bolts again until the necessary torque is kept.
(n) Safety all the bolts with lockwire or safety cable and safety cable ferrule.
(o) Lubricate the threads of the bolts, which attach the bridge bracket, with engine oil.
(p) Install the bridge bracket to the Flange M and N brackets with the bolts.
1) Tighten the bolts.
(q) Attach the fire detector clamps to the bridge bracket with the bolts, washers, and nuts.
(r) Install the tube for the accessory cooling air with the steps that follow:
1) Attach the tube nut of the tube to the inlet duct for the cooling air.
2) Connect the cooling air tube for the ignition exciter to the tee.
a) Tighten the tube nut.
(s) Lubricate the threads of the bolts, which attach the tube clamp, with engine oil.
(t) Attach the tube clamps with the bolts and the nuts.
1) Tighten the bolts.

S 024-014-N00

(3) Install the top left TVC Air Duct with the steps that follow (Fig. 402):
(a) Remove the protection caps.
(b) Attach a new gasket on the flange of the TVBCA valve with the paraffin wax.
(c) ENGINES WITHOUT PHASE 3 CHANGES, PRE-PW-SB 72-315, OR PRE-PW-SB 75-57;
Install a new metering orifice seal plate, convex side out, on the HPT pad where the rear flange of the TVCA duct goes.
1) Attach the plate with paraffin wax.
(d) ENGINES WITH PHASE 3 CHANGES, POST-PW-SB 72-315, OR POST-PW-SB 75-57;
Attach a new gasket on the HPT pad where the rear flange of the TVCA duct goes.

(e) Put the TVC air duct in position on the HPT boss and to the rear of the TVBCA valve.
(f) Attach the rear flange of the TVC air duct to the HPT case with the bolts.

NOTE: Use the larger bolts at the rear flange.

(g) Lubricate the threads of the bolts, which attach the forward flange of the TVC air duct, with engine oil.
(h) Attach the forward flange to the TVBCA valve with the bolts.
(i) Lubricate the threads of the bolts, which attach the clamp on the TVC air duct, with engine oil.
(j) Install the clamp on the TVC air duct at the bracket on the diffuser case to the bracket with the bolts and nuts.
1) Tighten the bolts to 85-95 pound-inches (9.6-10.7 newton-meters).
(k) Tighten the bolts which attach the forward flange to 85-95 pound-inches (9.6-10.7 newton-meters).
1) Without loosening, tighten the bolts again until the necessary torque is kept.
(l) Tighten the bolts, which attach the rear flange, to 180-200 pound-inches (20.3-22.6 newton-meters).
1) Without loosening, tighten the bolts again until the necessary torque is kept.
2) Safety the bolts at the rear flange with lockwire or safety cable and safety cable ferrule.
(m) Install the intermediate to high pressure tee (AMM 36-11-01/401).

S 024-015-N00
(4) Install the lower left TVC Air Duct with the steps that follow (Fig. 402):
(a) Remove the protection caps.
(b) ENGINES WITHOUT PHASE 3 CHANGES AND PRE-PW-SB 72-315;
Install the new metering orifice seal plate, convex side out, on the HPC case boss.
1) Attach the plate with paraffin wax.
(c) ENGINES WITH PHASE 3 CHANGES AND POST-PW-SB 72-315;
Use the paraffin wax and attach a new gasket on the HPC case boss.
(d) ENGINES WITHOUT PHASE 3 CHANGES AND PRE-PW-SB 72-315 OR POST-PW-SB 75-57;
Use the paraffin wax and attach a new gasket on the HPT boss.
(e) ENGINES WITH PHASE 3 CHANGES, POST-PW-SB 72-315 OR PRE-PW-SB 75-57;
Install a new metering orifice seal plate, convex side out, on the boss on the HPT case.
1) Attach the plate with paraffin wax.

(f) Put the TVC air duct and the deoiler tube in position.

(g) Lubricate the threads of the bolts, which attach the rear flange of the TVC air duct, with engine oil.
(h) Install the rear flange of the TVC air duct to the HPT case with the bolts.

NOTE: Use the larger bolts at the rear flange.

1) Tighten the bolts with your hand.
(i) Lubricate the threads of the bolts, which attach the forward flange of the TVC air duct, with engine oil.
(j) Install the forward flange and the brackets to the HPC case with the bolts.
1) Tighten the bolts with your hand.
(k) Install the clamp on the TVC air duct at the bracket on the diffuser case.
(l) Lubricate the threads of the bolts, which attach the clamp to the bracket on the diffuser case, with engine oil.
(m) Attach the clamp to the bracket with the bolts and the nuts.
1) Tighten the bolts to 85-95 pound-inches (9.6-10.7 newton-meters).
(n) Tighten the bolts which attach the forward flange to 85-95 pound-inches (9.6-10.7 newton-meters).
1) Without loosening, tighten the bolts again until the necessary torque is kept.
(o) Tighten the bolts, which attach the rear flange, to 180-200 pound-inches (20.3-22.6 newton-meters).
1) Without loosening, tighten the bolts again until the necessary torque is kept.
(p) Safety the bolts with lockwire or safety cable and safety cable ferrule.
(q) Install the bolts, washers and nuts which attach the supports to the bracket at the forward flange of the TVC air duct.
1) Tighten the bolts.
(r) Tighten the clamp bolt which attaches the No. 4 bearing oil tube to the bracket at the forward flange of the TVC air duct to 36-40 pound-inches (4.1-4.5 newton-meters).
(s) Tighten the clamp bolt which attaches the No. 3 bearing oil tube to the bracket at the forward flange of the TVC air duct to 36-40 pound-inches (4.1-4.5 newton-meters).
(t) ENGINES WITH A BORESCOPE PLUG IN THE TVC AIR DUCT;
Install the borescope plug in the aft lower elbow with the steps that follow:
1) Install the new gasket on the end of the borescope plug.
2) Install the borescope plug into the aft elbow.
3) Lubricate the threads of the bolts, which attach the borescope plug, with engine oil.
4) Install the borescope plug to the aft elbow flange with the bolts.

5) Tighten the bolts to 75-85 pound-inches (8.5-9.6 newton-meters).
   a) Without loosening, tighten the bolts again until the necessary torque is kept.
   b) Safety the bolts with lockwire or safety cable and safety cable ferrule.

(u) Connect the deoiler tube with the steps that follow:
   1) Install the new packing to the flange of the deoiler tube.

(v) Install the bolts which attach the brackets and the deoiler tube to the main gearbox.
   1) Tighten the bolts to 180-200 pound-inches (20.3-22.6 newton-meters).
   2) Install the clamps which attach the deoiler tube to the brackets with the bolts.
      a) Tighten the bolts.
   3) Tighten the clamp bolt which attaches the tube for the accessory cooling air to the bracket.

(w) Install the scupper drain tube with the steps that follow:
   1) Connect the scupper drain tube to the scupper drain elbow.
   2) Install the clamps which attach the scupper drain tube to the brackets.
   3) Tighten the tube nut and the clamp bolts.

F. Put the Aircraft Back to its Usual Condition

S 014-016-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT COULD OCCUR.

(1) Close the thrust reversers (AMM 78-31-00/201).

S 014-017-N00

(2) Close the core cowl panels (AMM 71-11-06/201).

S 014-018-N00

(3) Close the fan cowl panels (AMM 71-11-04/201).

S 044-019-N00

(4) Do the activation procedure for the thrust reversers (AMM 78-31-00/201).

S 714-021-N00

(5) Do the test for the external air tubes that is shown in the Power-plant Test-Reference Table (AMM 71-00-00/501).

TURBINE CASE COOLING (TCC) AIR SHUTOFF VALVE (HPT) - REMOVAL/INSTALLATION

1. General
   A. This procedure has two tasks. The first task removes the TCC air shutoff valve. The second task installs the TCC air shutoff valve.

TASK 75-24-03-004-001-N00

2. Remove the Turbine Case Cooling (TCC) Air Shutoff Valve
   A. References
      (1) AMM 71-11-04/201, Fan Cowl Panels
      (2) AMM 71-11-06/201, Core Cowl Panels
      (3) AMM 75-24-04/401, Turbine Case Cooling (TCC) Air Shutoff Valve (LPT)
      (4) AMM 78-31-00/201, Thrust Reverser System
   B. Access
      (1) Location Zones
          418 L Power Plant Core Cowl
          428 R power Plant Core Cowl

      (2) Access Panels
          418AR Core Cowl (Right)
          428AR Core Cowl (Right)

   C. Prepare to Remove the TCC Air Shutoff Valve

      S 014-002-N00
      (1) Open the fan cowl panels (AMM 71-11-04/201).

      S 044-003-N00

      WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

      (2) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

      S 014-004-N00
      (3) Open the core cowl panels (AMM 71-11-06/201).

S 014-005-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(4) Open the thrust reversers (AMM 78-31-00/201).

D. Remove the TCC Air Shutoff Valve (HPT) (Fig. 401)

S 034-006-N00

(1) Remove the TCC Air Shutoff Valve (LPT) (AMM 75-24-04/401).

S 034-007-N00

(2) Remove the bolt (7) which attaches the rod end of the control cable to the idler arm (16).

S 024-008-N00

(3) Remove the bolts (2, 12) which attach the upper flange of the TCC air shutoff valve and the support link to the support bracket.

S 824-009-N00

(4) Turn the upper support link in to the engine case.

S 024-010-N00

(5) Remove the bolts (10) and nuts (9) which attach the lower flange of the TCC air shutoff valve (11) to the support bracket.

S 024-011-N00

(6) Move the TCC air shutoff valve (HPT) (11) rearward and out from between the upper and lower support brackets.

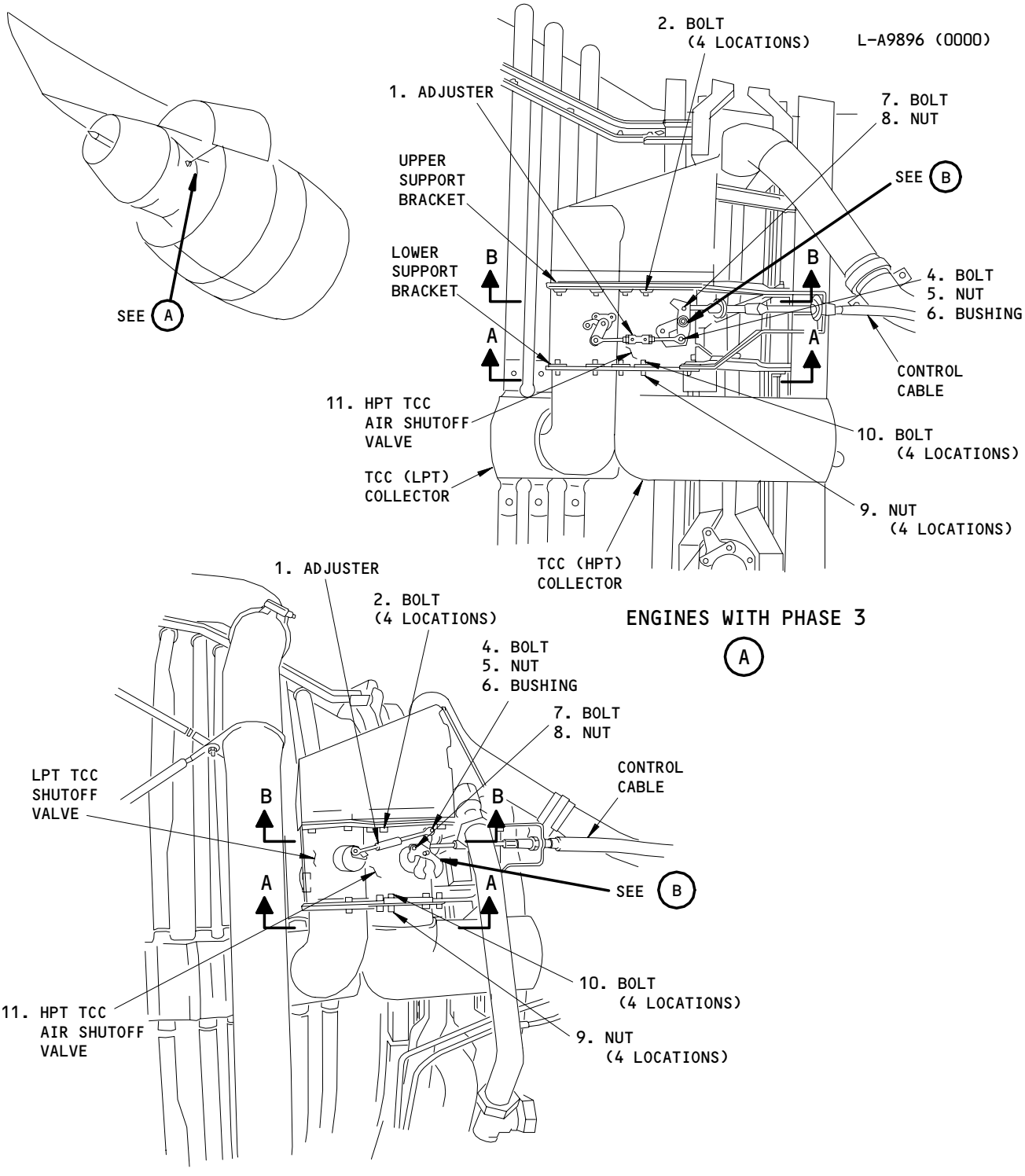
S 034-012-N00

(7) Remove the bolt (4) which attaches the adjuster rod end to the idler arm (16).

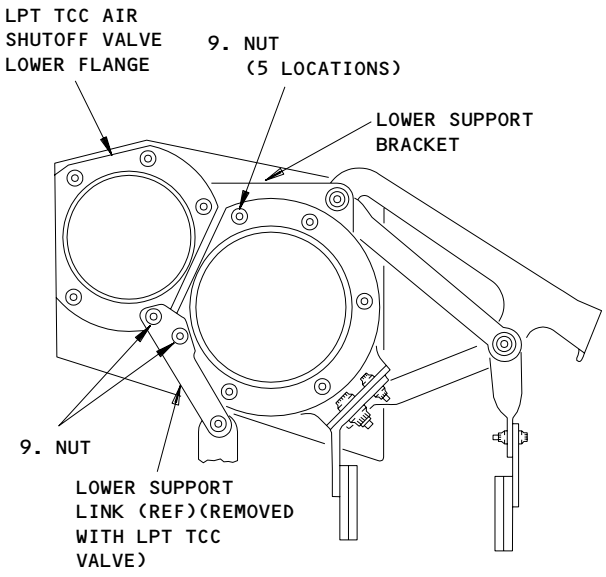
S 024-034-N00

(8) Remove the adjuster assembly and the bushing (6).

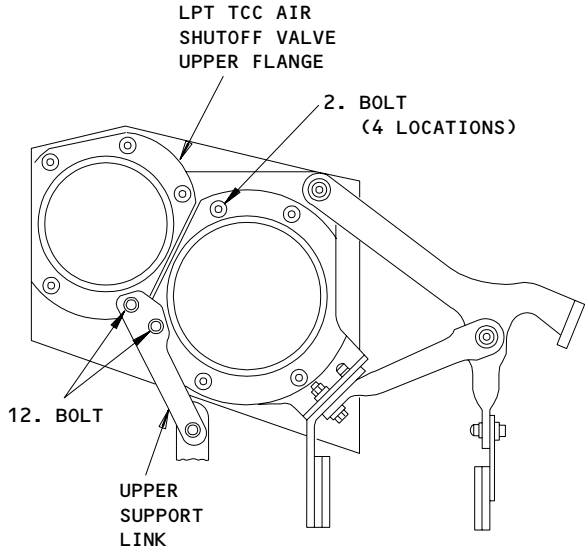
NOTE: The bolt and nut that connects the rod end to the LPT valve lever are removed with the LPT valve (AMM 75-24-04/401).



HPT TCC Air Shutoff Valve Installation
Figure 401 (Sheet 1)

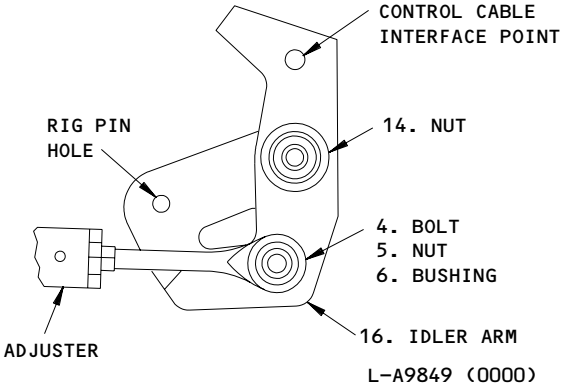


A-A



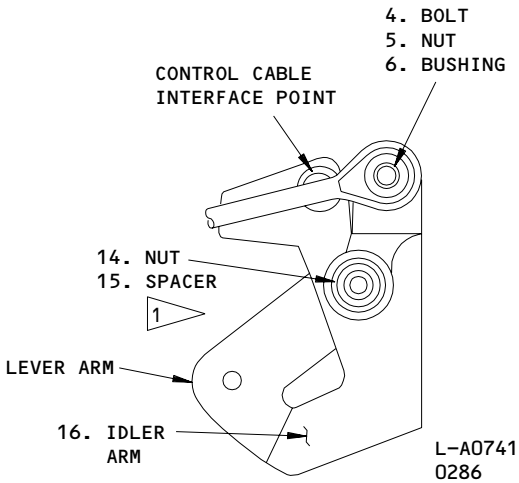
B-B

HPT TCC Air Shutoff Valve Installation
Figure 401 (Sheet 2)



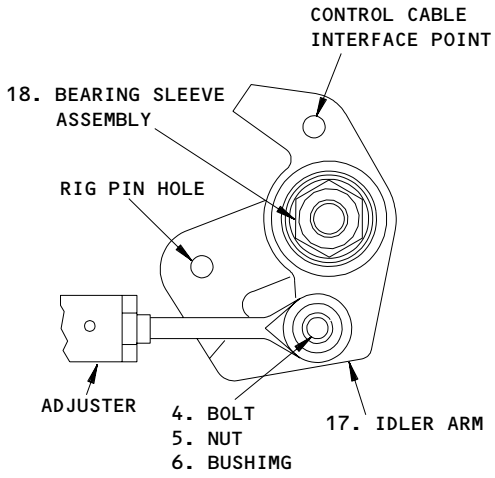
ENGINES WITH PHASE 3 AND
PRE-PW-SB 75-136

B



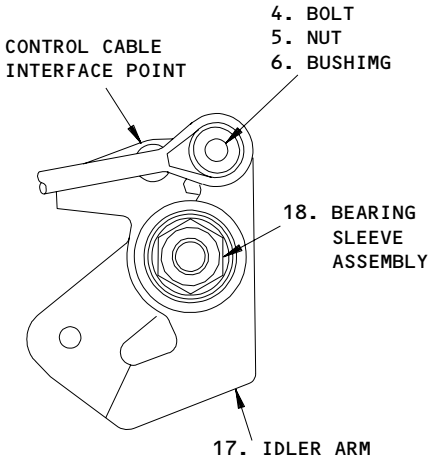
ENGINES WITHOUT PHASE 3 AND
PRE-PW-SB 75-136

B



ENGINES WITH PHASE 3 AND
POST-PW-SB 75-136

B



ENGINES WITHOUT PHASE 3 AND
POST-PW-SB 75-136

B

1 IF INSTALLED

L-B7115 (1298)
PW V

HPT TCC Air Shutoff Valve Installation
Figure 401 (Sheet 3)

K19567

S 964-033-N00

(9) If it is necessary to replace the TCC air shutoff valve (11), do the steps that follow:

(a) ENGINES PRE-PW-SB 75-136;
Remove the nut (14) which attaches the idler arm (16) to the lever arm.

(b) ENGINES POST-PW-SB 75-136;
Remove the bearing sleeve assembly (18) which attaches the idler arm (17) to the lever arm.

(c) Remove the idler arm (16/17) and, if equipped, spacer (15) from the lever arm.

TASK 75-24-03-404-015-N00

3. Install the Turbine Case Cooling (TCC) Air Shutoff Valve (HPT)

A. Consumable Materials

(1) D00137 Engine Oil - PWA 521

B. Parts

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	11	Turbine Case Cooling Air Shutoff Valve (HPT)	75-24-03	20	100

C. References

(1) AMM 71-11-04/201, Fan Cowl Panels
(2) AMM 71-11-06/201, Core Cowl Panels
(3) AMM 75-24-04/401, Turbine Case Cooling (TCC) Air Shutoff Valve (LPT)
(4) AMM 78-31-00/201, Thrust Reverser System

D. Access

(1) Location Zones

418 L Power Plant Core Cowl
428 R power Plant Core Cowl

(2) Access Panels
418AR Core Cowl (Right)
428AR Core Cowl (Right)

E. Procedure (Fig. 401)

S 424-016-N00
(1) Move the TCC air shutoff valve (HPT) (11) into the position between the upper and lower support brackets.

NOTE: Make sure the flow arrows point down and the bolt holes align.

S 824-017-N00
(2) Turn out the upper support link out into the position at the upper flange.

S 644-018-N00
(3) Lubricate the threads of the bolts (2, 12) with engine oil.

S 424-019-N00
(4) Attach the upper flange and the support link to the upper support bracket with the bolts (2, 12).

NOTE: Install the longer bolt at the support link location.

S 644-020-N00
(5) Lubricate the threads of the bolts (10) with engine oil.

S 424-021-N00
(6) Attach the lower flange of the TCC air shutoff valve (11) to the lower support bracket with the bolts (10) and nuts (9).

NOTE: Do not install the bolt and nut at the location of the lower support link. Install these bolts when you install the TCC air shutoff valve (LPT) (AMM 75-24-04/401).

S 424-022-N00
(7) Tighten the bolts (2, 10, 12) to 85-95 pound-inches (9.604-10.734 newton meters).

S 644-023-N00

(8) Lubricate the threads of the nut (14) or bearing sleeve assembly (18), as applicable, with Engine Oil.

S 424-033-N00

(9) ENGINES WITHOUT PHASE 3 AND PRE-PW-SB 75-136;
If it is not installed, install the idler arm (16) on the lever arm in position and, if equipped, with a spacer (15), as shown in Fig. 401, with the nut (14).

NOTE: Install the control cable and the adjuster during the TCC rig procedure.

S 424-037-N00

(10) ENGINES WITH PHASE 3 AND PRE-PW-SB 75-136;
If it is not installed, install the idler arm (16) on the lever arm, as shown in Fig. 401, with the nut (14).

NOTE: Install the control cable and the adjuster during the TCC rig procedure (AMM 75-24-00/501).

S 424-041-N00

(11) ENGINES WITH PHASE 3 AND POST-PW-SB 75-136;
if it is not installed, install the idler arm (17) on the lever arm, as shown in Fig. 401, with the bearing sleeve assembly (18) .

NOTE: Install the control cable and the adjuster during the TCC rig procedure (AMM 75-24-00/501).

S 424-039-N00

(12) Tighten the nut (14) or bearing sleeve assembly (18), as applicable, to 36-40 pound-inches (4.067-4.519 newton-meters).

S 424-035-N00

(13) Install the TCC Air Shutoff Valve (LPT) (AMM 75-24-04/401).

F. Put the Airplane Back to Its Usual Condition

S 414-026-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Close the thrust reversers (AMM 78-31-00/201).

S 414-027-N00

(2) Close the core cowl panels (AMM 71-11-06/201).

S 444-029-N00
(3) Do the activation procedure for thrust reversers (AMM 78-31-00/201).

S 414-028-N00
(4) Close the fan cowl panels (AMM 71-11-04/201).

TURBINE CASE COOLING (TCC) AIR SHUTOFF VALVE (LPT) - REMOVAL/INSTALLATION

1. General
   A. This procedure has two tasks. The first task removes the TCC air shutoff valve (LPT). The second task installs the TCC air shutoff valve (LPT).

TASK 75-24-04-004-001-N00

2. Remove the Turbine Case Cooling (TCC) Air Shutoff Valve (LPT)
   A. References
      (1) AMM 71-11-04/201, Fan Cowl Panels
      (2) AMM 71-11-06/201, Core Cowl Panels
      (3) AMM 78-31-00/201, Thrust Reverser System
   B. Access
      (1) Location Zones
          411 Left Engine
          421 Right Engine

      (2) Access Panels
          418AR Core Cowl (Right)
          428AR Core Cowl (Right)

   C. Prepare to Remove the TCC Air Shutoff Valve (LPT)

      S 014-002-N00
      (1) Open the fan cowl panels (AMM 71-11-04/201).

      S 044-003-N00

      WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

      (2) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

      S 014-004-N00
      (3) Open the core cowl panels (AMM 71-11-06/201).

S 014-005-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(4) Open the thrust reversers (AMM 78-31-00/201).

D. Remove the TCC Air Shutoff Valve (LPT) (Fig. 401)

S 024-006-N00

(1) Remove the bolts (10) which attach the lower support link to the lower flanges of the LPT and the HPT TCC air shutoff valves.

S 024-007-N00

(2) Turn the lower support link into the engine case.

S 024-008-N00

(3) Remove the bolts (7) which attach the lower flange of the TCC air shutoff valve (9) to the lower support bracket.

S 024-009-N00

(4) Remove the bolts (1, 12) which attach the flange at the top of the TCC air shutoff valve (9) and the upper support link to the support bracket.

S 034-010-N00

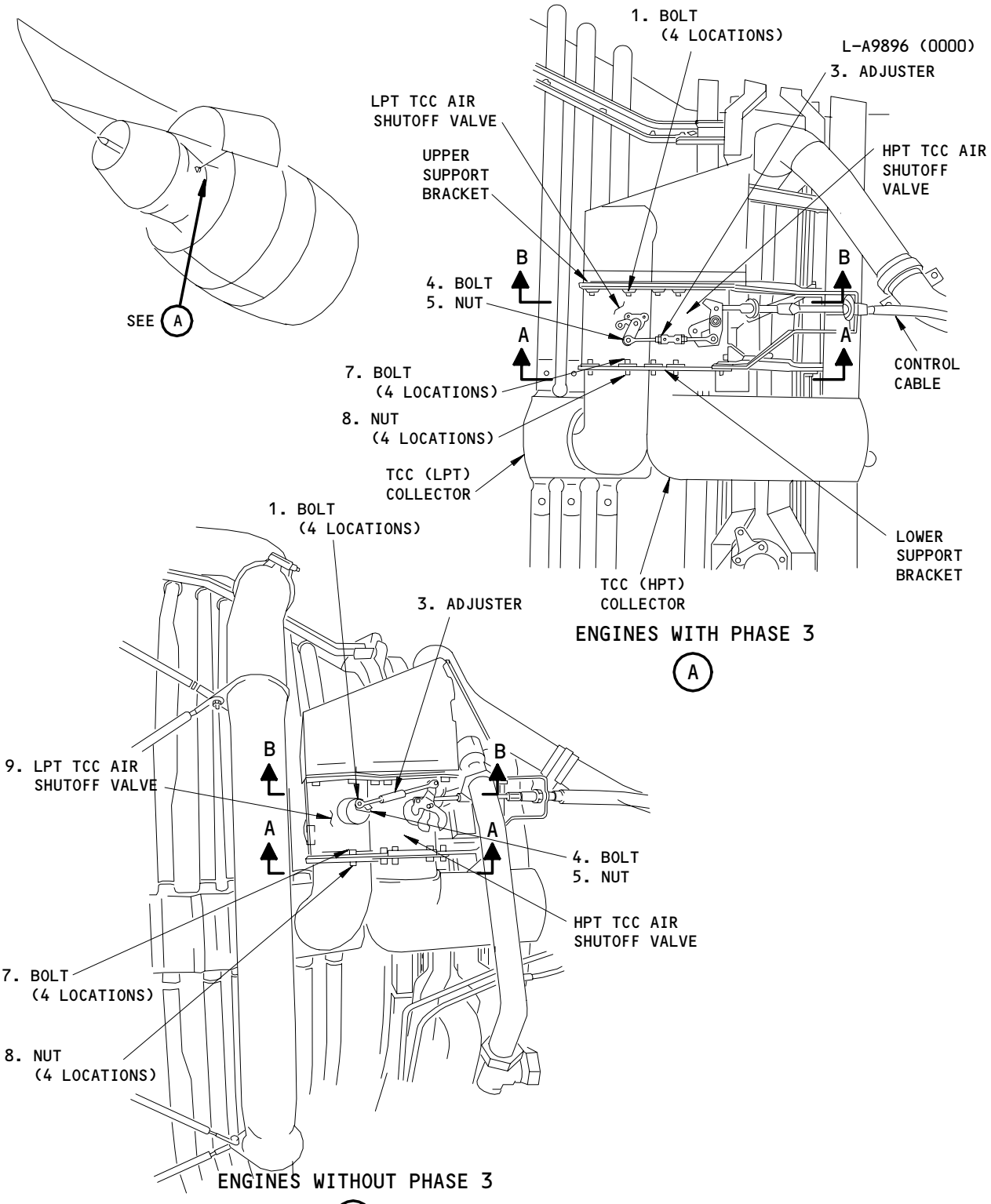
(5) Remove the bolt (4) which attaches the adjuster rod end and the bushing to the lever arm on the (LPT) TCC air shutoff valve.

S 034-011-N00

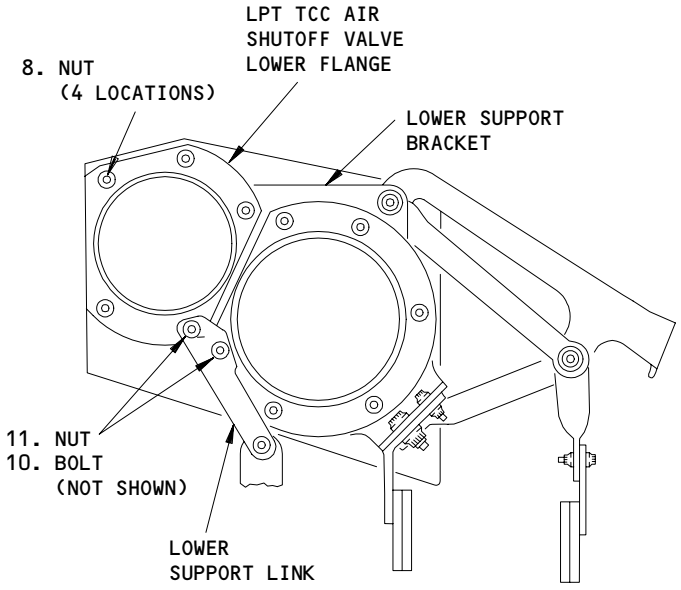
(6) Remove the adjuster (3) and the bushing (6).

S 024-012-N00

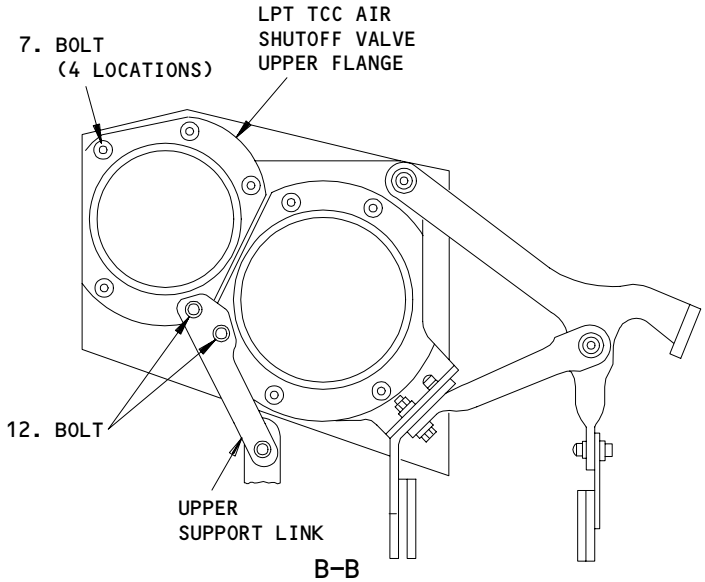
(7) Move the TCC Air Shutoff Valve (LPT) (9) rearward and out from between the support brackets on the top and the bottom.



LPT TCC Air Shutoff Valve Installation
Figure 401 (Sheet 1)



A–A



B–B

LPT TCC Air Shutoff Valve Installation
Figure 401 (Sheet 2)

TASK 75-24-04-404-013-N00

3. Install the Turbine Case Cooling (TCC) Air Shutoff Valve (LPT)

NOTE: You must install the TCC Air Shutoff Valve (HPT) before you install the TCC Air Shutoff Valve (LPT).

A. Consumable Materials
(1) D00137 Engine Oil - PWA 521

B. Parts

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	9	Turbine Case Cooling (TCC) Air Shutoff Valve (LPT)	75-24-04	01	25

C. References
(1) AMM 71-11-04/201, Fan Cowl Panels
(2) AMM 71-11-06/201, Core Cowl Panels
(3) AMM 75-24-00/501, Turbine Cooling System
(4) AMM 78-31-00/201, Thrust Reverser System

D. Access
(1) Location Zones
418 L Power Plant Core Cowl
428 R Power Plant Core Cowl

(2) Access Panels
418AR Core Cowl (Right)
428AR Core Cowl (Right)

E. Procedure (Fig. 401)

S 424-014-N00
(1) Move the TCC Air Shutoff Valve (LPT) (9) into the position between the upper and lower support brackets.
(a) Make sure the flow arrows point down.
(b) Make sure to align the bolt holes.
(c) Lubricate the threads of the bolts (1, 12) with engine oil.

S 424-015-N00

(2) Attach the top flange of the TCC air shutoff valve (LPT) (9) and the upper support link to the support bracket with the bolts (1, 12).

NOTE: Install the longer bolts at the support link locations.

(a) Tighten the bolts to 85-95 pound-inches (9.6-10.7 newton-meters).

S 424-016-N00

(3) Turn the lower support link out into the position at the lower flanges of the HPT and LPT TCC air shutoff valves.

S 644-017-N00

(4) Lubricate the threads of the bolts (7, 10) with engine oil.

S 424-018-N00

(5) Attach the lower flange of the TCC air shutoff valve (LPT) (9) and the lower support link to the support bracket with the bolts (7, 10) and nuts (8, 11).

NOTE: Install the longer bolts at the support link locations.

(a) Tighten the bolts to 85-95 pound-inches (9.6-10.7 newton-meters).

S 834-019-N00

(6) Adjust the Turbine Cooling System (AMM 75-24-00/501).

F. Put the Airplane Back to Its Usual Condition

S 414-020-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Close the thrust reversers (AMM 78-31-00/201).

S 414-021-N00

(2) Close the core cowl panels (AMM 71-11-06/201).

S 414-022-N00

(3) Close the fan cowl panels (AMM 71-11-04/201).

S 444-023-N00

(4) Do the activation procedure for the thrust reversers (AMM 78-31-00/201).

TURBINE CASE COOLING (TCC) AIR VALVE ACTUATOR - REMOVAL/INSTALLATION

1. General
   A. This procedure gives the instructions for the removal and the installation of the Turbine Case Cooling (TCC) air valve actuator. The TCC air valve actuator will be referred to as the actuator for this procedure.
   B. The actuator is found on the High Pressure Compressor (HPC) forward case at the 2 o'clock position.
   C. You can get access to the actuator through the right thrust reverser half.

TASK 75-24-05-004-001-N00

2. Remove the Turbine Case Cooling (TCC) Air Valve Actuator
   A. Equipment
      (1) Container - for fuel, minimum capacity of 1.0 gallon (4.0 liter)
   B. References
      (1) AMM 71-11-04/201, Fan Cowl Panels
      (2) AMM 71-11-06/201, Core Cowl Panels
      (3) AMM 78-31-00/201, Thrust Reverser System
   C. Access
      (1) Location Zones
          411 Left Engine
          421 Right Engine

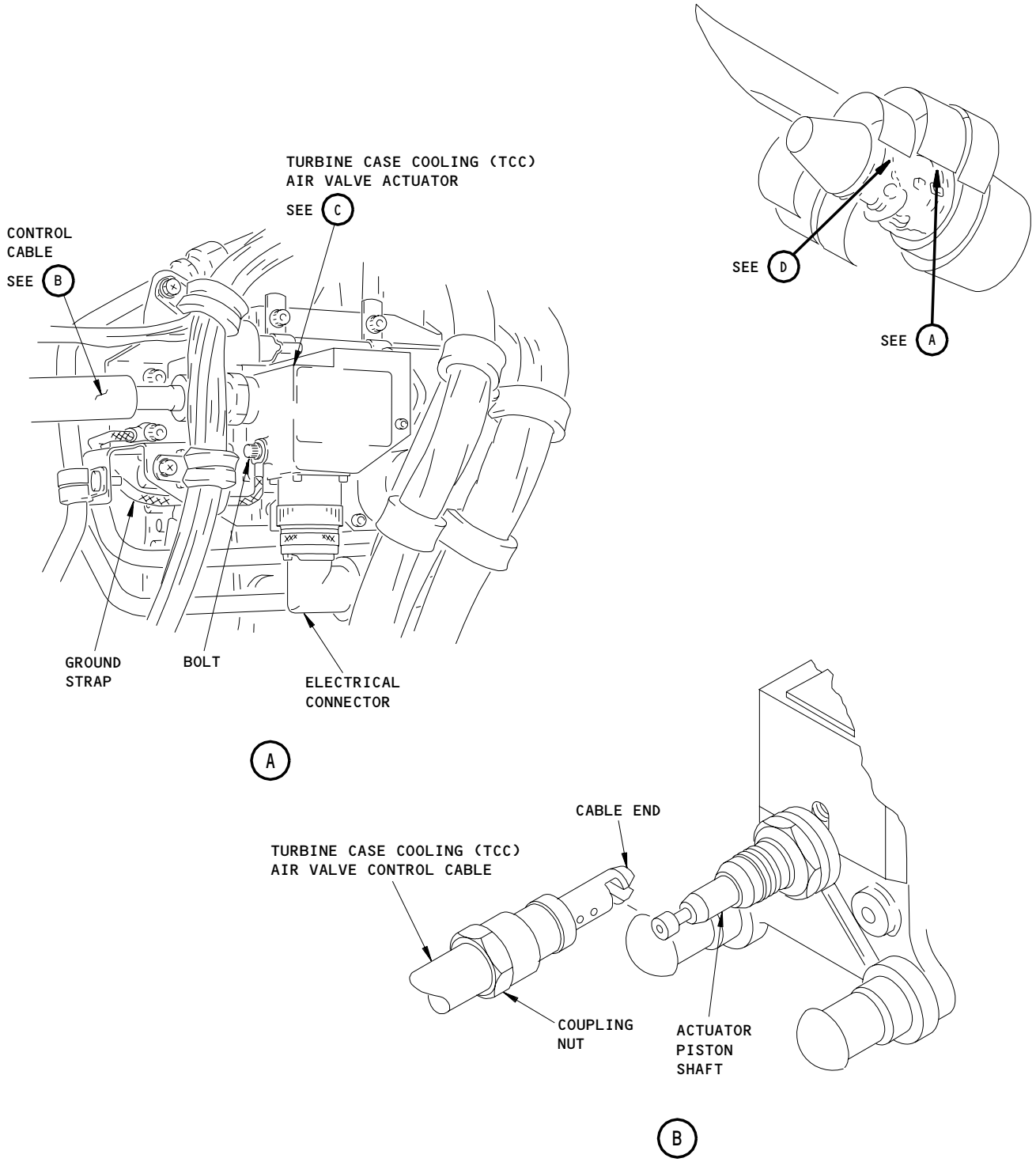
      (2) Access Panels
          414AR Fan Cowl Panel (Right), Left Engine
          416AR Fan Reverser (Right), Left Engine
          418AR Core Cowl (Right), Left Engine
          424AR Fan Cowl Panel (Right), Right Engine
          426AR Fan Reverser (Right), Right Engine
          428AR Core Cowl (Right), Right Engine

   D. Prepare to Remove the Actuator

      S 864-042-N00
      (1) For the left engine, open these circuit breakers on the overhead circuit breaker panel, P11, and attach the DO-NOT-CLOSE tags:
          (a) 11L3, L ENG PERF SOL CHAN A
          (b) 11L4, L ENG PERF SOL CHAN B

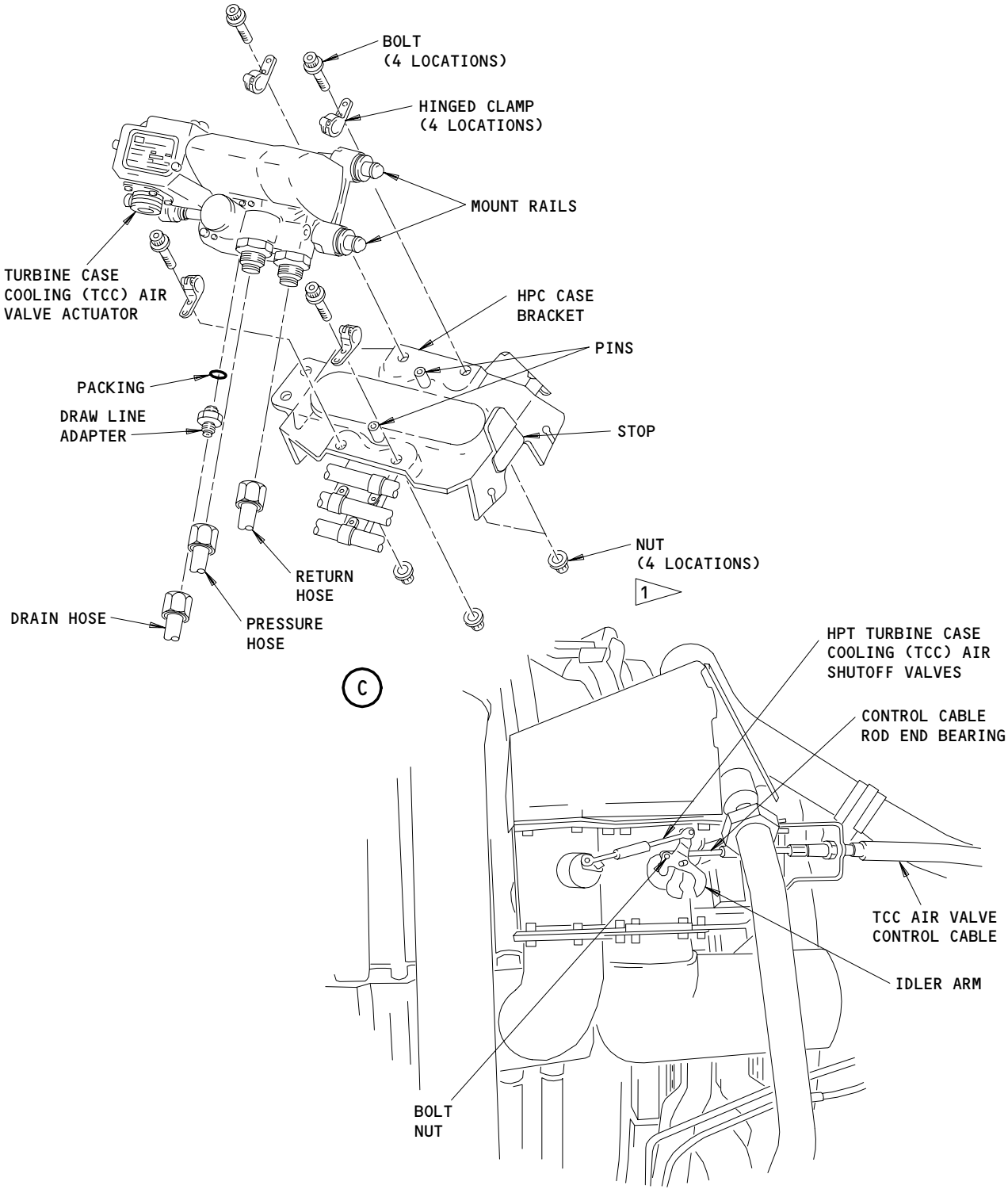
      S 864-002-N00
      (2) For the right engine, open these circuit breakers on the overhead circuit breaker panel, P11, and attach the DO-NOT-CLOSE tags:
          (a) 11L30, R ENG PERF SOL CHAN A
          (b) 11L31, R ENG PERF SOL CHAN B

      S 014-003-N00
      (3) Open the right fan cowl panel (AMM 71-11-04/201).



1 ENGINES PRE-PW-SB 75-35

Turbine Case Cooling (TCC) Air Valve Actuator Installation
Figure 401 (Sheet 1)



Turbine Case Cooling (TCC) Air Valve Actuator Installation
Figure 401 (Sheet 2)

S 044-004-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

(4) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 014-005-N00

(5) Open the right core cowl panel (AMM 71-11-06/201).

S 014-006-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(6) Open the right thrust reverser (AMM 78-31-00/201).

E. Procedure (Fig. 401)

S 024-045-N00

(1) Remove the actuator:
  (a) Disconnect the electrical connector from the actuator.
    1) Install protection caps on the electrical connector and the receptacle on the actuator.
  (b) Remove the bolt and the nut which attach the control-cable rod-end bearing to the idler arm of the HPT TCC air shutoff valve.
  (c) Disconnect the coupling nut of the control cable from the actuator.
  (d) Put a container in position below the actuator to catch the fuel from the pressure, return and drain hoses.
  (e) Disconnect the pressure, return and drain hoses from the actuator.
  (f) Remove the bolt which attaches the ground strap to the rear of the actuator.
  (g) ENGINES POST-PW-SB 75-35;
  Remove the bolts from the riveted nut plates which attach the hinged clamps on the mount rails to the HPC case bracket.
  (h) ENGINES PRE-PW-SB 75-35;

Remove the bolts and nuts which attach the hinged clamps on the mount rails to the HPC case bracket.

(i) Lift the actuator above the bracket pins and stops.

(j) Release the end of the control cable from the actuator piston shaft.

(k) Remove the actuator from the engine.

S 024-047-N00

(2) If it is necessary to replace the actuator, do the steps that follow:

(a) Remove the drain hose adapter from the actuator.

NOTE: The drain hose adapter is the smallest of the three adapters.

1) Discard the packing.

(b) Remove the hinged clamps.

S 024-046-N00

(3) Install protection covers to all open line ends and the openings in the actuator.

TASK 75-24-05-404-018-N00

3. Install the Turbine Case Cooling (TCC) Air Valve Actuator

A. Equipment

(1) M303, M305, or M307 Bergen Mechanical Crimper
Bergen Cable Technologies Inc
170 Gregg St
P.O. Box 1300
Lodi, NJ 07644-9982

B. Consumable Materials

(1) D00137 Engine Oil - PWA 521
(2) G02334 Lockwire - AS3214-02
(3) G02332 Ferrule - P05-292 (Optional)
(4) G02335 Cable - Safety - P05-291 (Optional)

C. References

(1) AMM 70-24-05/201, Electrical Harnesses

(2) AMM 71-00-00/501, Power Plant
(3) AMM 71-11-04/201, Fan Cowl Panels
(4) AMM 71-11-06/201, Core Cowl Panels
(5) AMM 75-24-00/501, Turbine Case Cooling (TCC) System
(6) AMM 78-31-00/201, Thrust Reverser System

D. Access

(1) Location Zones

411 Left Engine
421 Right Engine

(2) Access Panels

414AR Fan Cowl Panel (Right), Left Engine
416AR Fan Reverser (Right), Left Engine
418AR Core Cowl (Right), Left Engine
424AR Fan Cowl Panel (Right), Right Engine
426AR Fan Reverser (Right), Right Engine
428AR Core Cowl (Right), Right Engine

E. Prepare to Install the Actuator (Fig. 401)

S 424-050-N00

(1) Remove the protection covers from the openings in the actuator.

S 214-052-N00

(2) Make sure the actuator can move freely on its mount rails.

S 424-048-N00

(3) If it is necessary to install a new actuator, do the steps that follow:
(a) Lubricate the new packing for the drain line adapter with engine oil.
(b) Install the new packing on the drain line adapter.
(c) Install the drain line adapter in the port on the actuator.
1) Tighten the drain line adapter to 90-100 pound-inches (10.2-11.3 newton-meters).
2) Safety the drain line adapter with lockwire or safety cable and safety cable ferrule.
(d) Install two hinged clamps to each mount rail of the actuator.
1) Install lockwire to hold the hinged clamps in the closed position.

F. Procedure

S 424-051-N00

(1) Install the actuator:
(a) Lubricate the threads of the attaching bolts of the hinged clamps of the actuator, with engine oil.
(b) Hold the actuator in position above the pins on the HPC case bracket.
(c) Connect the end of the control cable to the actuator piston shaft.

(d) ENGINES POST-PW-SB 75-35;
Do the steps that follow:
1) Put the actuator in position on the HPC case bracket and engage the pins with the holes in the mount rails.
2) Attach the actuator with the four bolts at the hinged clamp locations.
a) Tighten the bolts to 85-95 pound-inches (9.6-10.7 newton-meters).

(e) ENGINES PRE-PW-SB 75-35;
Do the steps that follow:
1) Put the actuator in position on the HPT case bracket and engage the pins with the holes in the mount rails.
2) Attach the actuator with the four bolts and nuts at the hinged clamp locations.
a) Tighten the bolts to 85-95 pound-inches (9.6-10.7 newton-meters).

(f) Lubricate the threads of the attaching bolt of the ground strap with engine oil.

(g) Attach the ground strap to the actuator with the bolt.
1) Tighten the bolt to 85-95 pound-inches (9.6-10.7 newton-meters).

(h) Remove the protection covers from the pressure, return and drain hoses.

(i) Lubricate the threads of the tube nuts of the pressure, return and drain hoses with engine oil.

(j) Connect the pressure, return and drain hoses to the ports on the actuator.
1) Tighten the tube nut for the pressure hose to 450-500 pound-inches (50.8-56.5 newton-meters).
2) Tighten the tube nut for the return hose to 270-300 pound-inches (30.5-33.9 newton-meters).
3) Hold the adapter and tighten the tube nut for the drain hose to 135-150 pound-inches (15.3-16.9 newton-meters).

(k) Safety all tube nuts with lockwire or safety cable and safety cable ferrule.

(l) Lubricate the threads of the coupling nut for the control cable with engine oil.

(m) Connect the coupling nut to the actuator piston shaft.
1) Tighten the coupling nut to 100-125 pound-inches (11.3-14.2 newton-meters).
2) Safety the coupling nut with lockwire or safety cable and safety cable ferrule.

(n) Lubricate the threads of the attaching bolt for the control cable rod-end bearing with engine oil.

(o) Attach the control cable rod-end bearing to the idler arm of the HPT TCC air shutoff valve with the bolt and the nut.
1) Tighten the bolt to 36-40 pound-inches (4.1-4.5 newton-meters).

(p) Remove the protection caps from the electrical connector and the receptacle on the actuator.

CAUTION: USE THE CORRECT ASSEMBLY PROCEDURE, AND TOOLS, FOR THE HARNESS CONNECTOR INSTALLATION (AMM 70-24-05/201). IF YOU USE THE INCORRECT ASSEMBLY PROCEDURE, OR TOOLS, A DAMAGED OR LOOSE CONNECTOR CAN OCCUR. A LOOSE CONNECTOR PERMITS VIBRATION, WHICH CAUSES THE CONTACTS TO WEAR AND DECREASES THE LIGHTNING PROTECTION.

(q) Connect the electrical connector to the receptacle on the actuator (AMM 70-24-05/201):

(r) Do the adjustment of the turbine cooling system (AMM 75-24-00/501).

G. Return the Aircraft to Its Usual Condition

S 414-036-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Close the right thrust reverser (AMM 78-31-00/201).

S 414-037-N00
(2) Close the right core cowl panel (AMM 71-11-06/201).

S 414-038-N00
(3) Close the right fan cowl panel (AMM 71-11-04/201).

S 444-039-N00
(4) Do the activation procedure for the thrust reversers (AMM 78-31-00/201).

S 864-040-N00

(5) For the left engine, remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:
(a) 11L3, L ENG PERF SOL CHAN A
(b) 11L4, L ENG PERF SOL CHAN B

S 864-041-N00

(6) For the right engine, remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:
(a) 11L30, R ENG PERF SOL CHAN A
(b) 11L31, R ENG PERF SOL CHAN B

S 714-049-N00

(7) Do the test of the TCC air valve actuator that is shown in the Power Plant Test Reference Table (AMM 71-00-00/501).

TURBINE CASE COOLING (TCC) HPT COLLECTOR - REMOVAL/INSTALLATION

1. General
   A. This procedure gives the instructions for the removal and installation of the Turbine Case Cooling (TCC) HPT collector.
   B. The TCC HPT collector is found on the HPT case at approximately the 3 o'clock position. The TCC HPT collector is connected to the TCC HPT cooling air valve.
   C. You can get access to the TCC HPT collector through the right thrust reverser halve.

TASK 75-24-06-004-001-N00

2. Remove the Turbine Case Cooling (TCC) HPT Collector
   A. References
      (1) AMM 71-11-04/201, Fan Cowl Panels
      (2) AMM 71-11-06/201, Core Cowl Panels
      (3) AMM 75-24-02/401, Turbine Vane Cooling Air Ducts
      (4) AMM 78-31-00/201, Thrust Reverser System
   B. Access
      (1) Location Zones
          411 Left Engine
          421 Right Engine

      (2) Access Panels
          414AR Fan Cowl Panel (Right), Left Engine
          416AR Fan Reverser (Right), Left Engine
          418AR Core Cowl (Right), Left Engine
          424AR Fan Cowl Panel (Right), Right Engine
          426AR Fan Reverser (Right), Right Engine
          428AR Core Cowl (Right), Right Engine

   C. Prepare to Remove the TCC HPT Collector

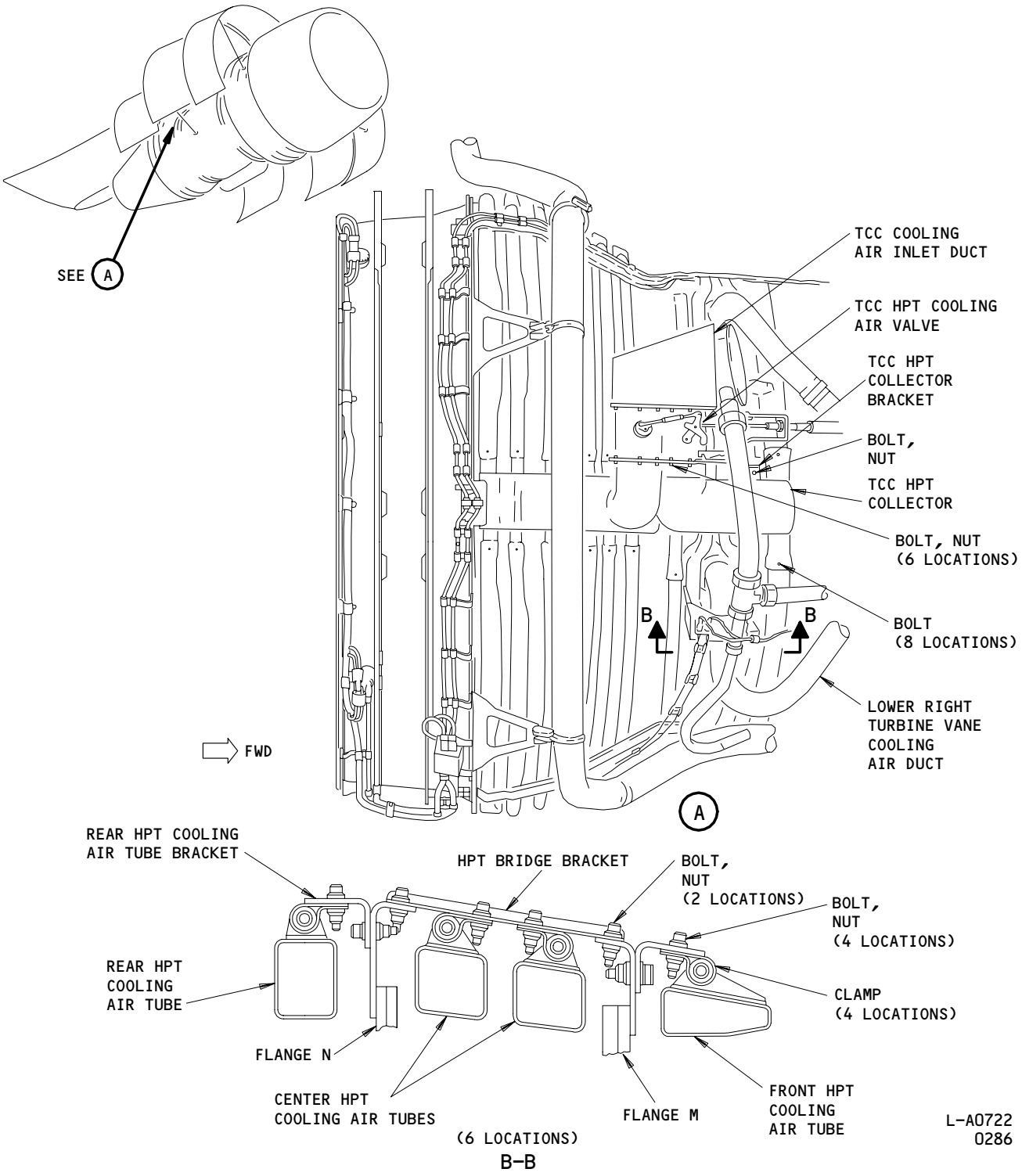
      S 014-002-N00
      (1) Open the right fan cowl panel (AMM 71-11-04/201).

      S 044-003-N00

      WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

      (2) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

      S 014-004-N00
      (3) Open the right core cowl panel (AMM 71-11-06/201).



Turbine Case Cooling (TCC) HPT Collector Installation
Figure 401

S 014-005-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT COULD OCCUR.

(4) Open the right thrust reverser (AMM 78-31-00/201).

D. Procedure

S 024-056-N00

(1) Remove the TCC HPT collector (Fig. 401):
  (a) Remove the lower right turbine vane cooling air duct (AMM 75-24-02/401).
  (b) Remove the bolts which attach the TCC manifolds to the TCC HPT collector.
  (c) Remove the bolts which attach the clamps on the front, lower HPT cooling air tube to the brackets.
    1) Disengage the tube from the TCC HPT collector.
  (d) Remove the bolts which attach the clamps on the front top tube for the HPT cooling air tube to the brackets.
    1) Disengage the tube from the TCC HPT collector.
  (e) Remove the two center bolts which attach the clamps on the six HPT bridge brackets.
  (f) Disengage the center of the top and lower HPT cooling air tubes from the bridge brackets.
  (g) Remove the two end bolts which attach the three lower HPT bridge brackets to the Flange M and N brackets.
  (h) Remove the bridge brackets.
  (i) Disengage the center, lower HPT cooling air tubes from the TCC HPT collector.
  (j) Remove two end bolts which attach the three top bridge brackets to the Flanges M and N brackets.
  (k) Remove the bridge brackets.
  (l) Remove the center, top HPT cooling air tubes from the TCC HPT collector.

(m) Remove the bolts which attach the clamps on the rear top and lower HPT cooling air tubes to the brackets.
(n) Disengage the rear top and lower HPT cooling air tubes from the TCC HPT collector.
(o) Remove the bolt which attaches the clamp to the bracket for the TCC HPT collector.
(p) Remove the bolts which attach the TCC HPT collector and the lower flange of the (TCC) Air Shutoff Valve (HPT) to the support bracket.
(q) Remove the TCC HPT collector.

TASK 75-24-06-404-023-N00

3. Install the Turbine Case Cooling (TCC) HPT Collector

A. Consumable Materials
(1) D00137 Engine Oil - PWA 521

B. References
(1) AMM 71-11-04/201, Fan Cowl Panels
(2) AMM 71-11-06/201, Core Cowl Panels
(3) AMM 75-24-02/401, Turbine Vane Cooling Air Ducts
(4) AMM 78-31-00/201, Thrust Reverser System

C. Access
(1) Location Zones
411 Left Engine
421 Right Engine

(2) Access Panels
414AR Fan Cowl Panel (Right), Left Engine
416AR Fan Reverser (Right), Left Engine
418AR Core Cowl (Right), Left Engine
424AR Fan Cowl Panel (Right), Right Engine
426AR Fan Reverser (Right), Right Engine
428AR Core Cowl (Right), Right Engine

D. Procedure

S 424-057-N00
(1) Install the TCC HPT collector (Fig. 401):
(a) Install the TCC HPT collector below the support bracket.

(b) Attach the TCC HPT collector and the lower flange of the TCC Air Shutoff Valve with the bolts and nuts to the support bracket.

NOTE: Make sure you install the longer bolt at the support link location.

1) Tighten the bolts with your hand.

(c) Lubricate the threads of the bolt, which attaches the clamp to the bracket for the TCC HPT collector, with engine oil.

(d) Install the bracket for the TCC HPT collector to the clamp with the bolt and nut.
1) Tighten the bolt with your hand.

(e) Lubricate the threads of the bolts, which attach the HPT cooling air tubes, with engine oil.

(f) Install the rear top and lower HPT cooling air tubes to the TCC HPT collector with the bolts.
1) Tighten the bolts to 36-40 pound-inches (4.1-4.5 newton-meters).

(g) Lubricate the threads of the bolts, which attach the clamps on the rear top and lower HPT cooling air tubes, with engine oil.

(h) Install the clamps for the rear top and lower HPT cooling air tube to the Flange N support bracket with the bolts and nuts.
1) Tighten the bolts to 36-40 pound-inches (4.1-4.5 newton-meters).

(i) Lubricate the threads of the bolts, which attach the center, top HPT cooling air tubes to the TCC HPT collector, with engine oil.

(j) Install the two center, top HPT cooling air tubes to the TCC HPT collector with the bolts.
1) Tighten the bolts to 36-40 pound-inches (4.1-4.5 newton-meters).

(k) Lubricate the threads of the bolts, which attach the top bridge brackets on the Flange M and N support brackets, with engine oil.

(l) Install the top bridge brackets on the Flange M and N support brackets with the bolts and nuts.
    1) Tighten the bolts to 36-40 pound-inches (4.1-4.5 newton-meters).
(m) Lubricate the threads of the bolts, which attach the clamps on the HPT cooling air tube to the top bridge brackets, with engine oil.
(n) Install the clamps for the center, top HPT cooling air tube to the top three bridge brackets with the bolts and nuts.
    1) Tighten the bolts to 36-40 pound-inches (4.1-4.5 newton-meters).
(o) Lubricate the threads of the bolts, which attach the HPT cooling air tubes to the TCC HPT collector, with engine oil.
(p) Install the two center, lower HPT cooling air tubes to the TCC HPT collector with the bolts.
    1) Tighten the bolts to 36-40 pound-inches (4.1-4.5 newton-meters).
(q) Lubricate the threads of the bolts, which attach the lower bridge brackets, with engine oil.
(r) Install the lower bridge brackets on the Flange M and N support brackets with the bolts and nuts.
    1) Tighten the bolts to 36-40 pound-inches (4.1-4.5 newton-meters).
(s) Lubricate the threads of the bolts, which attach the center, lower HPT cooling air tube, with engine oil.
(t) Install the clamps for the center, lower HPT cooling air tube to the lower three bridge brackets with the bolts and nuts.
    1) Tighten the bolts to 36-40 pound-inches (4.1-4.5 newton-meters).
(u) Lubricate the threads of the bolts, which attach the HPT cooling air tube to the TCC HPT collector, with engine oil.
(v) Install the front, top and lower HPT cooling air tubes to TCC HPT collector with the bolts.
    1) Tighten the bolts to 36-40 pound-inches (4.1-4.5 newton-meters).

(w) Lubricate the threads of the bolts, which attach the front, top HPT cooling air tube to the brackets, with engine oil.

(x) Install the clamps for the front top and lower HPT cooling tube to the brackets with the bolts and nuts.

1) Tighten the bolts to 36-40 pound-inches (4.1-4.5 newton-meters).

(y) Tighten the bolts, which attach the TCC HPT collector and the lower flange of the TCC Air Shutoff Valve (HPT), to 85-95 pound-inches (9.6-10.7 newton-meters).

(z) Tighten the bolt, which attaches the bracket of the TCC HPT collector to the clamp, to 36-40 pound-inches (4.1-4.5 newton-meters).

(aa) Install the lower right turbine vane cooling air duct (AMM 75-24-02/401).

E. Return the Aircraft to Its Usual condition

S 414-050-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT COULD OCCUR.

(1) Close the right thrust reverser (AMM 78-31-00/201).

S 414-051-N00

(2) Close the right core cowl panel (AMM 71-11-06/201).

S 414-052-N00

(3) Close the right fan cowl panel (AMM 71-11-04/201).

S 444-053-N00

(4) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

TURBINE CASE COOLING (TCC) HPT MANIFOLDS - REMOVAL/INSTALLATION

1. General
   A. This procedure gives the instructions for the removal and installation of Turbine Case Cooling (TCC) manifolds (air tubes) for the High Pressure Turbine (HPT) case.
   B. The cooling air tubes are installed on the HPT case and are connected to the HPT TCC collector.
   C. You can get access to the cooling air tubes through the left and right core cowl panels.

TASK 75-24-07-004-001-N00

2. Remove the TCC HPT Manifolds
   A. References
      (1) AMM 71-11-06/201, Core Cowl Panels
      (2) AMM 78-31-00/201, Thrust Reverser System
   B. Access
      (1) Location Zones
          411 Left Engine
          421 Right Engine

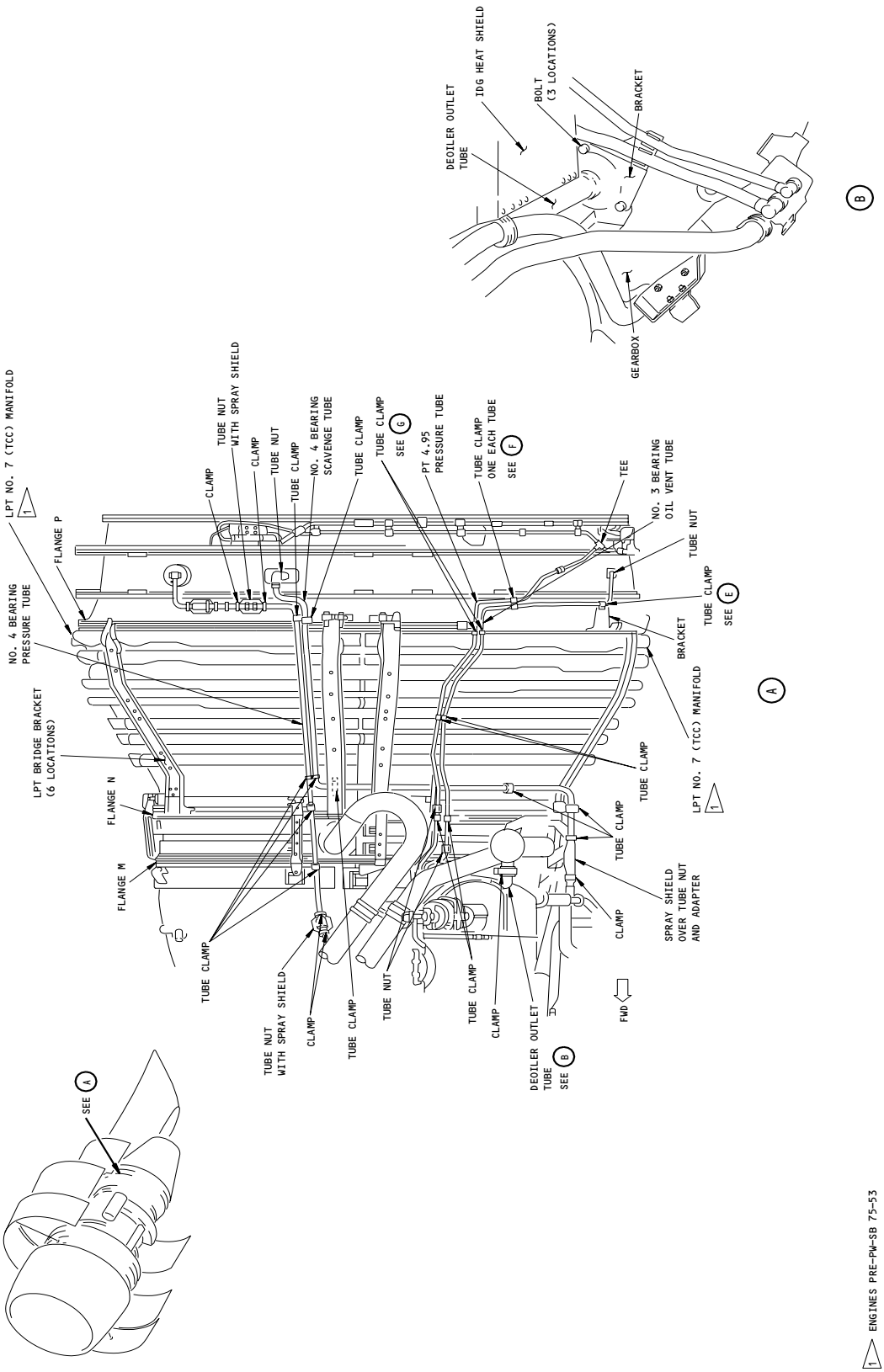
      (2) Access Panels
          417AL Core Cowl (Left), Left Engine
          418AR Core Cowl (Right), Left Engine
          427AL Core Cowl (Left), Right Engine
          428AR Core Cowl (Right), Right Engine

   C. Prepare to Remove the TCC HPT Manifolds.

S 044-003-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

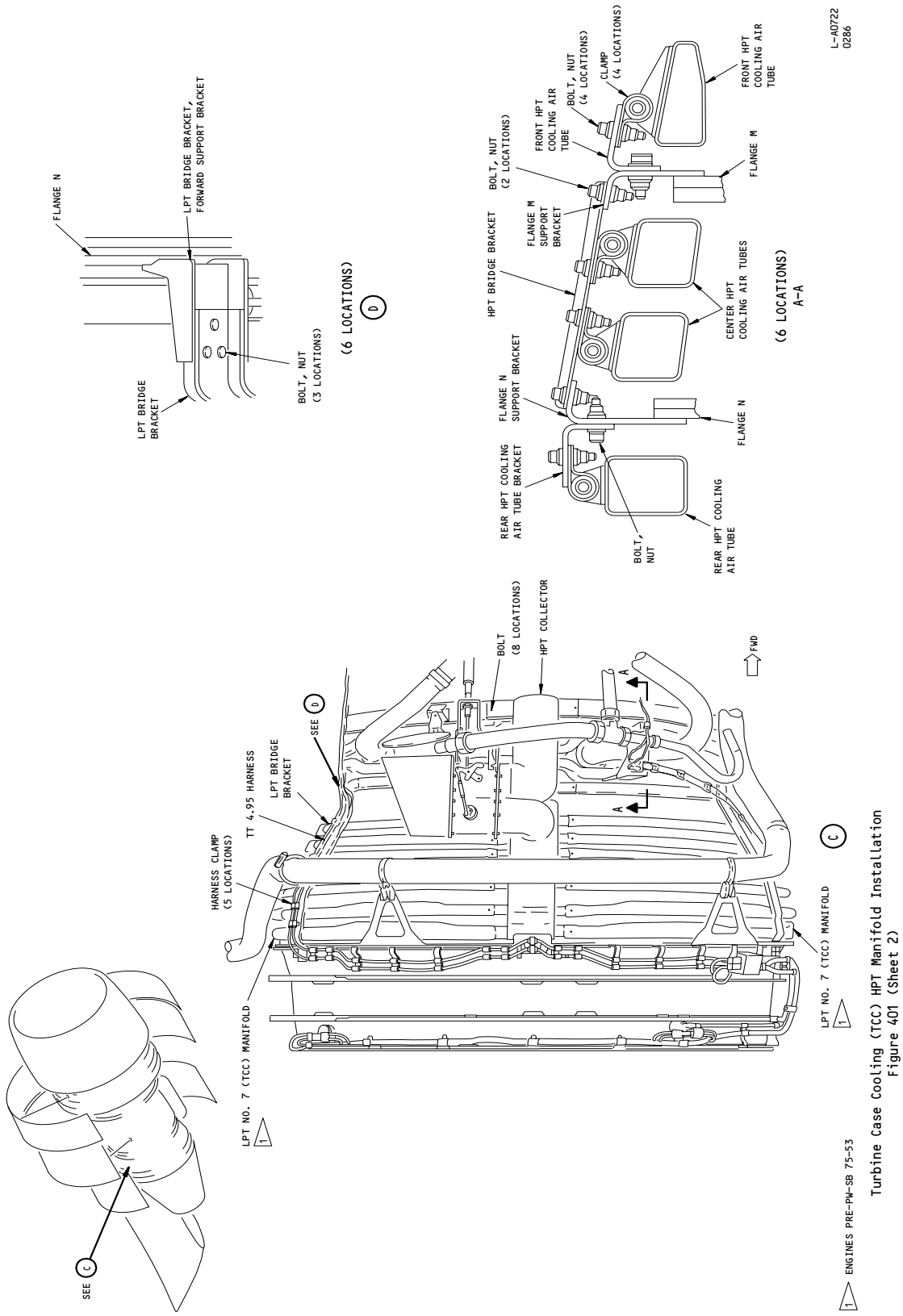
(1) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).



1 ENGINES PRE-PW-SB 75-53

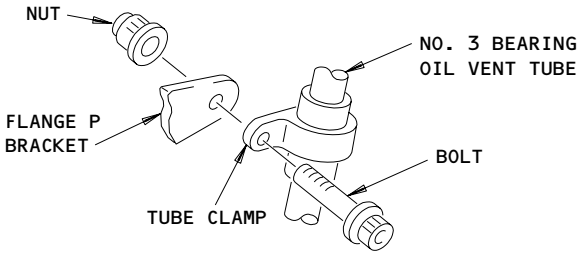
Turbine Case Cooling (TCC) HPT Manifold Installation
Figure 401 (Sheet 1)

258971

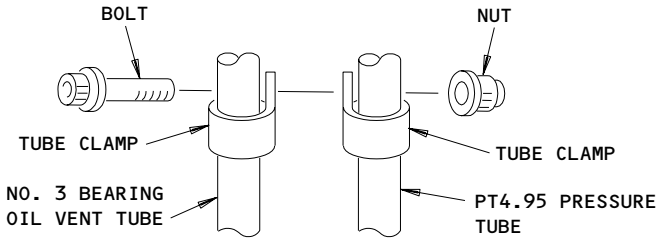


Turbine Case Cooling (TCC) HPT Manifold Installation
Figure 401 (Sheet 2)

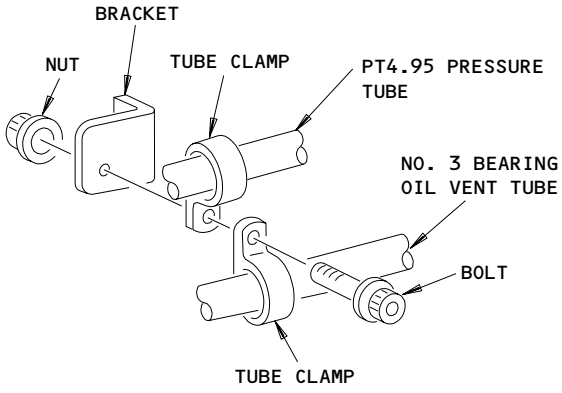
2589728



E



F



G

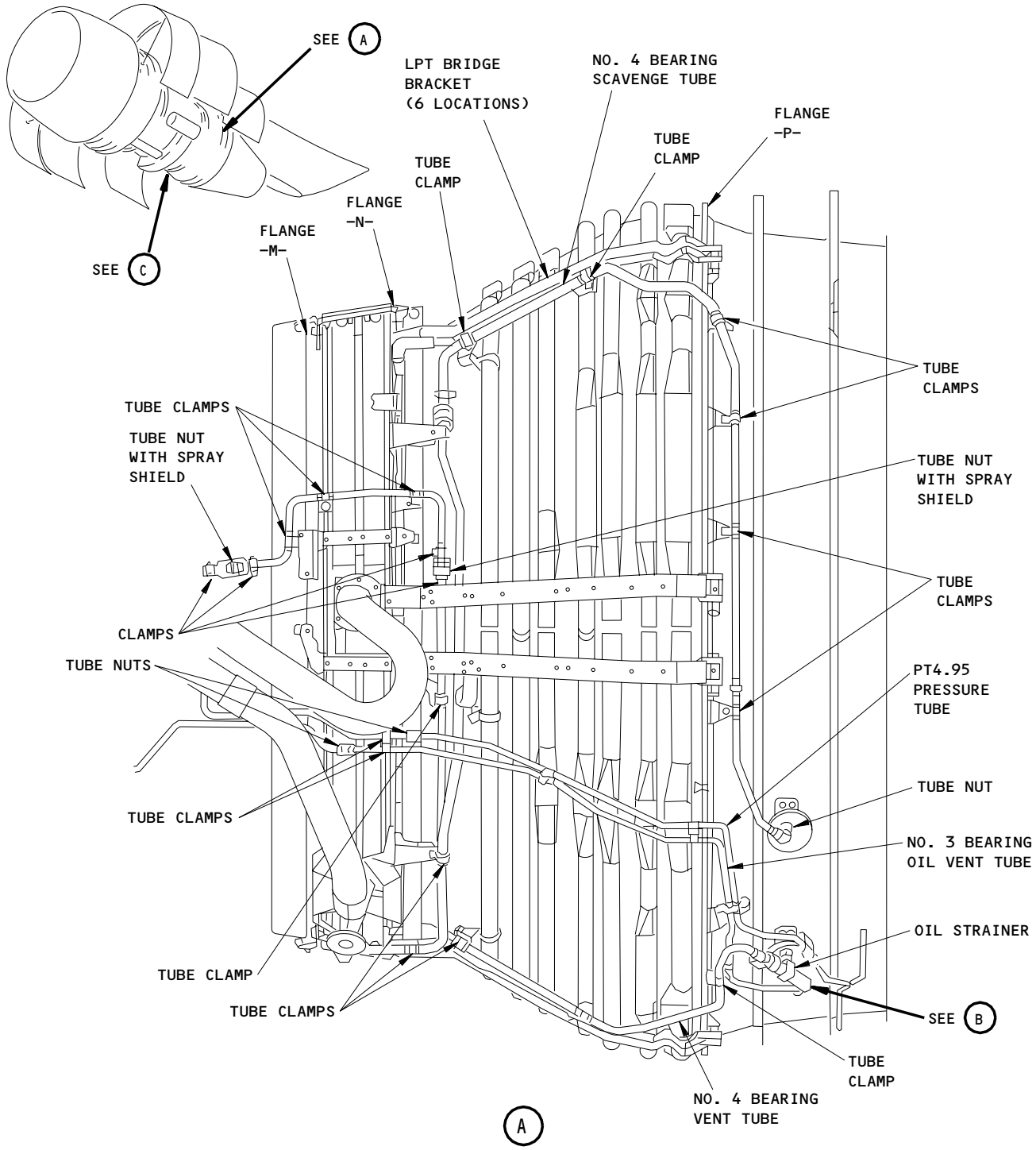
Turbine Case Cooling (TCC) HPT Manifold Installation
Figure 401 (Sheet 3)

S 014-004-N00
(2) Open the core cowl panels (AMM 71-11-06/201).

D. Remove the TCC HPT Manifolds (Fig. 401).

S 024-063-N00
(1) ENGINES PRE-PW-SB 79-76;
Remove the oil pressure tube of the No. 4 bearing.
(a) Remove the clamps which attach the spray shield at the tube nut forward of Flange M.
(b) Remove the spray shield from the engine.
(c) Disconnect the tube nut forward of Flange M from the tube adapter.
(d) Remove the clamps which attach the spray shield at the tube nut aft of Flange P.
(e) Remove the spray shield from the engine.
(f) Disconnect the tube nut aft of Flange P from the tube adapter.
(g) Remove the tube clamps which attach the center section of the oil pressure tube to the brackets on Flanges M, N, and P.
(h) Remove the tube clamp which attaches the center section of the oil pressure tube to the No. 4 bearing scavenge tube.
(i) Remove the center section of the oil pressure tube from the engine.
(j) Install protective caps.

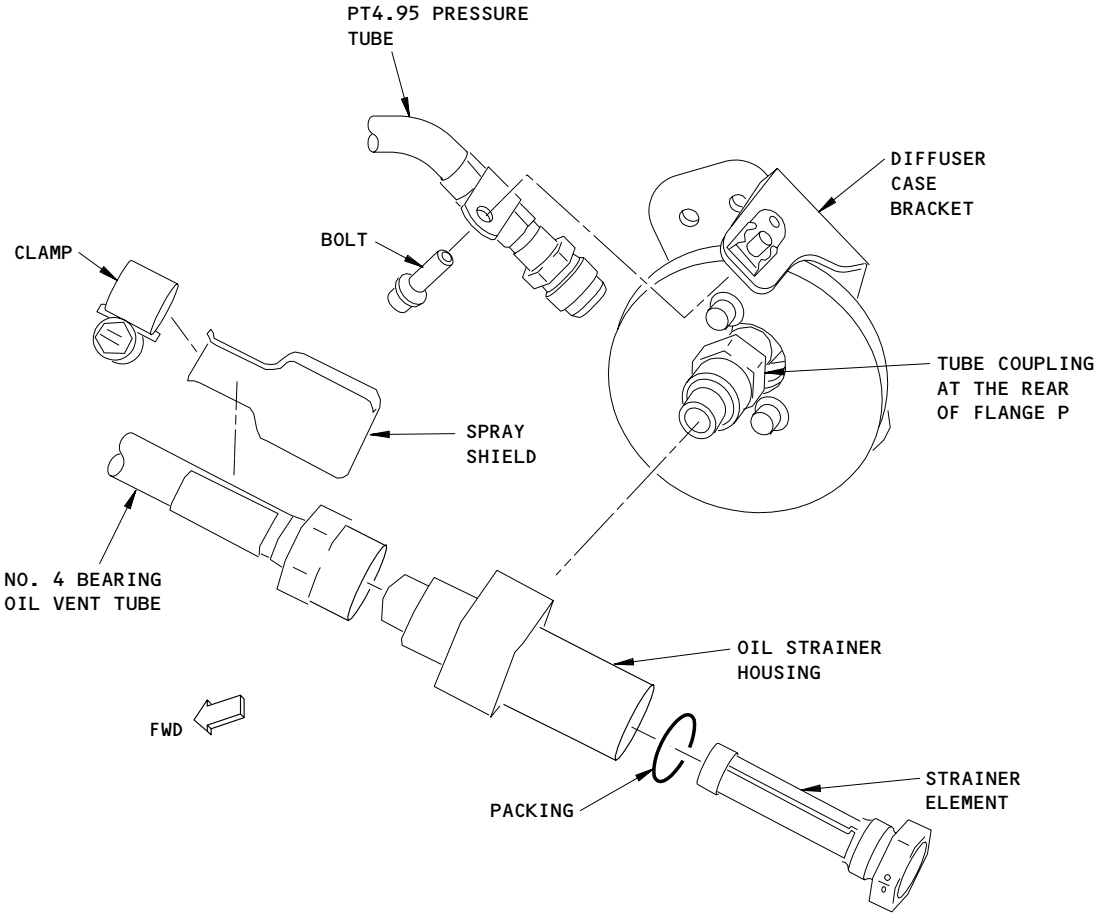
S 024-060-N00
(2) ENGINES POST-PW-SB 79-76;
Remove the oil pressure tube of the No. 4 bearing (Fig. 402).
(a) Remove clamps which attach the spray shield at the tube nut forward of Flange M.
(b) Remove the spray shield from the engine.
(c) Disconnect the tube nut forward of Flange M from the tube adapter.
(d) Remove the clamps which attach the spray shield at the tube nut aft of Flange N.
(e) Remove the spray shield from the engine.
(f) Disconnect the tube nut, between the upper and lower sections of the oil pressure tube, aft of Flange N.



ENGINES POST-PW-SB 79-75 AND POST-PW-SB 79-76

L-B2781 (0000)

Turbine Case Cooling (TCC) HPT Manifold Installation
Figure 402 (Sheet 1)

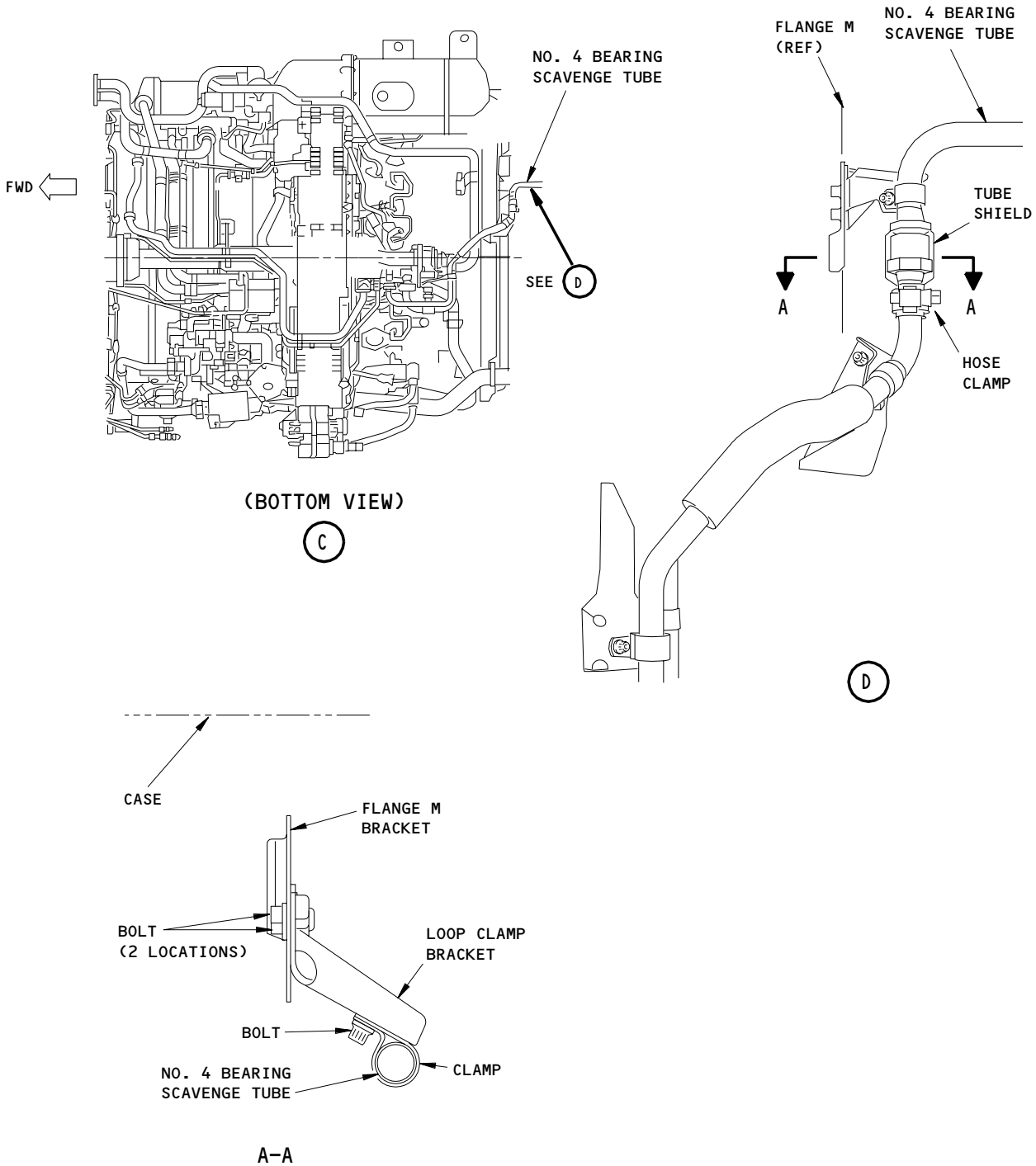


B

L-B2793 (0000)

ENGINES POST-PW-SB 79-75 AND POST-PW-SB 79-76

Turbine Case Cooling (TCC) HPT Manifold Installation
Figure 402 (Sheet 2)



L-B2531 (0000)

ENGINES POST-PW-SB 79-75 AND POST-PW-SB 79-76

Turbine Case Cooling (TCC) HPT Manifold Installation
Figure 402 (Sheet 3)

(g) Remove the tube clamps which attach the upper section of the oil pressure tube to the brackets at Flanges M and N.
(h) Remove the tube clamp forward of Flange M.
(i) Remove the upper section of the oil pressure tube from the engine and install protective caps on the tube.
(j) Remove the clamps, which attach the spray shield at the tube nut, on the oil strainer housing on the engine case.
(k) Remove the spray shield from the engine.
(l) Disconnect the tube nut from the strainer housing.
(m) Remove the tube clamp which attaches the lower section of the pressure tube to Flange P.
(n) Remove the tube clamps on the LPT Bridge Bracket (2 locations).
(o) Remove the tube clamps at Flange N (2 locations).
(p) Remove the lower section of the oil pressure tube from the engine.
(q) Install protective caps.
(r) Remove the strainer housing aft of Flange P, at the engine case.
1) Remove the strainer element.
2) Remove and discard packing from the groove in the strainer element.

S 024-064-N00

(3) ENGINES PRE-PW-SB 79-76;
Remove the No. 4 bearing scavenge tube (Fig. 401).
(a) Disconnect the scavenge tube elbow at the rear from the internal tube on the engine case.
(b) Remove the bolt which attaches the tube clamp to the bracket on Flange P.
1) Remove the tube clamp.
(c) Remove the bolts which attach the tube clamps to the brackets on Flange N.
1) Remove the tube clamps.
(d) Remove the bolt which attaches the clamp and the aft end of the spray shield to the bracket on Flange M.
1) Remove the clamp.
(e) Remove the clamp which attaches the forward end of the spray shield to the tube.
1) Remove the spray shield.
(f) Disconnect the tube nut at Flange M from the tube adapter.
(g) Remove the aft end of the No. 4 bearing scavenge tube from the engine.

S 024-061-N00

(4) ENGINES POST-PW-SB 79-76;
Remove the No. 4 bearing scavenge tube assembly (Fig. 402).
(a) Disconnect the scavenge tube from the internal tube on the engine case.
(b) Remove the bolt which attaches the tube clamp to the bracket on Flange P (4 places).
1) Remove the tube clamps.
(c) Remove the bolts which attach the tube clamps to the brackets on the LPT Bridge Bracket (2 places).
1) Remove the tube clamps.
(d) Remove the clamps that attach the spray shield to the tube nut found aft of Flange N.
1) Remove the spray shield from engine.
(e) Disconnect the tube nut aft of Flange N.
(f) Remove the upper section of the No. 4 scavenge tube and install protective caps.
(g) Remove the bolts which attach the tube clamps on Flange N (2 locations).
1) Remove the clamps.
(h) Remove the bolt which attaches the clamp and the aft end of the spray shield to the bracket on Flange M.
1) Remove the tube clamp.
(i) Remove the clamp which attaches the forward end of the spray shield to the tube.
1) Remove the tube clamp and spray shield.
(j) Disconnect the tube nut at Flange M from the tube adapter.
(k) Remove the lower section of the No. 4 bearing scavenge tube from the engine and install protective caps.

S 024-069-N00

(5) Remove the deoiler outlet tube.
(a) Remove the bolt which attaches the tube clamp to the bracket on Flange M.
1) Remove the tube clamp.
(b) Remove the bolt which attaches the tube clamp on the adjacent tube forward of Flange M.
1) Remove the tube clamp.
(c) Remove the bolts which attach the deoiler outlet tube to the pad on the rear of the gearbox.
(d) Remove the deoiler outlet tube from the engine.
(e) Discard the packing from the deoiler outlet tube.

S 024-070-N00

(6) Remove the oil vent tube of the No. 3 bearing.
(a) Disconnect the tube nut from the adapter on the turbine exhaust case.
(b) Remove the bolts which attach the tube clamps to the Flange P brackets.
1) Remove the tube clamps.

(c) Remove the bolt which attaches the tube clamp to the tube clamp of the PT4.95 pressure tube in the middle of Flanges P and N.
1) Remove the tube clamps.
(d) Remove the bolt which attaches the tube clamp to the bracket on Flange N.
1) Remove the tube clamp.
(e) Remove the bolt and nut that attaches the tube clamp to the adjacent PT4.95 tube assembly at approximately the 7:30 o'clock position.
(f) Remove the tube clamp from the oil vent tube.
(g) Disconnect the tube nut at the tube connection just aft of Flange M.
(h) Remove the oil vent tube from the engine.
(i) Install protective caps on the tube fittings.

S 024-071-N00
(7) Remove the PT4.95 pressure tube.
(a) Disconnect the tube nut from the tube coupling at the rear of Flange P at approximately the 7 o'clock position.
(b) Remove the bolt and nut that attaches the tube clamp to the Flange P bracket at the 7 o'clock position.
(c) Remove the bolt which attaches the tube clamp to the Flange N bracket.
1) Remove the tube clamp.
(d) Remove the bolt which attaches the tube clamp to the diffuser case bracket.
1) Remove the tube clamp.
(e) Disconnect the tube nut from the tube adapter aft of Flange N at approximately the 8 o'clock position.
(f) Remove the PT4.95 pressure tube from the engine.
(g) Install protective caps on the tube fittings.

S 024-072-N00
(8) Disconnect the TT4.95 harness.
(a) Remove the bolts which attach the harness clamps to the bracket for the cooling air tube.
(b) Remove the harness clamps.

S 024-012-N00

(9) Remove the HPT Cooling Air Tubes.

(a) Remove the bolts which attach the upper HPT cooling air tube to the HPT collector.

(b) Remove the bolts which attach the lower HPT cooling air tube to the HPT collector.

(c) Remove the bolts which attach the tube clamps on the front, lower HPT cooling air tube to the brackets.

(d) Remove the front, lower HPT cooling air tube from the engine.

(e) Remove the bolts which attach the tube clamps on the front, upper HPT cooling air tube to the brackets.

(f) Remove the front, upper HPT cooling air tube from the engine.

(g) Remove the center bolts which attach the tube clamps of the HPT cooling air tubes on the HPT bridge brackets.

(h) Remove the center, upper HPT cooling air tube from the engine.

(i) Remove the end bolts which attach the lower HPT bridge brackets to the Flange M and N brackets.

1) Remove the HPT bridge brackets.

(j) Remove the center, lower HPT cooling air tube from the engine.

(k) Remove the end bolts which attach the upper HPT bridge brackets to the Flange M and N brackets.

1) Remove the HPT bridge brackets.

(l) Remove the center, upper HPT cooling air tubes from the engine.

(m) Remove the bolts which attach the tube clamps on the rear, lower HPT cooling air tube to the brackets.

(n) Move the rear, lower HPT cooling air tubes rearward to give access to the aft side of the Flange N brackets.

(o) Remove the bolts which attach the rear, upper HPT cooling air tubes to the brackets.

(p) Move the rear, upper HPT cooling air tubes rearward to give access to the aft side of the Flange N brackets.

(q) Remove the bolts which attach the rear, upper brackets of the HPT cooling air tube to the support bracket on Flange N.

(r) Remove the bolts which attach the rear, lower brackets of the HPT cooling air tube to the support bracket on Flange N.

(s) Remove the bolts which attach the LPT bridge brackets to the forward support brackets of the LPT bridge bracket.

NOTE: Removal of the support brackets is necessary to supply access to the rear HPT cooling air tubes.

(t) Remove the flange bolts which attach the forward support brackets of the LPT bridge bracket to Flange N.

1) Remove the forward support brackets.

(u) Remove the rear, upper HPT cooling air tubes.

(v) Remove the rear, lower HPT cooling air tubes.

TASK 75-24-07-404-013-N00

3. Install the TCC HPT Manifolds

A. Equipment

(1) M303, M305, or M307 Bergen Mechanical Crimper
Bergen Cable Technologies Inc
170 Gregg St
P.O. Box 1300
Lodi, NJ 07644-9982

B. Consumable Materials

(1) D00137 Engine Oil - PWA 521
(2) D50124 Paste - Anti-seize PWA 36246
(3) G02334 Lockwire - AS3214-02
(4) G02332 Ferrule - P05-292 (Optional)
(5) G02335 Cable - Safety - P05-291 (Optional)

C. References

(1) AMM 71-00-00/501, Power Plant - General
(2) AMM 71-11-06/201, Core Cowl Panels
(3) AMM 78-31-00/201, Thrust Reverser System

D. Access

(1) Location Zones

411 Left Engine
421 Right Engine

(2) Access Panels

417AL Core Cowl (Left), Left Engine
418AR Core Cowl (Right), Left Engine
427AL Core Cowl (Left), Right Engine
428AR Core Cowl (Right), Right Engine

E. Procedure

S 424-014-N00

(1) Install the rear, upper HPT cooling air tubes around the case with the open ends forward of the HPT collector.
(a) Do not attach the rear, upper HPT cooling air tube at this time.

S 424-015-N00
(2) Install the rear, lower HPT cooling air tubes around the case with the open ends forward of the HPT collector.
   (a) Do not attach the rear, lower HPT cooling air tube at this time.

S 424-073-N00
(3) Do the steps that follow to install the rear, upper brackets of the HPT cooling air tube:
   (a) Lubricate the threads of the bolts with oil.
   (b) Attach the rear, upper brackets of the HPT cooling air tube to the support brackets on Flange N with the bolts.
   (c) Tighten the bolts to 36-40 pound-inches (4.1-4.5 newton-meters).

S 424-074-N00
(4) Do the steps that follow to install the rear, lower brackets of the HPT cooling air tube:
   (a) Lubricate the threads of the bolts with oil.
   (b) Attach the rear, lower brackets of the HPT cooling air tube to the support brackets on Flange N with the bolts.
   (c) Tighten the bolts to 36-40 pound-inches (4.1-4.5 newton-meters).

S 644-018-N00
(5) Lubricate the threads of the the flange bolts, which attach the forward support brackets of the LPT bridge brackets, with oil.

S 424-075-N00
(6) Attach the forward support brackets of the LPT bridge brackets to Flange N with flange bolts and nuts.
   (a) Tighten the flange bolts to 180-200 pound-inches (20.3-22.6 newton-meters).

S 644-020-N00
(7) Lubricate the threads of the the bolts, which attach the rear HPT cooling air tubes to the HPT collector, with oil.

S 424-076-N00
(8) Attach the rear HPT cooling air tubes to the HPT collector with the bolts.
   (a) Tighten the bolts with your hand.

S 644-022-N00
(9) Lubricate the bolts which attach the LPT bridge bracket to the forward support bracket, with oil.

S 424-077-N00
(10) Attach the LPT bridge bracket to the forward support bracket with the bolts and nuts.

NOTE: The bolt at approximately the 8 o'clock position also attaches the tube clamp which holds the HPT cooling air tube.

(a) Tighten the bolts to 36-40 pound-inches (4.1-4.5 newton-meters).

S 424-078-N00
(11) Install the tube clamps to the rear, upper HPT cooling air tube.

S 424-079-N00
(12) Install the tube clamps to the rear, lower HPT cooling air tube.

S 644-026-N00
(13) Lubricate the bolts which attach the tube clamps to the support brackets at Flange N, with oil.

S 424-080-N00
(14) Attach the tube clamps to the support brackets at Flange N with the bolts and nuts.
(a) Tighten the bolts with your hand.

S 424-028-N00
(15) Do the steps that follow to install the center, upper HPT cooling air tubes:
(a) Install the center, upper HPT cooling air tubes on the engine case.
(b) Engage the open ends of the center, upper HPT cooling air tube to the HPT collector.
(c) Lubricate the threads of the bolts, which attach the center, upper HPT cooling air tube, with oil.
(d) Attach the center, upper HPT cooling air tubes with the bolts and nuts.
1) Tighten the bolts with your hand.

S 644-029-N00
(16) Lubricate the threads of the bolts, which attach the upper HPT bridge brackets, with oil.

S 424-081-N00
(17) Attach the upper HPT bridge brackets to the support brackets on Flanges M and N with the bolts and nuts.
(a) Tighten the bolts with your hand.

S 644-031-N00
(18) Lubricate the threads of the tube clamp bolts, which attach the center, upper HPT cooling air tube, with oil.

S 424-082-N00
(19) Install the tube clamp on the center, upper HPT cooling air tube with the tube clamp bolts.
(a) Tighten the tube clamp bolts with your hand.

S 424-033-N00
(20) Do the steps that follow to install the center, lower HPT cooling air tubes:
(a) Put the center, lower HPT cooling air tubes on the engine case.
(b) Engage the open ends of the center, lower HPT cooling air tube to the HPT collector.
(c) Lubricate the threads of the bolts, which attach the center, lower HPT cooling air tubes to the HPT collector, with oil.
(d) Attach the center, lower HPT cooling air tubes with the bolts.
1) Tighten the bolts with your hand.

S 644-034-N00
(21) Lubricate the threads of the bolts, which attach the lower HPT bridge brackets, with oil.

S 424-083-N00
(22) Attach the lower HPT bridge brackets to the support brackets at Flanges M and N with the bolts and nuts.
(a) Tighten the bolts with your hand.

S 644-036-N00
(23) Lubricate the threads on the tube clamp bolts, which attach the center, lower HPT cooling air tube, with oil.

S 424-084-N00
(24) Install the tube clamps to the lower HPT bridge brackets with the tube clamp bolts and nuts.
(a) Tighten the tube clamp bolts with your hand.

S 424-038-N00
(25) Do the steps that follow to install the front, upper HPT cooling air tubes:
(a) Install the front, upper HPT cooling air tubes on the engine case.
(b) Engage the open ends of the front, upper HPT cooling air tubes with the HPT collector.
(c) Lubricate the threads of the bolts, which attach the front, upper HPT cooling air tubes to the engine case, with oil.
(d) Attach the front, upper HPT cooling air tubes with the bolts.
(e) Tighten the bolts with your hand.

S 424-039-N00

(26) Do the steps that follow to install the front, lower HPT cooling air tubes:
  (a) Install the front, lower HPT cooling air tubes on the engine case.
  (b) Engage the open ends of the front, lower HPT cooling air tubes with the HPT collector.
  (c) Lubricate the threads of the bolts, which attach the front, lower HPT cooling air tubes to the engine case, with oil.
  (d) Attach the front, lower HPT cooling air tubes with the bolts.
  (e) Tighten the bolts with your hand.

S 644-040-N00

(27) Lubricate the threads of the tube clamp bolts, which attach the tube clamps of the front, upper HPT cooling air tube, with oil.

S 424-085-N00

(28) Install the tube clamps on the front, upper HPT cooling air tube to the brackets with the tube clamp bolts and nuts.
  (a) Tighten the tube clamp bolts with your hand.

S 644-042-N00

(29) Lubricate the threads of the tube clamp bolts, which attach the tube clamps of the front, lower HPT cooling air tube, with oil.

S 424-086-N00

(30) Install the front, lower HPT cooling air tube to the brackets with the tube clamp bolts and nuts.
  (a) Tighten the tube clamp bolts with your hand.

S 424-087-N00

(31) Tighten the bolts, which attach the HPT cooling air tubes, as follows:
  (a) Tighten the bolts which attach the HPT cooling air tubes to the HPT collector to 36-40 pound-inches (4.1-4.5 newton-meters).
  (b) Tighten the bolts which attach the HPT bridge brackets to the support brackets at Flanges M and N to 36-40 pound-inches (4.1-4.5 newton-meters).
  (c) Tighten the bolts which attach the tube clamps of the center HPT cooling air tubes to the HPT bridge brackets to 36-40 pound-inches (4.1-4.5 newton-meters).

(d) Tighten the tube clamp bolts to the brackets on the front HPT cooling air tube to 36-40 pound-inches (4.1-4.5 newton-meters).
(e) Tighten the tube clamp bolts to the brackets on the rear HPT cooling air tube to 36-40 pound-inches (4.1-4.5 newton-meters).

S 424-088-N00

(32) Connect the PT4.95 harness.
(a) Lubricate the threads of the harness clamp bolts with oil.
(b) Install the harness clamps and the tube clamp of the LPT cooling air tube to the LPT bridge bracket with the harness clamp bolts.
(c) Tighten the harness clamp bolts to 36-40 pound-inches (4.1-4.5 newton-meters).

S 424-089-N00

(33) Install the PT4.95 pressure tube.

CAUTION: DO NOT USE A LUBRICANT ON THE EEC SENSE TUBES, ADAPTERS, OR PACKINGS. THE LUBRICANT CAN CAUSE CONTAMINATION OF THE EEC.

(a) Remove protective caps from the tube fittings.
(b) Install the tube nut to the tube coupling at approximately the 7 o'clock position and rearward of Flange P.
(c) Install the tube nut to the tube coupling at approximately the 8 o'clock position and rearward of Flange N.
(d) Lubricate the threads of the tube clamp bolt, which attaches the tube clamp to the bracket location on Flange N, with oil.
(e) Install the tube clamp on the PT4.95 pressure tube at the bracket location on Flange N with the tube clamp bolt.
1) Tighten the tube clamp bolt with your hand.
(f) Lubricate the threads of the tube clamp bolt, which attaches the tube clamp to the diffuser case, with oil.
(g) Install the tube clamp on the PT4.95 pressure tube to the diffuser case with the tube clamp bolt.
1) Tighten the tube clamp bolt with your hand.

(h) Tighten the tube nuts of the PT4.95 pressure tube to 200-225 pound-inches (22.5-25.4 newton-meters).
(i) Safety the tube nuts with lockwire or safety cable and safety cable ferrule.
(j) Tighten all tube clamp bolts which attach the PT4.95 pressure tube to 36-40 pound-inches (4.1-4.5 newton-meters).

S 424-090-N00

(34) Install the deoiler outlet tube.
(a) Lubricate the new packing for the deoiler outlet tube with oil.
(b) Install the new packing into the groove on the front flange of the deoiler outlet tube.
(c) Install the forward end of the deoiler outlet tube to the gearbox pad and the rear flange to the boss on the exhaust case.
(d) Put the bracket over the front tube flange.
(e) Lubricate the threads of the bolts, which attach the bracket to the front tube flange, with oil.
(f) Attach the bracket and the front tube flange to the gearbox with the bolts.
1) Tighten the bolts to 85-95 pound-inches (9.6-10.7 newton-meters).
(g) Install lockwire on the bolts.
(h) Lubricate the threads of the bolt, which attaches the tube clamp to the bracket at Flange M, with oil.
(i) Install the tube clamp to the bracket at Flange M with the bolt and nut.
1) Tighten the bolt to 36-40 pound-inches (4.1-4.5 newton-meters).
(j) Lubricate the threads of the bolt, which attaches the deoiler outlet tube to the adjacent tube, with oil.
(k) Install the tube clamp to the adjacent tube with the bolt and nut.
1) Tighten the bolt to 36-40 pound-inches (4.1-4.5 newton-meters).

S 424-091-N00

(35) Install the oil vent tube of the No. 3 bearing.
(a) Remove protective caps from the tube fittings.

(b) Lubricate the tube nuts of the oil vent tube with lubricant.
(c) Put the aft end of the oil vent tube to the exhaust case adapter.
(d) Put the forward end of the oil vent tube to the adapter aft of Flange M.
(e) Tighten the tube nuts for the oil vent tube with your hand.
(f) Lubricate the threads of the bolt, which attaches the oil vent tube to the bracket location on Flange N, with oil.
(g) Install the tube clamp to the bracket location on Flange N with the bolt and nut.
1) Tighten the bolt with your hand.
(h) Lubricate the threads of the bolts, which attach the tube clamps to the brackets on Flange P, with oil.
(i) Install the tube clamps to the brackets on Flange P with bolts and nuts.
1) Tighten the bolts with your hand.
(j) Install the tube clamps to the oil vent tube at approximately the 7:30 o'clock position.
(k) Lubricate the threads of the bolt, which attaches the tube clamp of the oil vent tube, with oil.
(l) Attach the tube clamp to the adjacent PT4.95 tube assembly rearward of Flange P with the bolt and nut.
1) Tighten the bolt with your hand.
(m) Lubricate the threads of the bolt, which attaches the tube clamps to the oil vent tube and the PT4.95 pressure tube, with oil.
(n) Install the tube clamps of the oil vent tube and the PT4.95 pressure tube in the middle of Flanges P and N with the bolt and nut.
1) Tighten the bolt with your hand.
(o) Tighten all bolts, which attach the tube clamps, to 36-40 pound-inches (4.1-4.5 newton-meters).
(p) Tighten the tube nuts on the oil vent tube to 200-225 pound-inches (22.5-25.4 newton-meters).
(q) Safety the tube nuts with lockwire or safety cable and safety cable ferrule.

S 424-092-N00

(36) ENGINES PRE-PW-SB 79-76;
Install the No. 4 bearing scavenge tube.
(a) Put the No. 4 bearing scavenge tube inboard of the deoiler outlet tube and LPT bridge brackets.

(b) Lubricate the tube elbow threads with lubricant.
(c) Attach the tube elbow to the tube nut on the exhaust case.
    1) Tighten the tube nut with your hand.
(d) Lubricate the tube adapter threads with lubricant.
(e) Attach the tube adapter to the tube nut at Flange M.
    1) Tighten the tube nut with your hand.
(f) Lubricate the threads of the bolt, which attaches the tube clamp to the bracket location on Flange P, with oil.
(g) Install the tube clamp to the bracket location on Flange P with the bolt and nut.
    1) Tighten the bolt with your hand.
(h) Lubricate the threads of the bolt, which attaches the tube clamp to the bracket location on Flange N, with oil.
(i) Install the tube clamp to the bracket location on Flange N with the bolt and nut.
    1) Tighten the bolt with your hand.
(j) Tighten the bolts, which attach the tube clamps on the No. 4 bearing scavenge tube, to 36-40 pound-inches (4.1-4.5 newton-meters).
(k) Tighten the tube nut at the exhaust case to 200-225 pound-inches (22.6-25.4 newton-meters).
(l) Safety the tube nut on the exhaust case with lockwire or safety cable and safety cable ferrule.
(m) Tighten the tube nut at the Flange M location to 475-525 pound-inches (53.7-59.3 newton-meters).
(n) Safety the tube nut at the Flange M location with lockwire or safety cable and safety cable ferrule.
(o) Do the steps that follow to install the spray shield:
    1) Put the spray shield to the inboard side of the No. 4 bearing scavenge tube at the tube nut on Flange M.
    2) Attach the forward end of the spray shield with a clamp.
    3) Tighten the clamp to 15-18 pound-inches (1.7-2.0 newton-meters).
    4) Lubricate the threads of the bolt, which attaches the tube clamp on the spray shield to the bracket on Flange M, with oil.
    5) Attach the tube clamp to the Flange M bracket with the bolt and nut.
    6) Tighten the bolt to 36-40 pound-inches (4.1-4.5 newton-meters).

S 424-067-N00

(37) ENGINES POST-PW-SB 79-76;
Install the No. 4 bearing scavenge tube (Fig. 402).
(a) Put the upper section of the No. 4 bearing scavenge in position.
(b) Lubricate the tube elbow threads with lubricant.
(c) Attach the tube elbow to the tube nut on the exhaust case.
1) Tighten the tube nut with your hand.
(d) Put the lower/forward section of the No. 4 bearing scavenge tube inboard of the deoiler outlet tube and LPT bridge brackets.
(e) Lubricate the tube adapter threads with lubricant.
(f) Attach the tube adapter to the tube nut at Flange M.
1) Tighten the tube nut with your hand.
(g) Connect the upper and lower sections of the No. 4 bearing scavange tube at the bracket attached to Flange N.
1) Tighten the tube nut with your hand.
(h) Tighten the bolts, which attach the tube clamps on the No. 4 bearing scavenge tube, to 36-40 pound-inches (4.1-4.5 newton-meters).
(i) Tighten the tube nut at the exhaust case to 200-225 pound-inches (22.6-25.4 newton-meters).
(j) Safety the tube nut at the exhaust case with lockwire or safety cable and safety cable ferrule.
(k) Tighten the tube nuts at the Flanges M and N location to 475-525 pound-inches (53.7-59.3 newton-meters).
(l) Safety the tube nuts at the Flanges M and N location with lockwire or safety cable and safety cable ferrule.
(m) Do the steps that follow to install the spray shield:
1) Put the spray shield to the inboard side of the No. 4 bearing scavenge tube at the tube nut on Flange N.
2) Attach the upper end of the spray shield with a clamp.
3) Tighten the clamp to 15-18 pound-inches (1.7-2.0 newton-meters).
4) Lubricate the threads of the bolt, which attaches the tube clamp on the spray shield to the bracket on Flange N, with oil.
5) Attach the tube clamp to the Flange N bracket with the bolt and nut.
6) Tighten the bolt to 36-40 pound-inches (4.1-4.5 newton-meters).

S 424-094-N00

(38) ENGINES PRE-PW-SB 79-75 AND PRE-PW-SB 79-76;
Install the oil pressure tube of the No. 4 bearing.
(a) Remove protective caps from the tube fittings.

(b) Lubricate the tube nut threads of the center piece of the oil pressure tube with anti-seize paste.
(c) Attach the center piece of the oil pressure tube with the tube nuts.
    1) Tighten the tube nut with your hand.
(d) Lubricate the threads of the bolt, which attaches the tube clamp to the No. 4 bearing scavenge tube, with oil.
(e) Install the tube clamp on the oil pressure tube to the No. 4 bearing scavenge tube with the bolt and nut.
(f) Lubricate the threads of the bolts, which attaches the tube clamps to the brackets on Flanges M, N and P, with oil.
(g) Install the tube clamps on the oil pressure tube to the brackets on Flanges M, N and P with the bolts and nuts.
(h) Tighten all bolts, which attach the tube clamps on the oil pressure tube, with your hand.
(i) Tighten all bolts to 36-40 pound-inches (4.1-4.5 newton-meters).
(j) Tighten all tube nuts for the oil pressure tube to 450-500 pound-inches (50.8-56.5 newton-meters).
(k) Install the spray shield between the engine case and tube nut on the oil pressure tube aft of Flange P with clamps.
(l) Tighten the tube nuts on the oil pressure tube to 450-500 pound-inches (50.8-56.5 newton-meters).
(m) Safety the tube nuts with lockwire or safety cable and safety cable ferrule.
(n) ENGINES PRE-PW-SB 79-54;
    Attach the spray shield to the inboard side of the forward tube connection with the steps that follow:
    1) Install the spray shield to the forward tube connection with the clamps.
    2) Attach the rear of the spray shield with a hose clamp.
    3) Tighten the hose clamp to 15-18 pound-inches (1.7-2.0 newton-meters).
(o) ENGINES POST-PW-SB 79-54;
    Attach the spray shield to the inboard side of the forward tube connection with the steps that follow:
    1) Install the spray shield to the inboard side of the forward tube connection to the front of the flange M.

2) Lubricate the threads of the bolt, which attaches the clamp, with engine oil.
3) Attach the forward end of the spray shield to the bracket on the diffuser case with a clamp and bolt.
4) Tighten the bolt for the clamp to 36-40 pound-inches (4.1-4.5 newton-meters).
5) Attach the rear end of the spray shield with a hose clamp.
6) Tighten the hose clamp to 15-18 pound-inches (1.7-2.0 newton-meters).

(p) ENGINES POST-PW-SB 79-75 AND POST-PW-SB 79-76;
Install the oil pressure tube of the No. 4 bearing (Fig. 402).
(q) Install new packing in the groove in the No. 4 bearing strainer element (lubricate with engine oil).
(r) Install the strainer element in the No. 4 bearing element housing (lubricate with engine oil).
1) Tighten the strainer element with your hand.
(s) Install the strainer housing on the engine case tube nut aft of Flange P.
(t) Remove the protective caps from both the upper and lower sections of the tube.
(u) Lubricate the tube nut threads of the upper and lower sections of the oil pressure tube with anti-seize paste.
(v) Put the lower section of the oil pressure tube in position, behind the 2 center LPT Bridge Brackets.
(w) Put the upper section of the oil pressure tube in position.
(x) Connect the two sections of the oil pressure tube with the tube nut.
1) Tighten the tube nut with your hand.
(y) Connect the upper section of the oil pressure tube to the tube nut forward of Flange M.
1) Tighten the tube nut with your hand.
(z) Connect the the lower oil pressure tube to the oil strainer housing on the engine case, aft of Flange P.
1) Tighten the tube nut with your hand.
(aa) Lubricate the threads of the bolt, which attaches the tube clamp to the bracket forward of Flange M with oil.
(ab) Install the tube clamp on the oil pressure tube.

(ac) Tighten the bolt, which attaches the tube clamp on the oil pressure tube, with your hand.
(ad) Tighten the bolt to 27-30 pound-inches (3.6-3.4 newton-meters).
(ae) Use engine oil to lubricate the threads of the bolts, which attach the tube clamps to the brackets on Flanges M and N.
(af) Install the tube clamps on the oil pressure tube to the brackets on Flanges M, N, P and on the lower LPT bridge bracket with the bolts and nuts.
(ag) Tighten all bolts, which attach the tube clamps on the oil pressure tube, with your hand.
(ah) Tighten all bolts to 36-40 pound-inches (4.1-4.5 newton-meters).
(ai) Tighten the strainer to the strainer housing to 150-170 pound-inches (16.9-19.2 newton-meters).
(aj) Safety the strainer with lockwire or safety cable and safety cable ferrule.
(ak) Tighten the strainer housing to the tube nut on the engine case to 270-300 pound-inches (30.5-33.9 newton-meters).
(al) Safety the strainer housing and the tube nut with lockwire or safety cable and safety cable ferrule.
(am) Tighten all tube nuts for the oil pressure tube to 340-375 pound-inches (38.4-42.4 newton-meters).
(an) Safety the tube nuts with lockwire or safety cable and safety cable ferrule.
(ao) Install the spray shield between the strainer housing, on the engine case and tube nut on the oil pressure tube with clamps (aft of Flange P).
    1) Tighten the hose clamp to 15-18 pound-inches (1.7-2.0 newton-meters).
(ap) Use clamps to install the spray shield, on the inboard side of the tube nut between the upper and lower sections of the oil pressure tube (aft of Flange N).
    1) Tighten the hose clamp to 15-18 pound-inches (1.7-2.0 newton-meters).
(aq) ENGINES PRE-PW-SB 79-54;
Attach the spray shield to the inboard side of the forward tube connection with the steps that follow:
    1) Install the spray shield to the forward tube connection with the clamps.
    2) Attach the rear of the spray shield with a hose clamp.
    3) Tighten the hose clamp to 15-18 pound-inches (1.7-2.0 newton-meters).
(ar) ENGINES POST-PW-SB 79-54;
Attach the spray shield to the inboard side of the forward tube connection with the steps that follow:

1) Install the spray shield to the inboard side of the forward tube connection to the front of the flange M.
2) Lubricate the threads of the bolt, which attaches the clamp, with engine oil.
3) Attach the forward end of the spray shield to the bracket on the diffuser case with a clamp and bolt.
4) Tighten the bolt for the clamp to 36-40 pound-inches (4.1-4.5 newton-meters).
5) Attach the rear end of the spray shield with a hose clamp.
6) Tighten the hose clamp to 15-18 pound-inches (1.7-2.0 newton-meters).

F. Return the Aircraft to Its Usual Condition.

S 414-052-N00
(1) Close the core cowl panels (AMM 71-11-06/201).

S 444-053-N00
(2) Do the activation procedure for the thrust reversers (AMM 78-31-00/201).

S 714-095-N00
(3) If the PT4.95 pressure tube was removed, do the test of the engine pressure ratio indicating system (AMM 77-11-01/501).

S 714-096-N00
(4) If the external oil tubes for the No.3 or No.4 bearing were removed, do the test for the external oil tubes that is shown in the Power Plant Test Reference Table (AMM 71-00-00/501).

S 714-055-N00
(5) Do the test of the TCC HPT manifolds that is shown in the Power Plant Test Reference Table (AMM 71-00-00/501).

TURBINE CASE COOLING (TCC) LPT COLLECTOR - REMOVAL/INSTALLATION

TASK 75-24-08-004-001-N00

1. Remove the TCC LPT Collector (Fig. 401)

A. References

(1) AMM 71-11-04/201, Fan Cowl Panels

(2) AMM 71-11-06/201, Core Cowl Panels

(3) AMM 78-31-00/201, Thrust Reverser System

B. Access

(1) Location Zones

411 Left Engine

421 Right Engine

(2) Access Panels

417AL Core Cowl (Left)

418AR Core Cowl (Right)

427AL Core Cowl (Left)

428AR Core Cowl (Right)

C. Prepare for Removal of the TCC LPT Collector

S 014-002-N00

(1) Open the fan cowl panels (AMM 71-11-04/201).

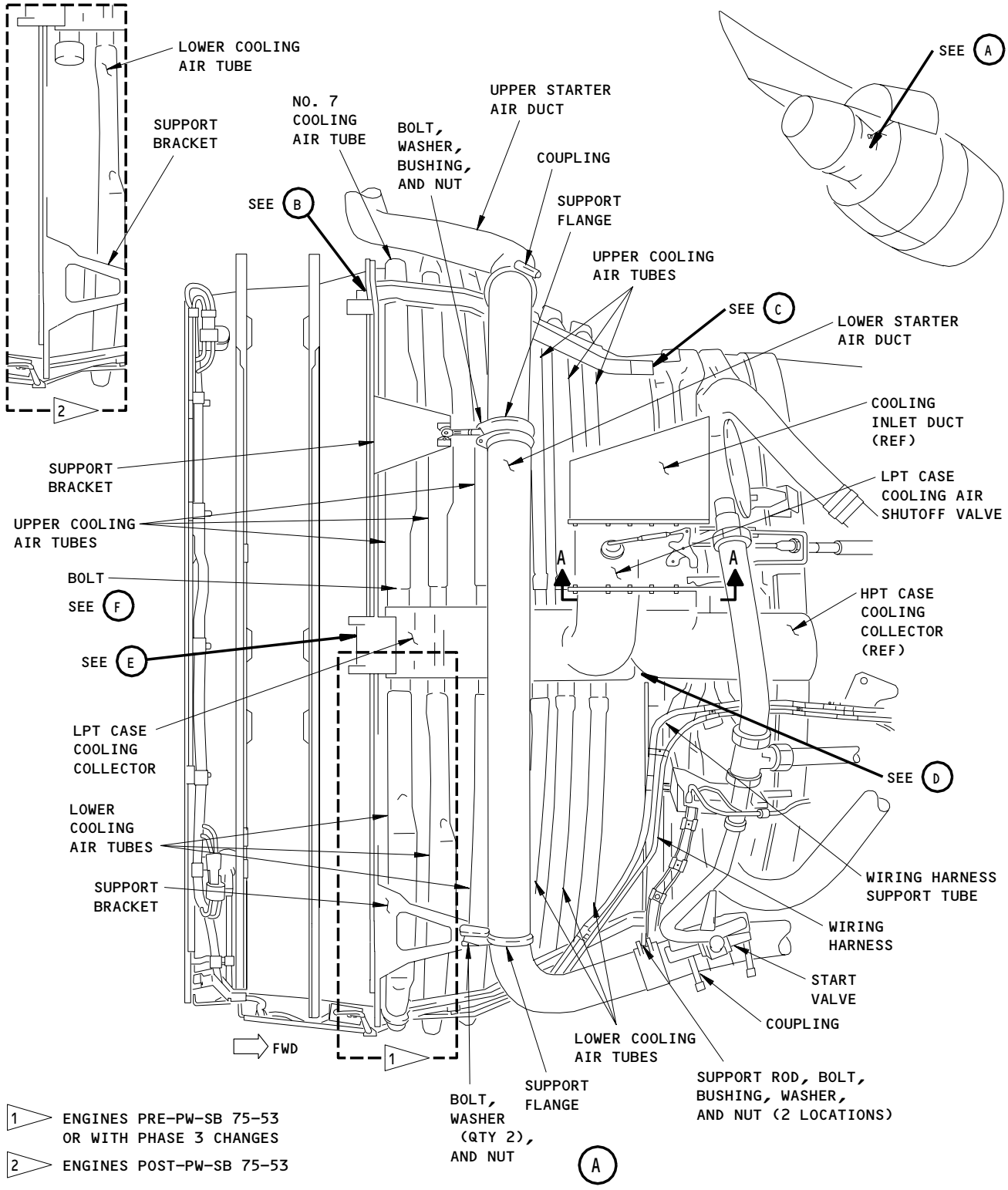
S 044-003-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO YOU OR DAMAGE TO EQUIPMENT.

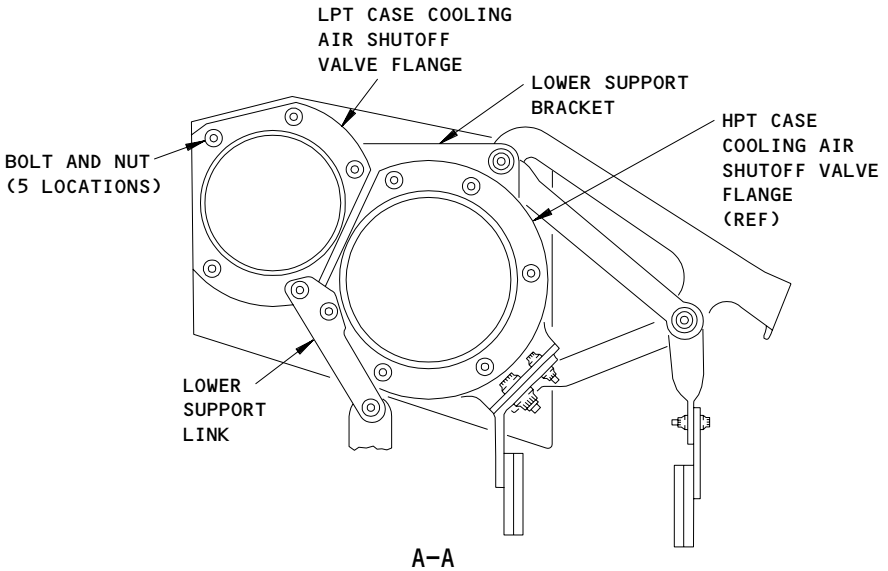
(2) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

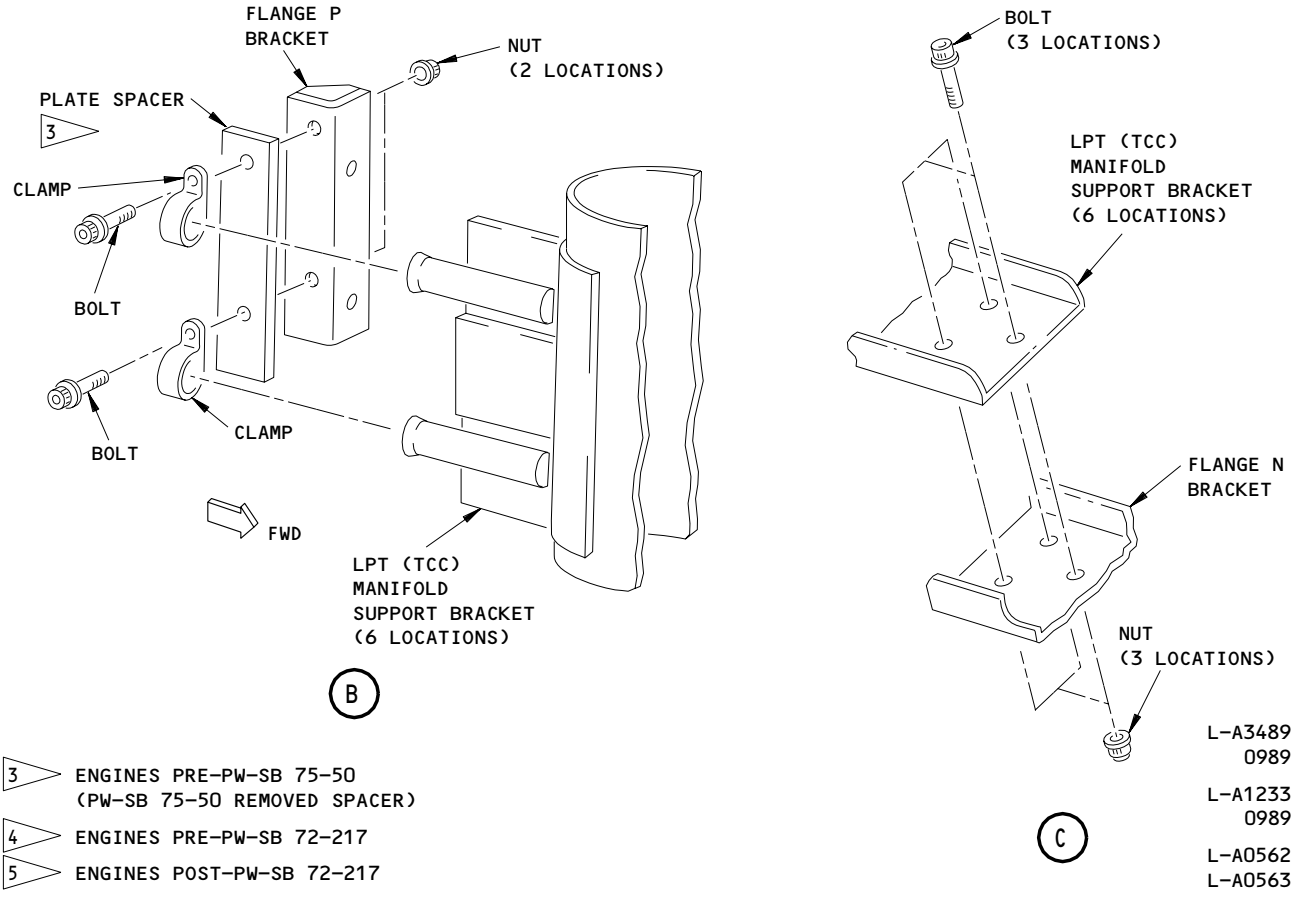
S 014-004-N00

(3) Open the core cowl panels (AMM 71-11-06/201).

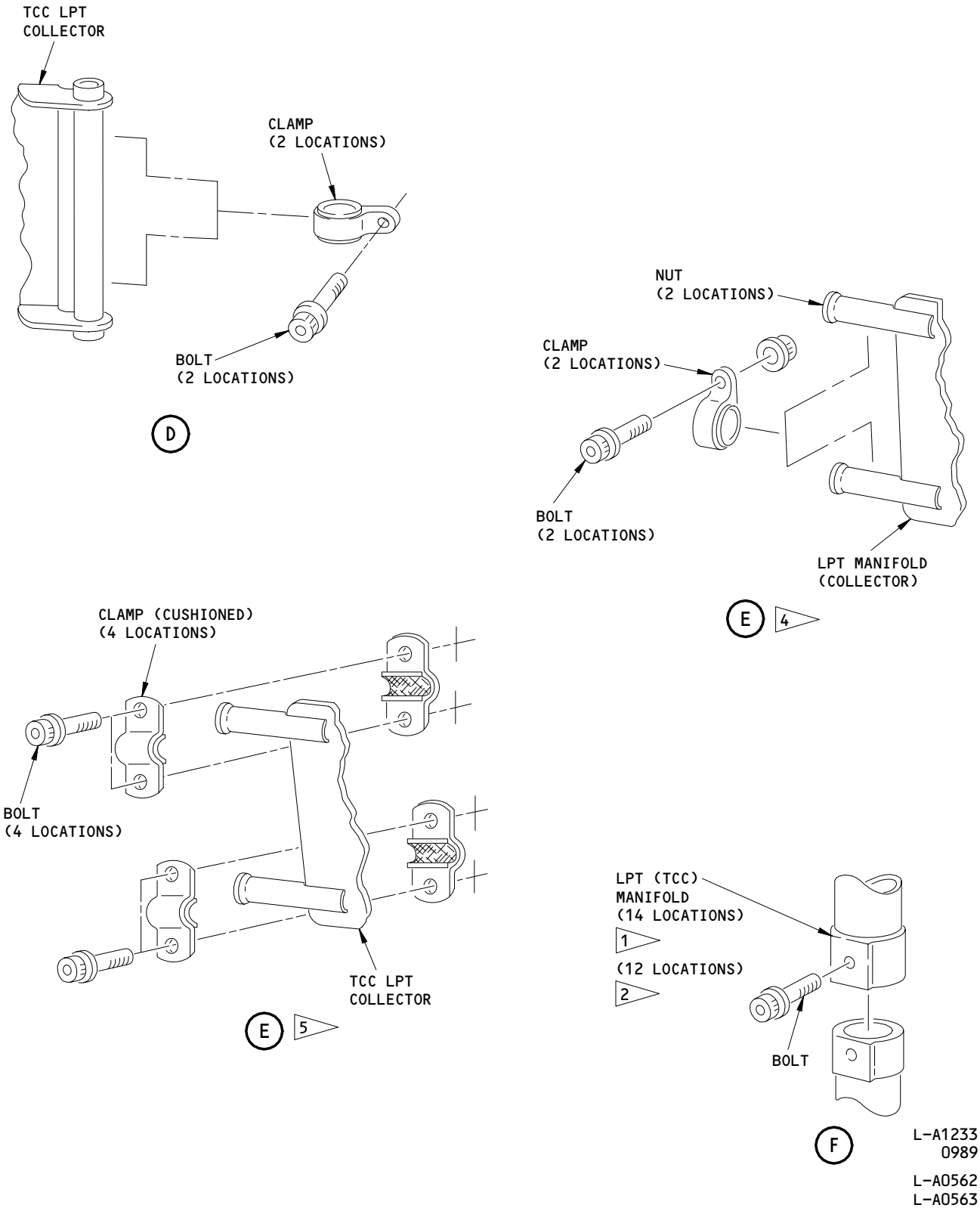


Turbine Case Cooling (TCC) LPT Collector Installation
Figure 401 (Sheet 1)





Turbine Case Cooling (TCC) LPT Collector Installation
Figure 401 (Sheet 2)



Turbine Case Cooling (TCC) LPT Collector Installation
Figure 401 (Sheet 3)

S 014-005-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSYRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT COULD OCCUR.

(4) Open the thrust reversers (AMM 78-31-00/201).

D. Remove the TCC LPT Collector (Fig. 401)

S 034-006-N00

(1) Remove the lower starter air duct.
   (a) Remove the coupling which attaches the lower starter air duct to the starter control valve.
   (b) Remove the coupling which attaches the lower starter air duct to the upper starter air duct.
   (c) Remove the bolts which attach the lower starter air duct to the support brackets aft of starter control valve.
   (d) Remove the bolts which attach the lower starter air duct to the triangular brackets.
   (e) Remove the lower starter air duct from the engine.

S 034-007-N00

(2) Remove the bolts which attach the LPT cooling air tubes to the TCC LPT collector.

S 034-039-N00

(3) ENGINES WITHOUT THE NO. 7 COOLING AIR TUBE;
Remove the bolts that attach the upper and lower cover assemblies from the rear of the TCC LPT collector.

S 024-053-N00

(4) Remove the bolts and nuts which attach the collector and lower support link to the support bracket and the shutoff valve flange for the LPT case cooing air (section A-A).

S 034-008-N00

(5) Remove the bolts which attach the clamps on the tube bracket to the rear mounts on Flange P.

S 034-009-N00

(6) Remove the bolts which attach the tube brackets to the brackets on Flange N.

S 034-010-N00

(7) Move the lower LPT cooling air tubes around the LPT case to disengage the lower LPT cooling air tubes from the TCC LPT collector.

S 034-011-N00
(8) Move the upper LPT cooling air tubes around the LPT case to disengage the upper LPT cooling air tubes from the TCC LPT collector.

S 034-041-N00
(9) ENGINES WITHOUT THE NO. 7 COOLING AIR TUBE;
Remove the upper and lower cover assemblies from the rear of the TCC LPT collector.

S 034-012-N00
(10) Remove the bolts which attach the TCC LPT collector to the lower flange of the LPT cooling air valve and support bracket.

S 034-013-N00
(11) Remove the bolts which attach the front mount clamps of the TCC LPT collector to the bracket on Flange N.

S 034-014-N00
(12) Remove the bolts which attach the rear TCC LPT collector clamps to the brackets on Flange P.

S 024-015-N00
(13) Remove the TCC LPT collector from the engine.

S 434-047-N00
(14) Install the protective covers, where necessary.

TASK 75-24-08-404-016-N00

2. Install the TCC LPT Collector (Fig. 401)

A. Consumable Materials
(1) D00137 Oil, PWA 521B

B. References
(1) AMM 71-00-00/501, Power Plant
(2) AMM 71-11-04/201, Fan Cowl Panels
(3) AMM 71-11-06/201, Core Cowl Panels
(4) AMM 78-31-00/201, Thrust Reverser System

C. Access
(1) Location Zones
411 Left Engine
421 Right Engine

(2) Access Panels
417AL Core Cowl (Left)
418AR Core Cowl (Right)
427AL Core Cowl (Left)
428AR Core Cowl (Right)

D. Procedure

S 034-048-N00
(1) Remove the protective covers.

S 644-017-N00
(2) Lubricate the threads of the bolts, which attach the TCC LPT collector, with oil.

S 424-018-N00
(3) Install the TCC LPT collector to the lower flange on the LPT cooling air valve and the support bracket with the bolts and nuts (View A-A).
(a) Tighten the bolts with your hand.

S 644-019-N00
(4) Lubricate the threads of the bolts, which attach the front mount clamps, with oil.

S 434-020-N00
(5) Attach the front mount clamps on the TCC LPT collector to the bracket on Flange N with the bolts.
(a) Tighten the bolts with your hand.

S 644-021-N00
(6) Lubricate the threads of the bolts, which attach the rear mount clamps, with oil.

S 434-022-N00
(7) Attach the rear mount clamps on the TCC LPT collector to the brackets on Flange P with the bolts and nuts.
(a) Tighten the bolts with your hand.

S 434-023-N00
(8) Move the lower LPT cooling air tubes around the LPT case to engage the ends with the TCC LPT collector.

S 644-024-N00
(9) Lubricate the threads of the bolts, which attach the LPT cooling air tubes, with oil.

S 434-025-N00
(10) Attach the lower LPT cooling air tubes with the bolts.
(a) Tighten the bolts with your hand.

S 434-026-N00
(11) Move the upper LPT cooling air tubes around the LPT case to engage the ends with the TCC LPT collector.

S 434-043-N00
(12) ENGINES WITHOUT THE NO.7 COOLING AIR TUBE;
Do the steps that follow:
(a) Install the upper and lower cover assemblies from the rear tube (No. 7 cooling air tube) of the TCC LPT collector tubes.
(b) Lubricate the threads of the bolts, which attach the cover assemblies, with engine oil.
(c) Attach the cover assemblies to the TCC LPT collector with the bolts.
(d) Tighten the bolts with your hand.

S 644-027-N00
(13) Lubricate the threads of the bolts, which attach the LPT cooling air tubes, with oil.

S 434-028-N00
(14) Attach the upper LPT cooling air tubes with the bolts.
(a) Tighten the bolts with your hand.

S 644-029-N00
(15) Lubricate the threads of the bolts, which attach the tube brackets to Flange N, with oil.

S 434-030-N00
(16) Attach the tube brackets to the brackets on Flange N with the bolts and nuts.
(a) Tighten the bolts with your hand.

S 644-031-N00
(17) Lubricate the threads of the bolts, which attach the tube brackets to Flange P, with oil.

S 424-049-N00
(18) ENGINES PRE-PW-SB 75-50;
Attach the clamps on the tube bracket to the Flange P brackets with the bolts, nuts, and spacers.

S 424-050-N00
(19) ENGINES POST-PW-SB 75-50;
Attach the clamps on the tube bracket to the Flange P brackets with the bolts and nuts.
(a) Tighten the bolts with your hand.

S 424-052-N00
(20) Tighten the bolts in the sequence that follows:
(a) Tighten the bolts, which attach the TCC LPT collector to the lower flange of the LPT cooling air valve, to 85-95 pound-inches (9.6-10.7 newton-meters).
(b) Tighten the bolts, which attach the front mount clamps to the bracket on Flange N, to 36-40 pound-inches (4.1-4.5 newton-meters).
(c) Tighten the bolts, which attach the rear mount clamps to the brackets on Flange P, to 36-40 pound-inches (4.1-4.5 newton-meters).
(d) Tighten the bolts, which attach the LPT cooling air tubes to the TCC LPT collector, to 36-40 pound-inches (4.1-4.5 newton-meters).
(e) ENGINES WITHOUT THE NO. 7 COOLING AIR TUBE;
Tighten the bolts, which attach the cover assemblies, to 36-40 pound-inches (4.1-4.5 newton-meters).
(f) Tighten the bolts, which attach the tube brackets to the Flange N brackets, to 36-40 pound-inches (4.1-4.5 newton-meters).
(g) Tighten the bolts, which attach the tube brackets to the Flange P brackets, to 36-40 pound-inches (4.1-4.5 newton-meters).
(h) Tighten the bolt, which attaches the clamp at approximately the 12 o'clock position to the rear mounts on Flange P, to 36-40 pound-inches (4.1-4.5 newton-meters).

S 434-034-N00

(21) Install the lower starter air duct.

(a) Lubricate the threads of the bolts, which attach the lower starter air duct to the triangular brackets, with oil.

(b) Attach the lower starter air duct to the engine case at the triangular brackets with the bolts, nuts, and washers. Tighten the bolts with your hand.

(c) Atach the lower starter air duct to the upper starter air duct with the coupling. Tighten the coupling to 100-115 pound-inches (11.3-13.0 newton-meters).

(d) Attach the lower starter air duct to the starter control valve with the coupling. Tighten the coupling to 100-115 pound-inches (11.3-13.0 newton-meters).

(e) Attach the lower starter air duct to the support brackets aft of the starter control valve with the bolts, nuts, and washer. Tighten the bolts to 50-75 pound-inches (5.6-8.5 newton-meters).

(f) Tighten the bolts, which attach the lower starter air duct to the triangular brackets, to 50-75 pound-inches (5.6-8.5 newton-meters).

E. Put the airplane back to its initial condition.

S 414-035-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT COULD OCCUR.

(1) Close the thrust reversers (AMM 78-31-00/201).

S 414-036-N00

(2) Close the core cowl panels (AMM 71-11-06/201).

S 444-037-N00

(3) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

S 414-055-N00
(4) Close the fan cowl panels (AMM 71-11-04/201).

S 714-038-N00
(5) Do the test of the TCC LPT Collector that is shown in the Power Plant Test Reference Table (AMM 71-00-00/501).

TURBINE CASE COOLING (TCC) LPT MANIFOLDS - REMOVAL/INSTALLATION

TASK 75-24-09-004-001-N00

1. Remove the TCC LPT Manifolds

A. References

(1) AMM 71-11-06/201, Core Cowl Panels

(2) AMM 78-31-00/201, Thrust Reverser System

B. Access

(1) Location Zones

411 Left Engine

421 Right Engine

(2) Access Panels

417AL Core Cowl (Left), Left Engine

418AR Core Cowl (Right), Left Engine

427AL Core Cowl (Left), Right Engine

428AR Core Cowl (Right), Right Engine

C. Prepare to Remove the TCC LPT Manifolds

S 044-003-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(1) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 014-004-N00

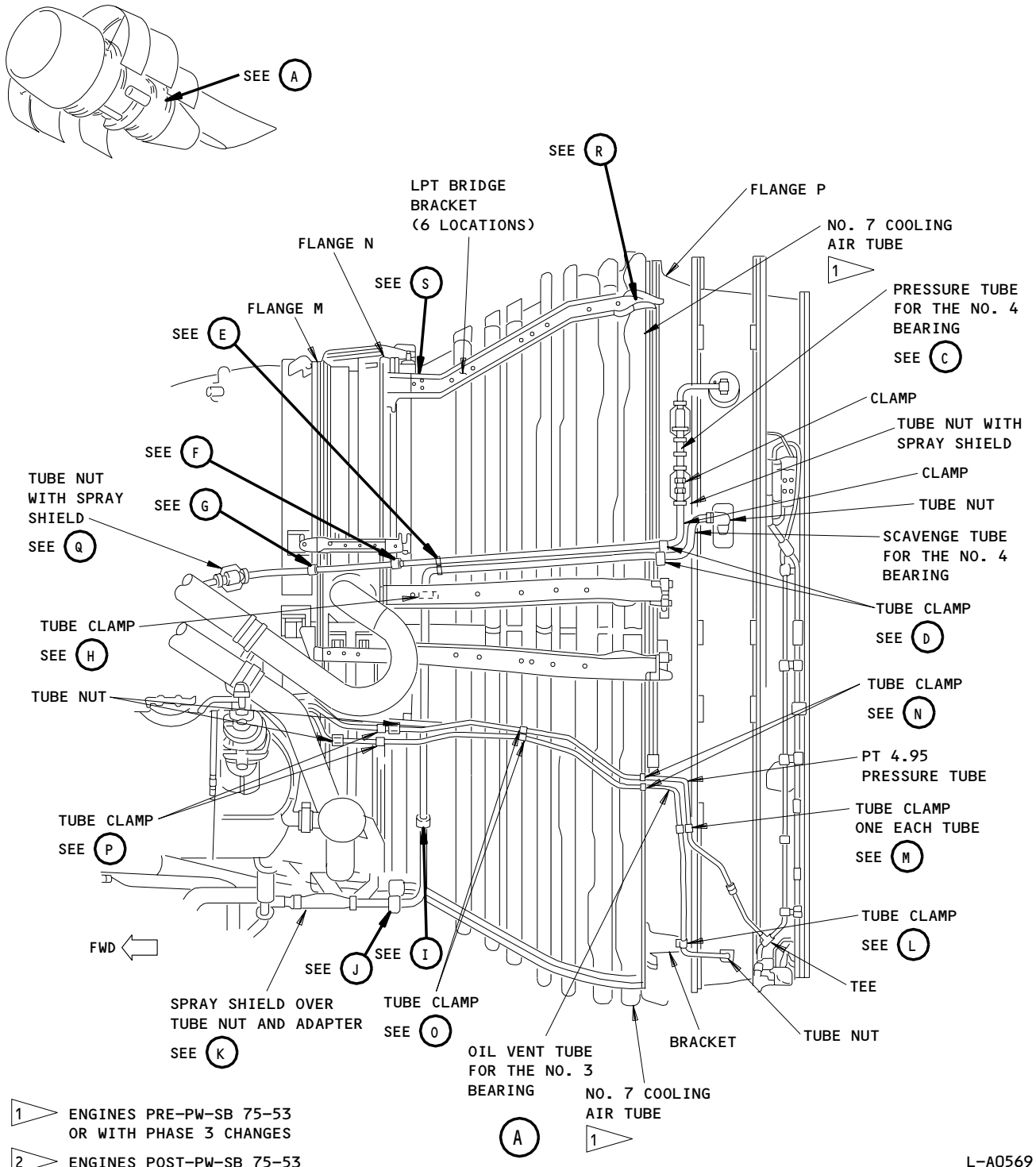
(2) Open the core cowl panels (AMM 71-11-06/201).

D. Remove the TCC LPT Manifolds (Fig. 401)

S 014-057-N00

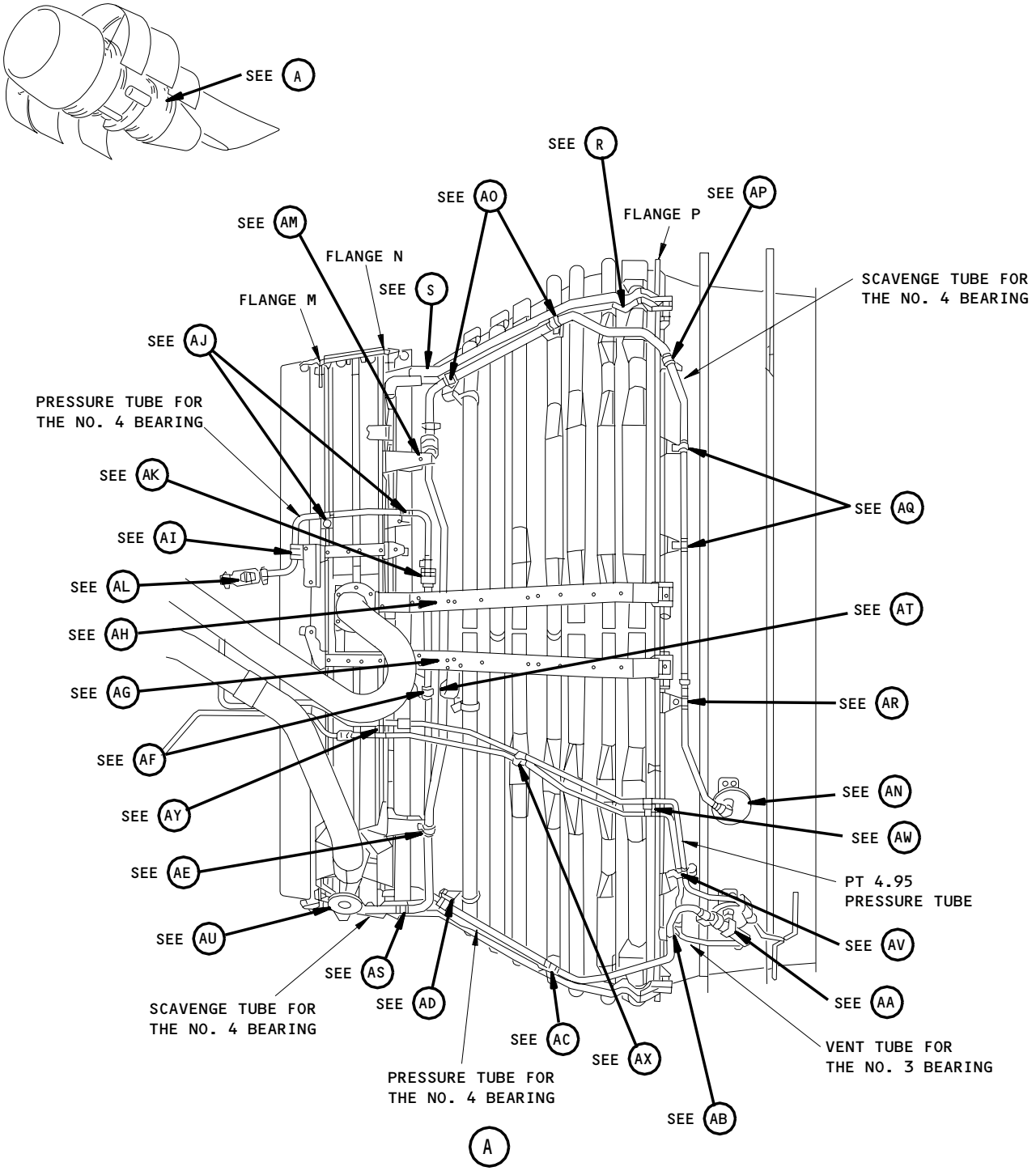
(1) ENGINES PRE-PW-SB 79-76;
Remove the oil pressure tube of the No. 4 bearing:

(a) Remove the clamps which attach the spray shield at the tube nut forward of Flange M.



ENGINES PRE-PW-SB 79-76

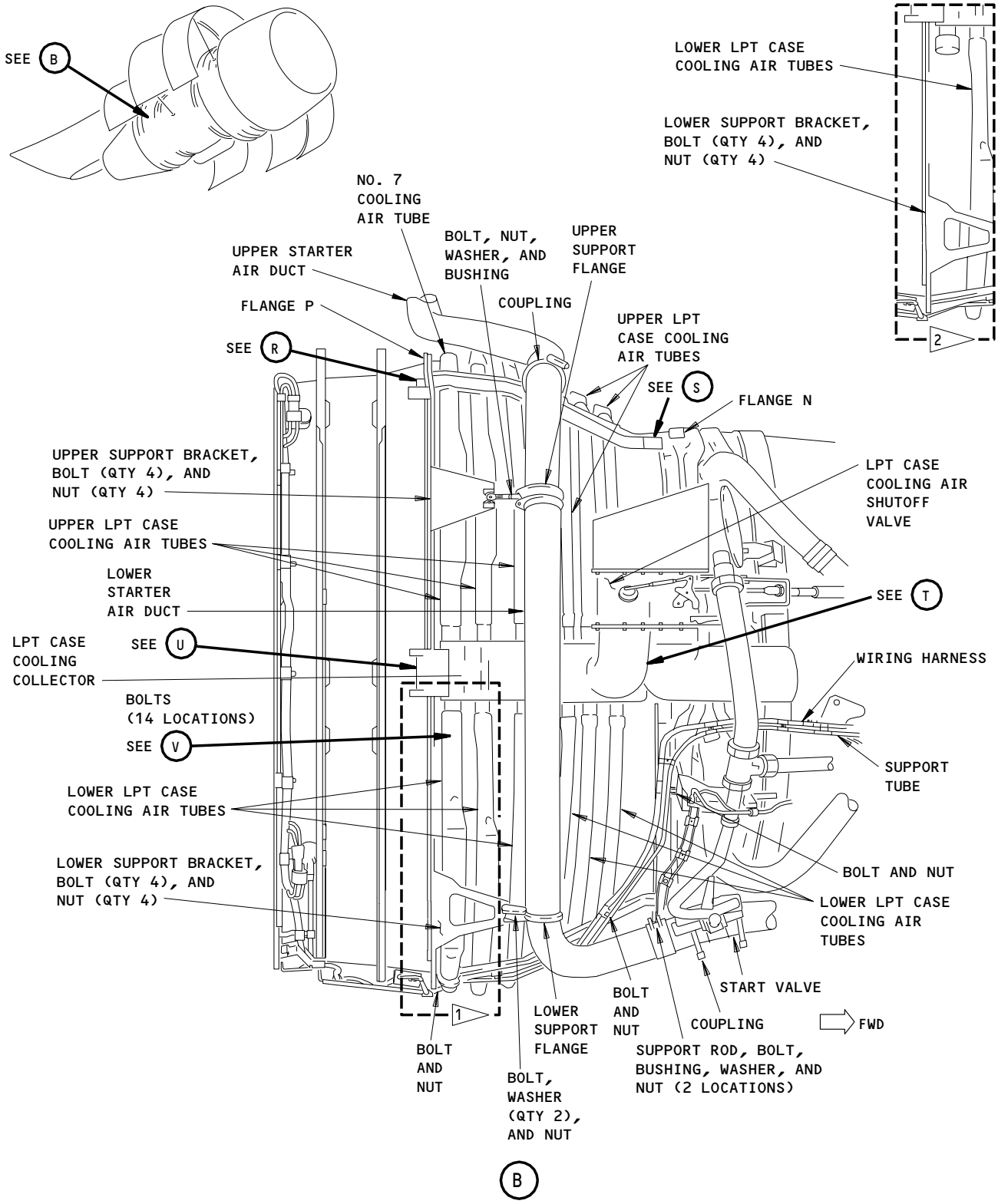
Turbine Case Cooling (TCC) LPT Manifold Installation
Figure 401 (Sheet 1)



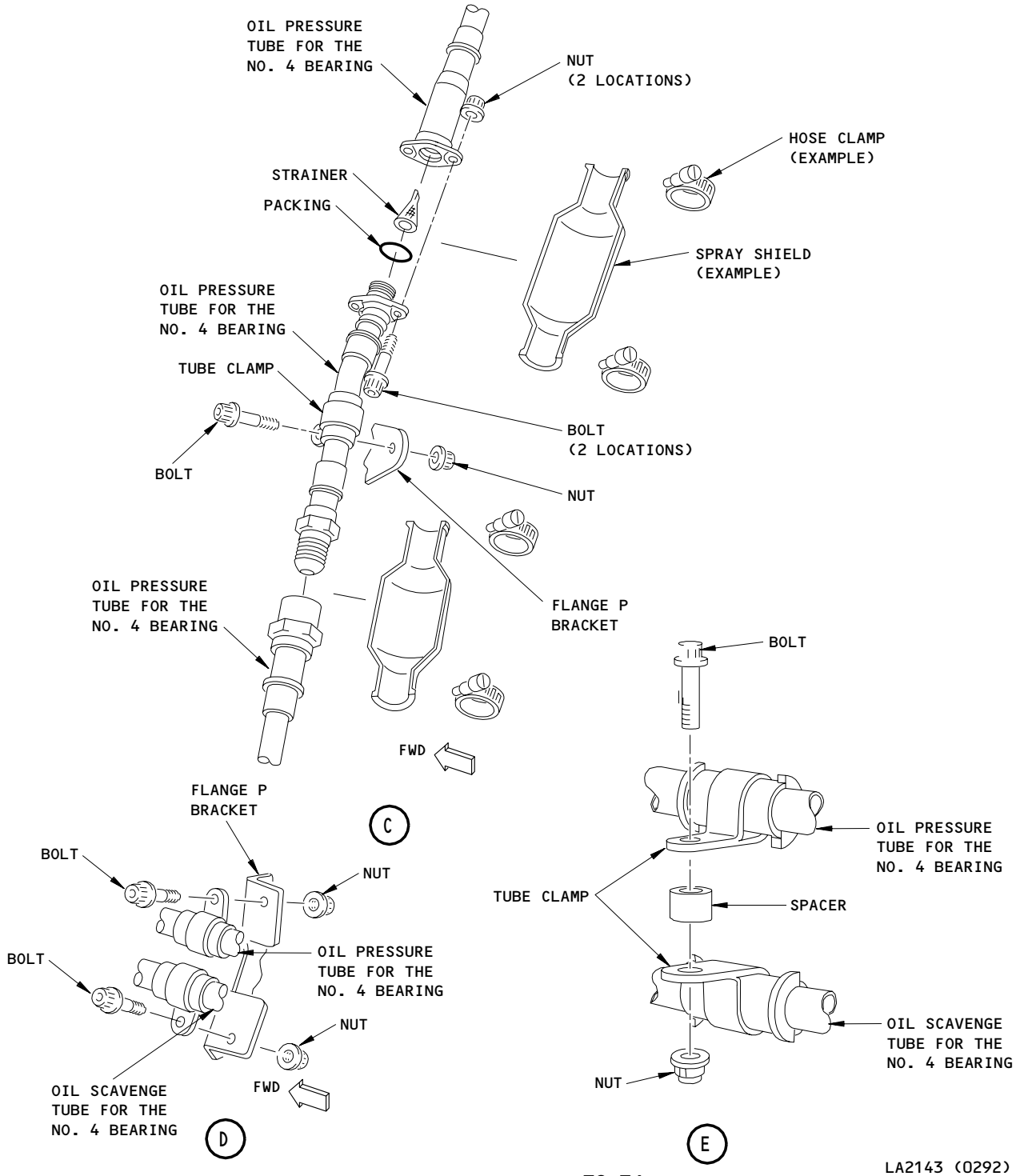
ENGINES POST-PW-SB 79-76

L-B2781 (0000)

Turbine Case Cooling (TCC) LPT Manifold Installation
Figure 401 (Sheet 2)



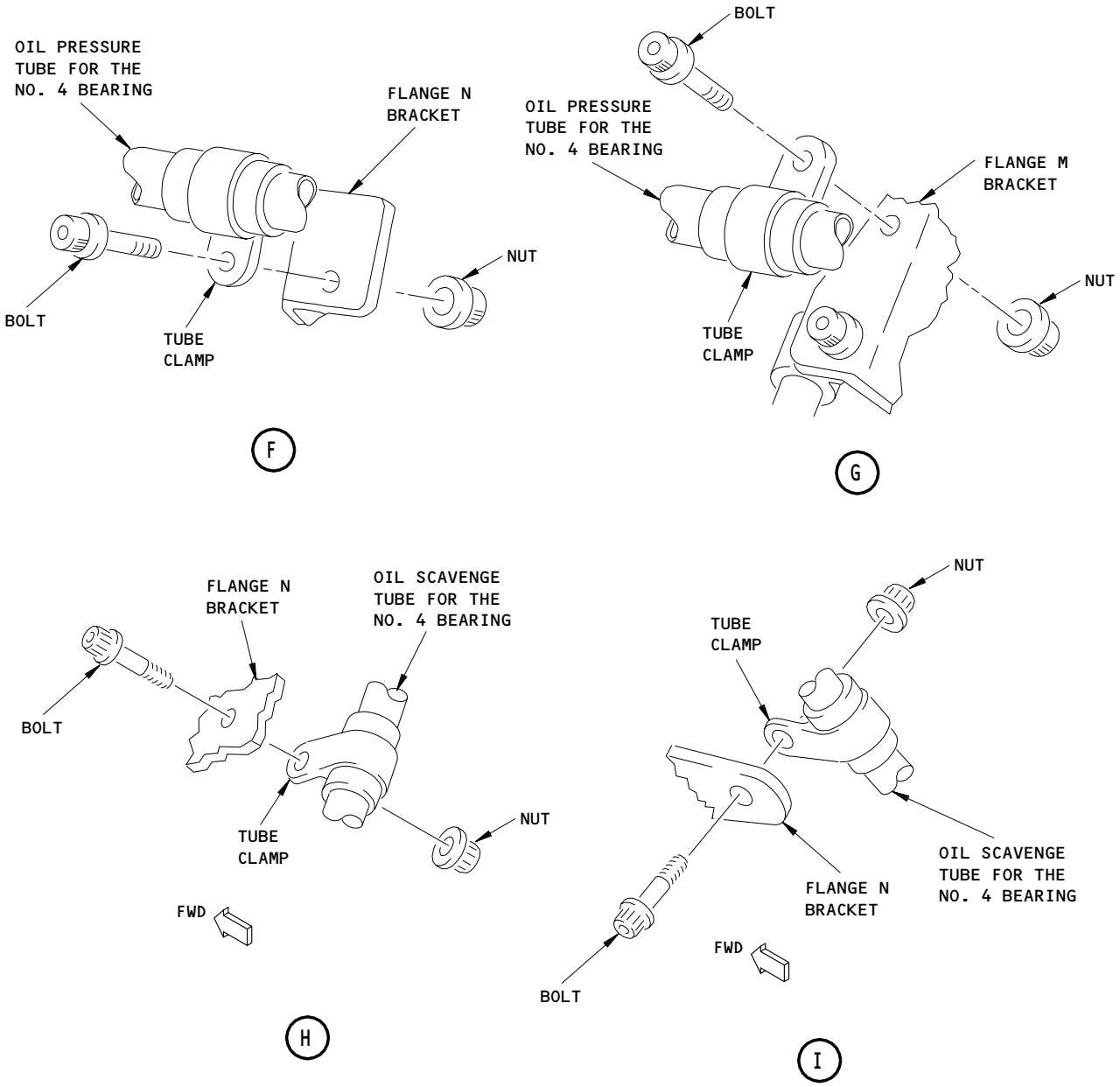
Turbine Case Cooling (TCC) LPT Manifold Installation
Figure 401 (Sheet 3)



ENGINES PRE-PW-SB 79-76

LA2143 (0292)
L-A4352
0688

Turbine Case Cooling (TCC) LPT Manifold Installation
Figure 401 (Sheet 4)

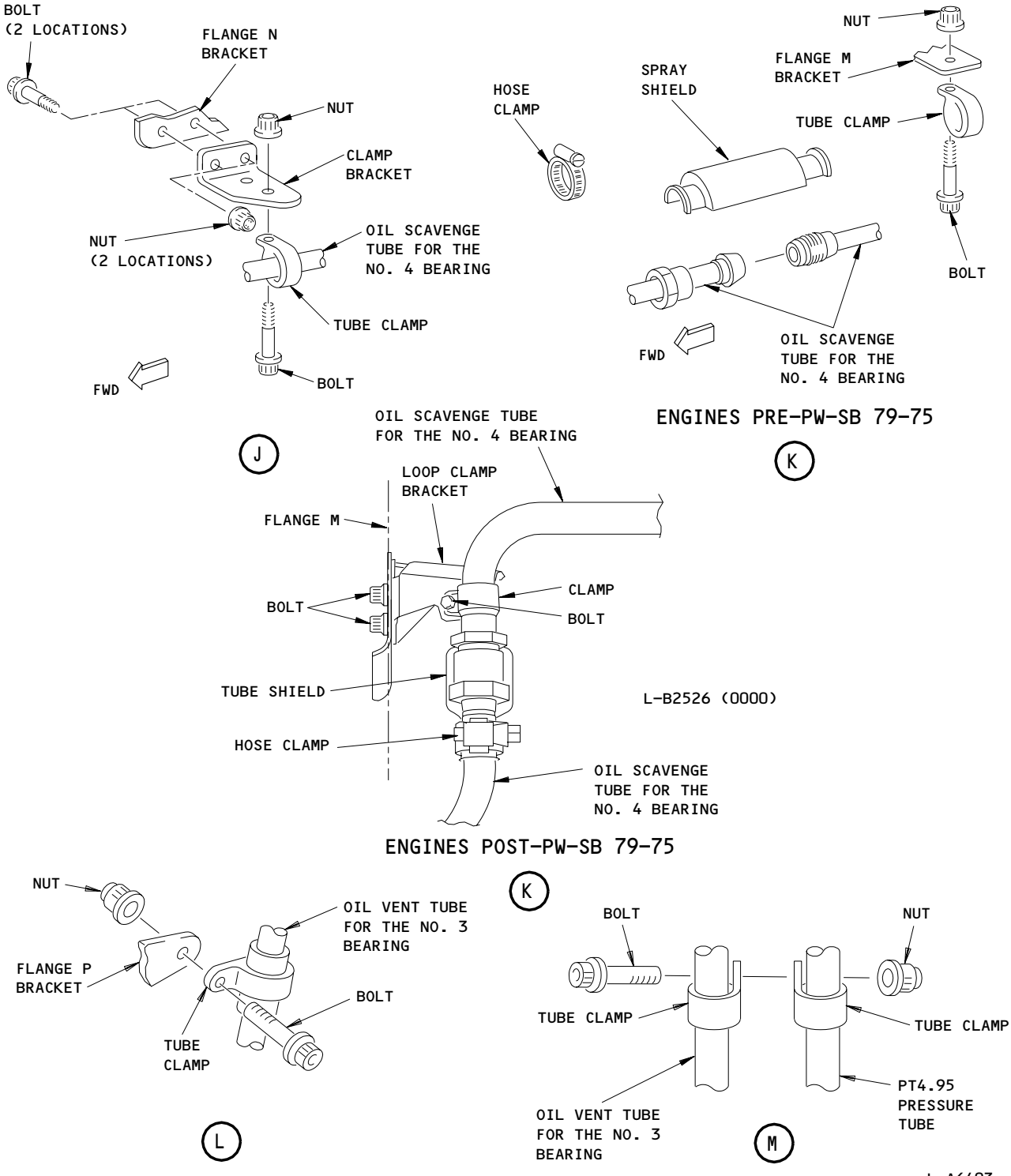


L-A4352
0688

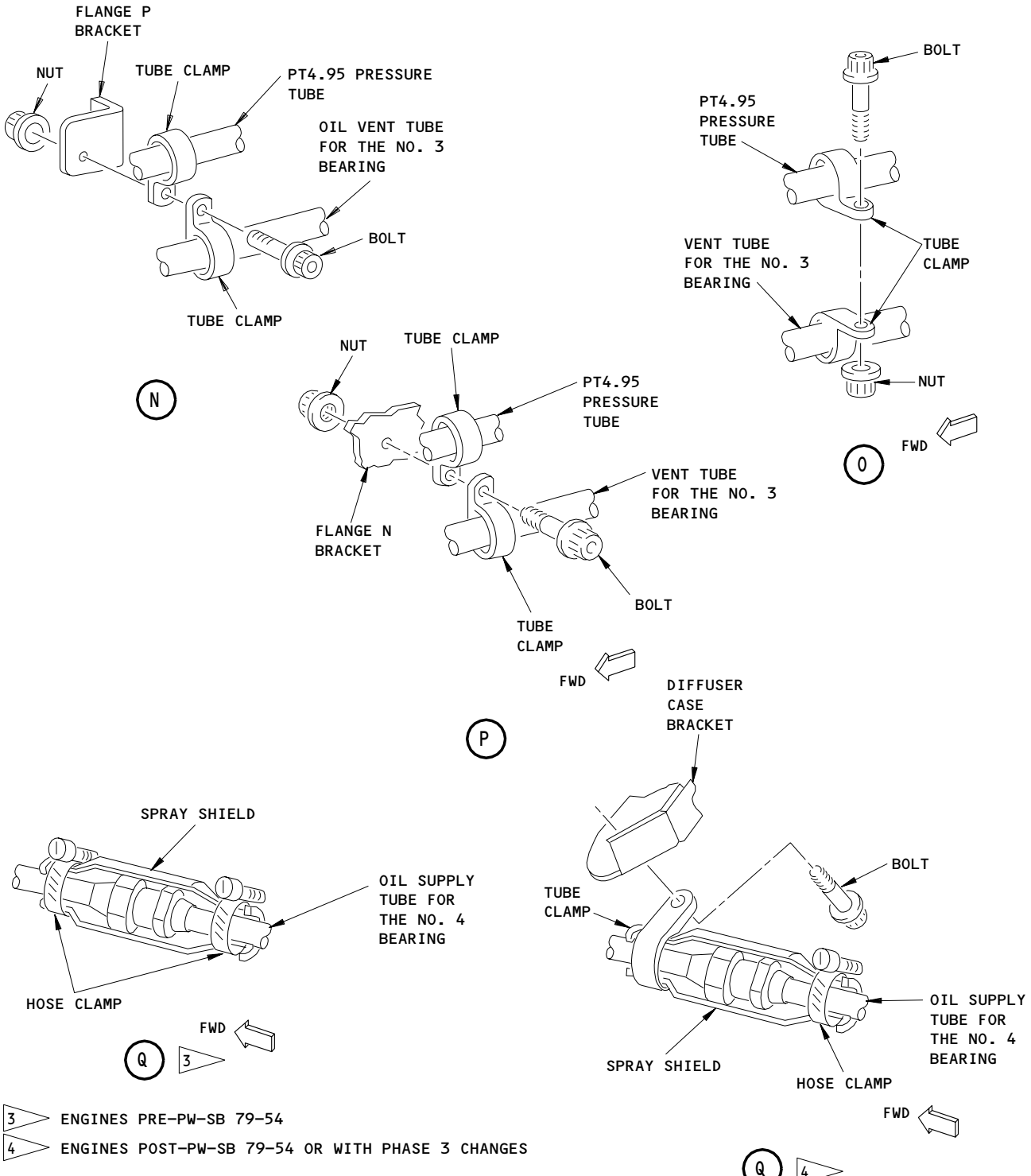
ENGINES PRE-PW-SB 79-76

L-A4358 (1289)

Turbine Case Cooling (TCC) LPT Manifold Installation
Figure 401 (Sheet 5)



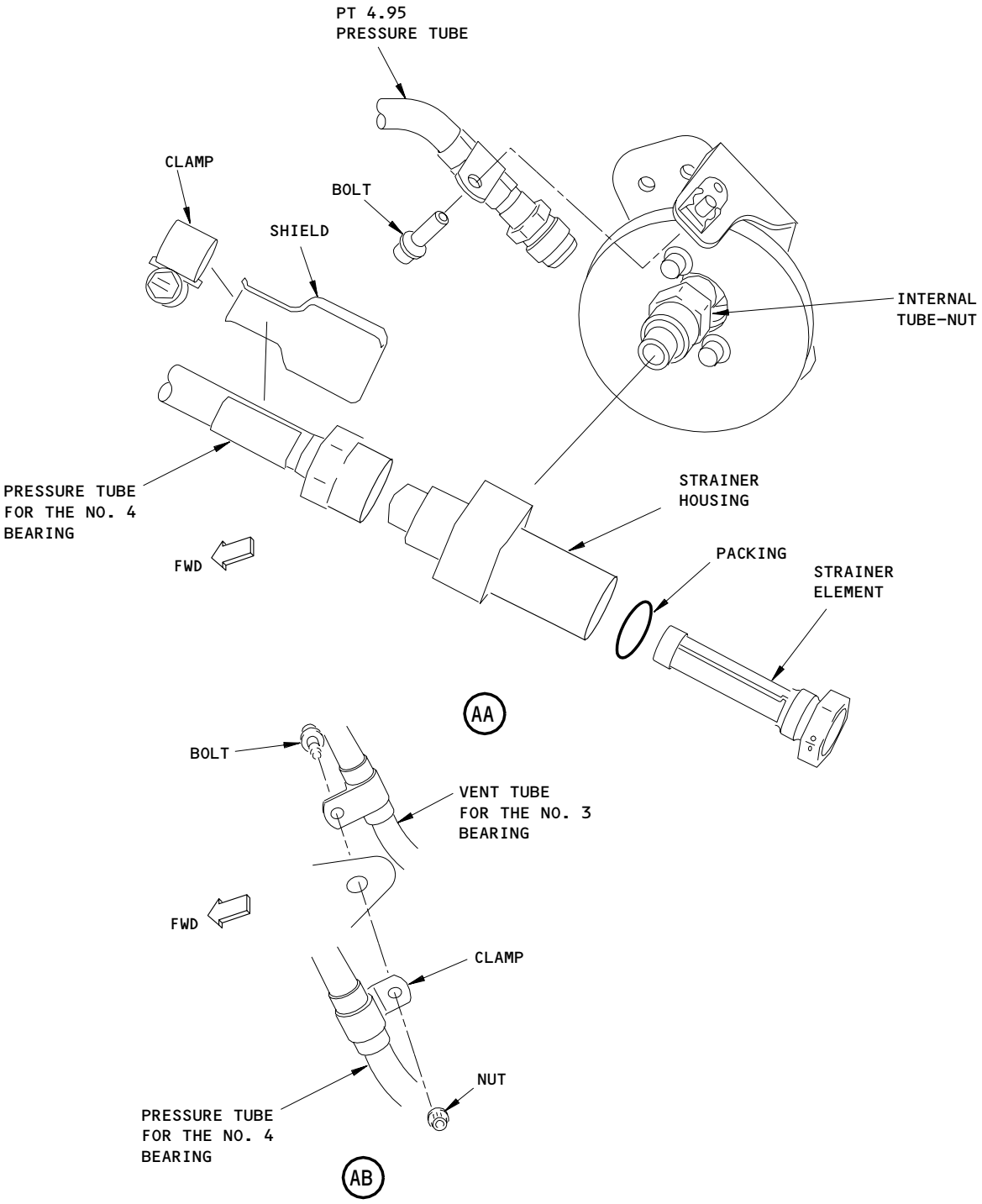
Turbine Case Cooling (TCC) LPT Manifold Installation
Figure 401 (Sheet 6)



ENGINES PRE-PW-SB 79-76

L16405
LA6825(0000)

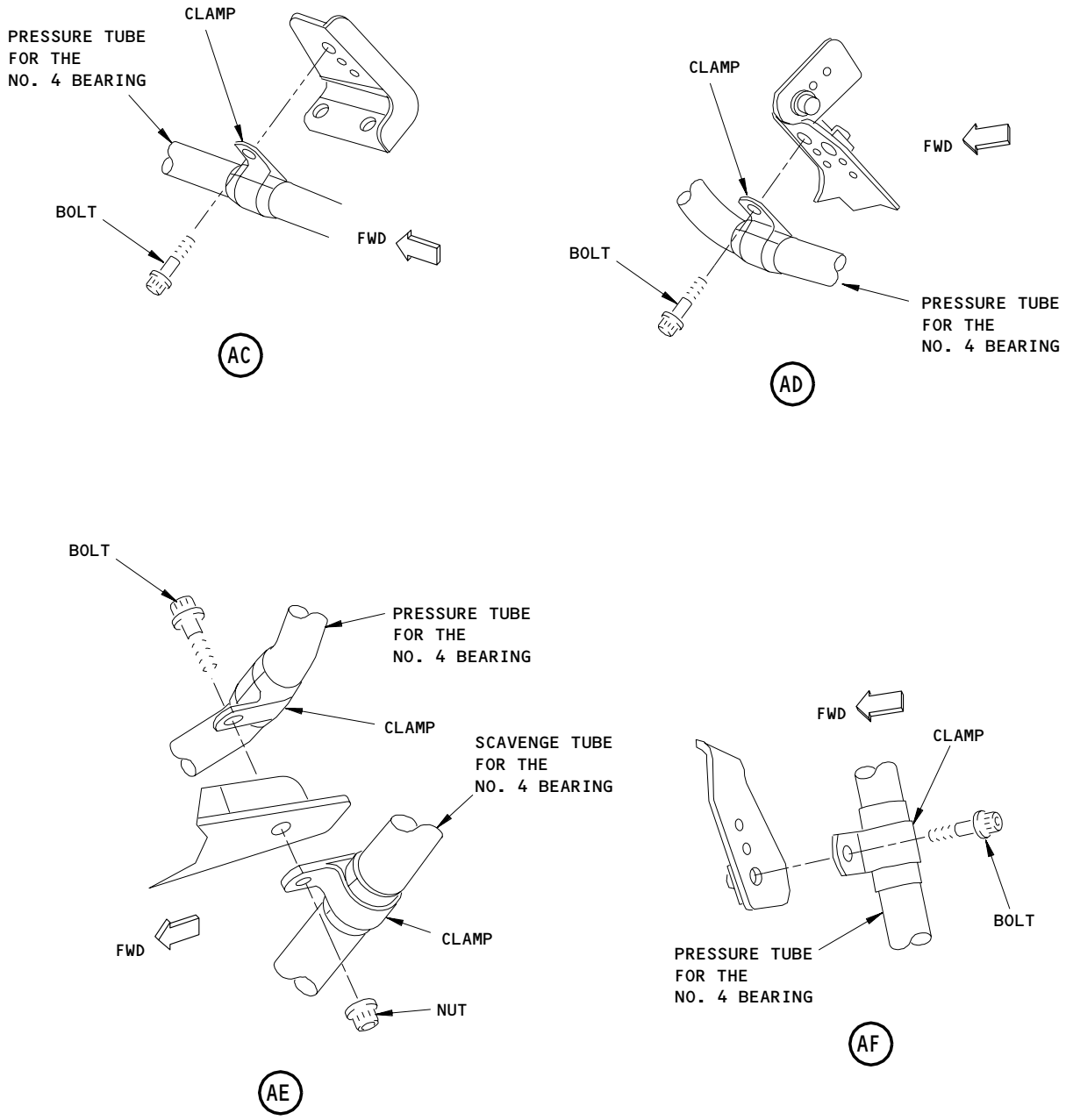
Turbine Case Cooling (TCC) LPT Manifold Installation
Figure 401 (Sheet 7)



ENGINES POST–PW–SB 79–76

L–B2793 (0000)

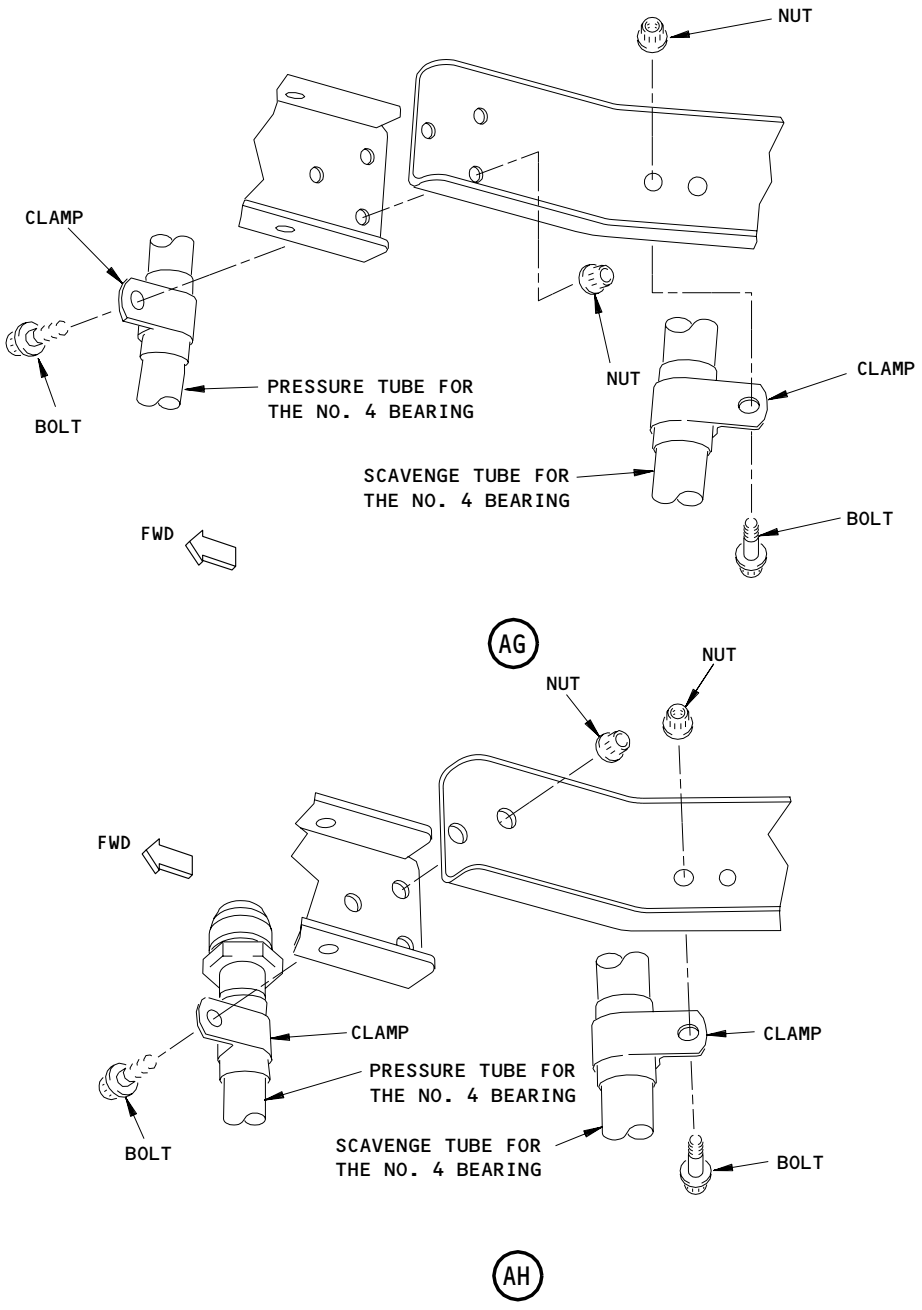
Turbine Case Cooling (TCC) LPT Manifold Installation
Figure 401 (Sheet 8)



ENGINES POST-PW-SB 79-76

L-B2791 (0000)

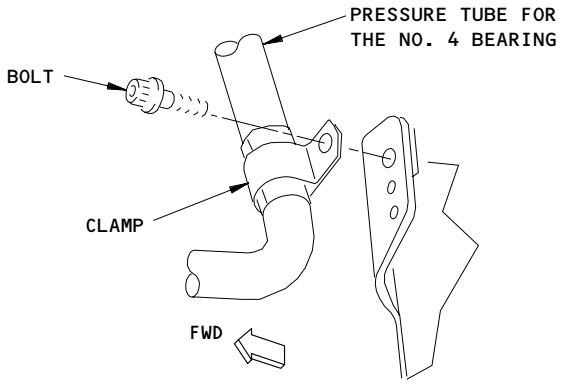
Turbine Case Cooling (TCC) LPT Manifold Installation
Figure 401 (Sheet 9)

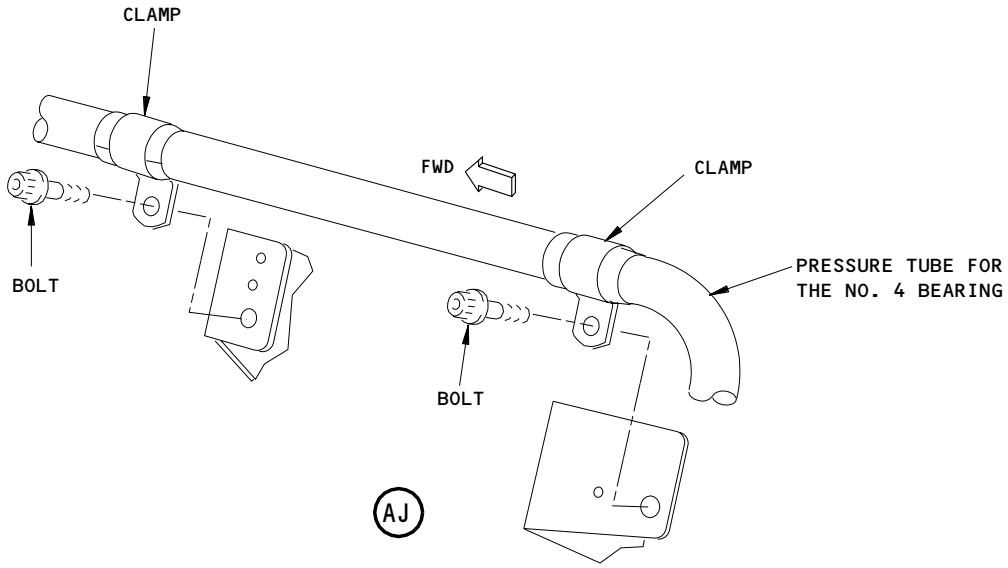


ENGINES POST-PW-SB 79-76

L-B2788 (0000)

Turbine Case Cooling (TCC) LPT Manifold Installation
Figure 401 (Sheet 10)



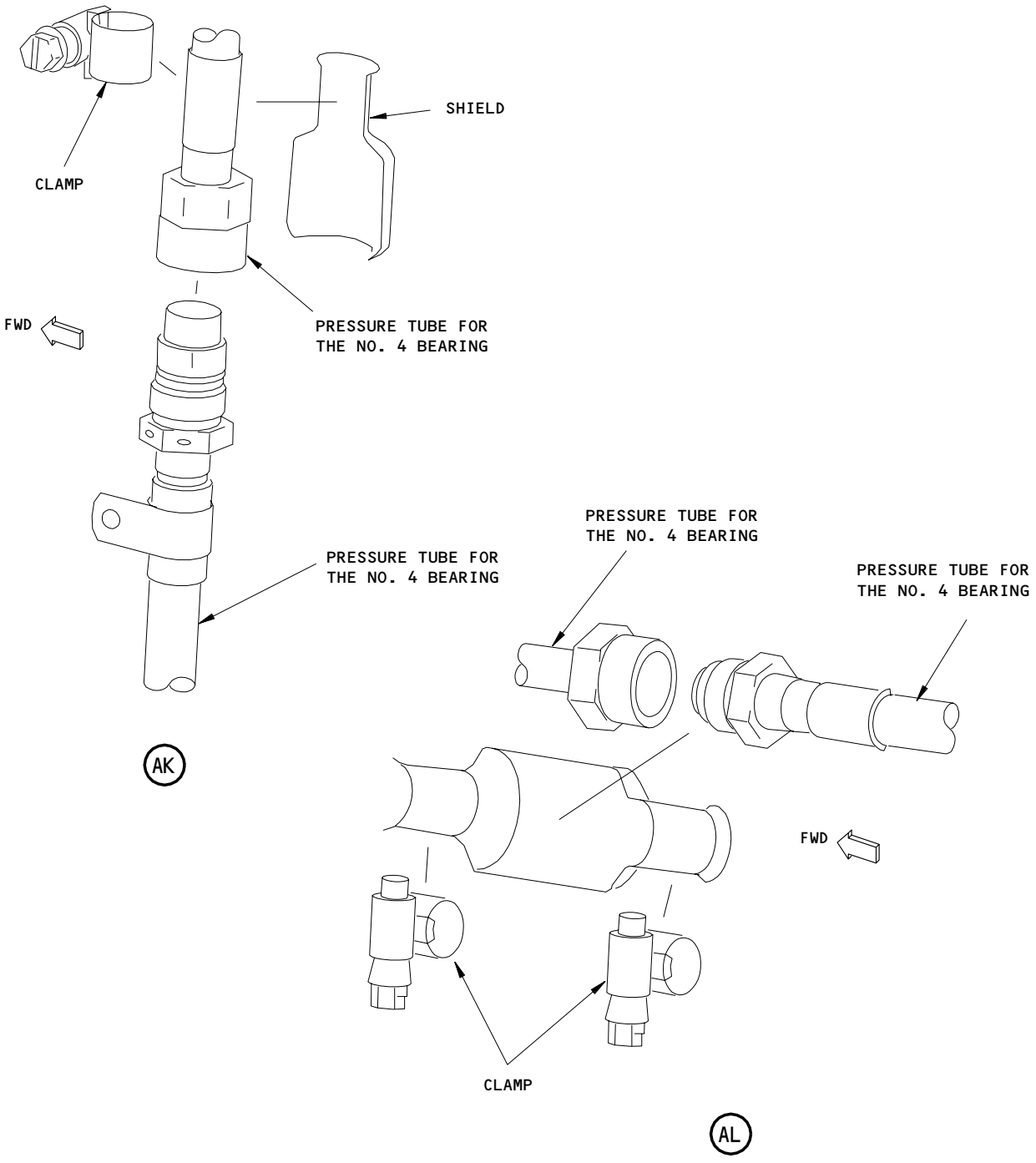


L-B2789 (0000)

ENGINES POST-PW-SB 79-76

Turbine Case Cooling (TCC) LPT Manifold Installation
Figure 401 (Sheet 11)

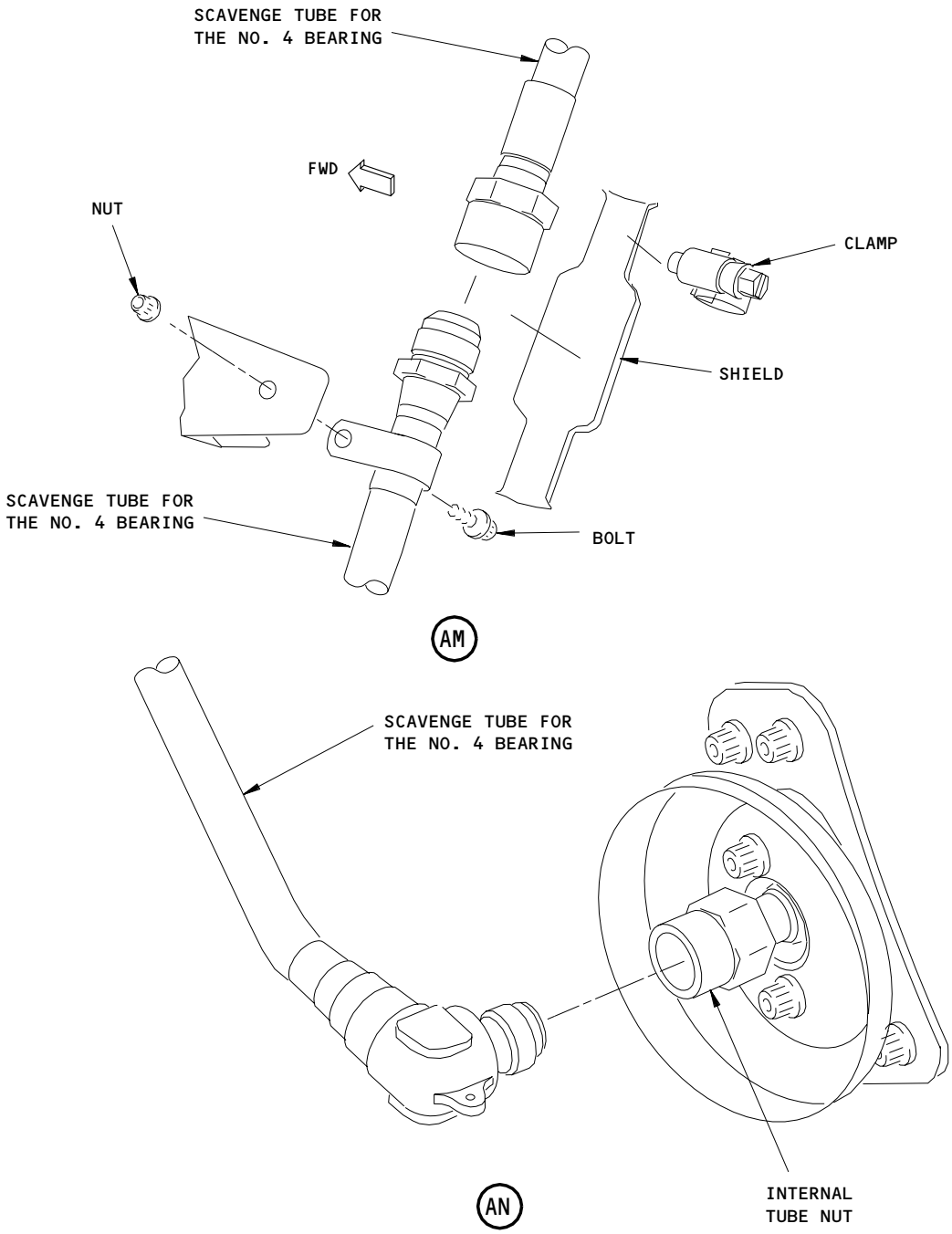
G86426



L-B2790 (0000)

ENGINES POST-PW-SB 79-76

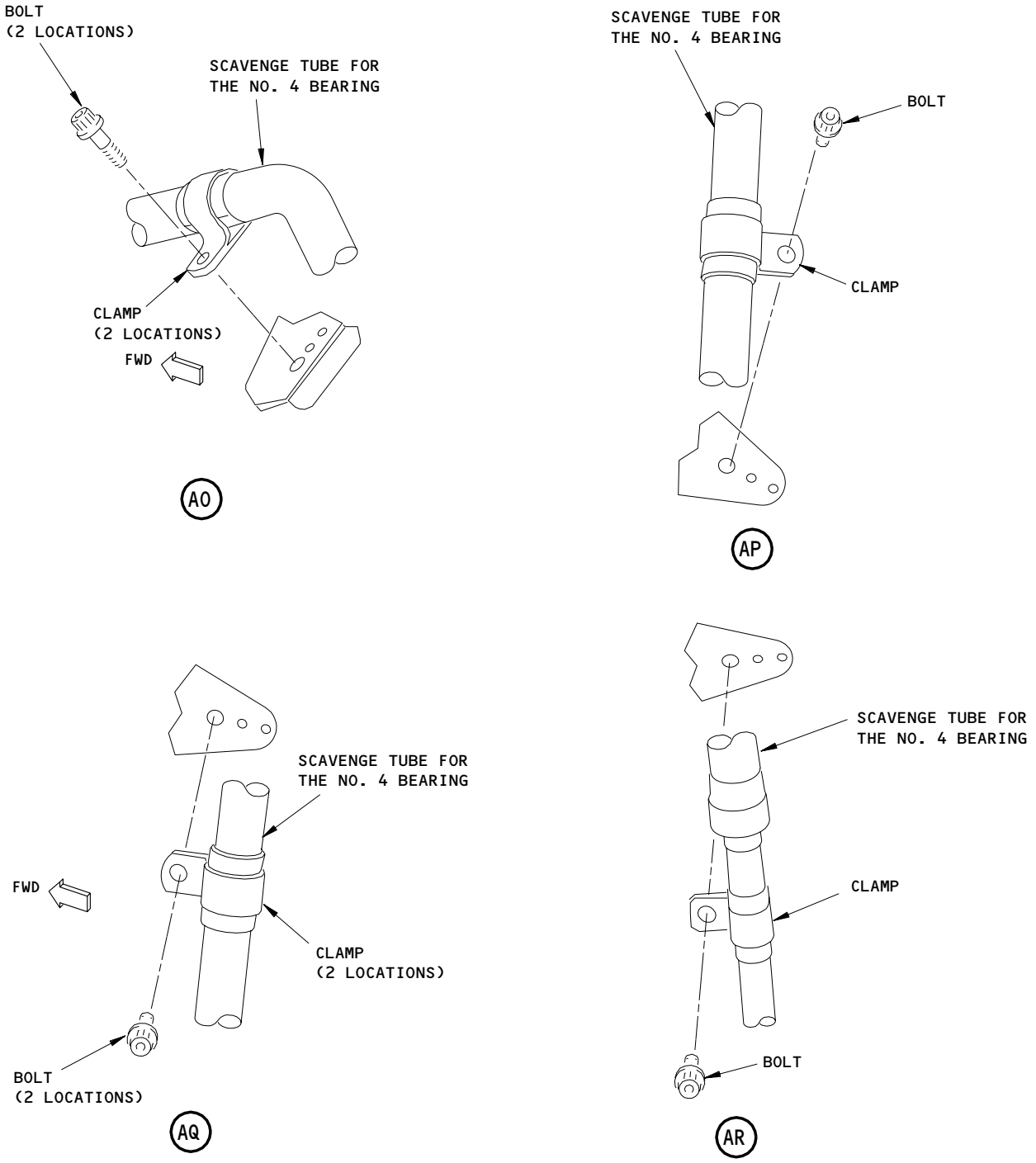
Turbine Case Cooling (TCC) LPT Manifold Installation
Figure 401 (Sheet 12)



ENGINES POST-PW-SB 79-76

L-B2784 (0000)

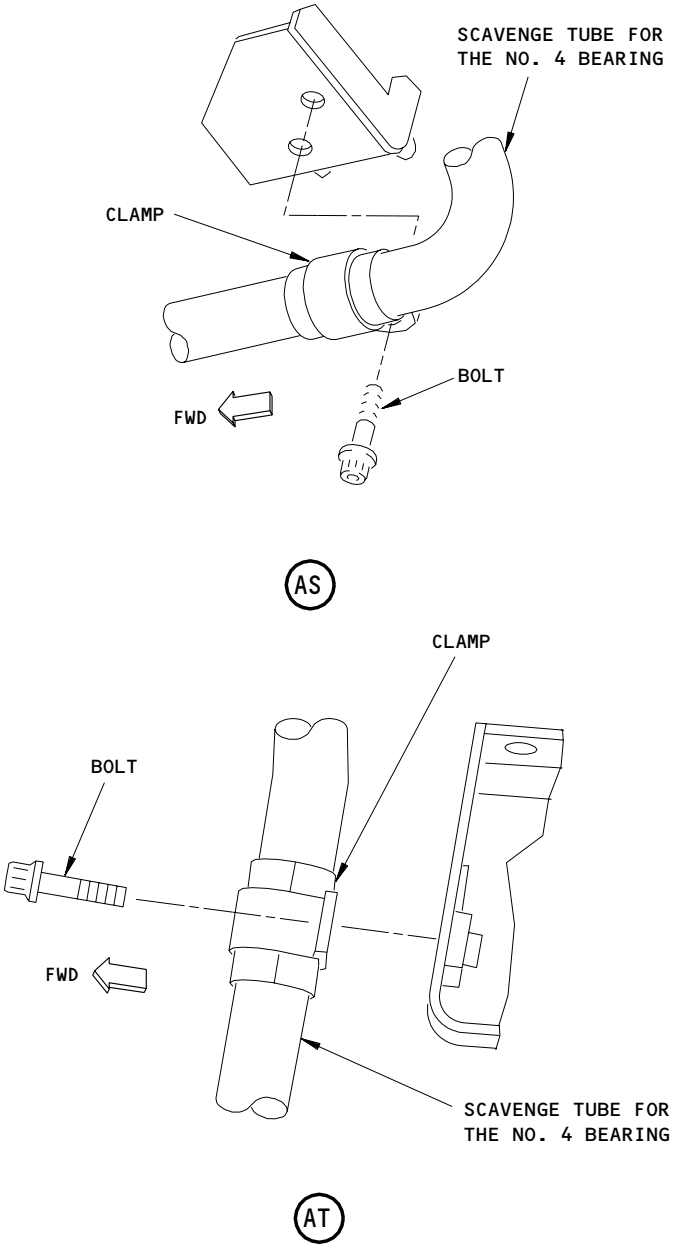
Turbine Case Cooling (TCC) LPT Manifold Installation
Figure 401 (Sheet 13)



ENGINES POST-PW-SB 79-76

L-B2785 (0000)

Turbine Case Cooling (TCC) LPT Manifold Installation
Figure 401 (Sheet 14)

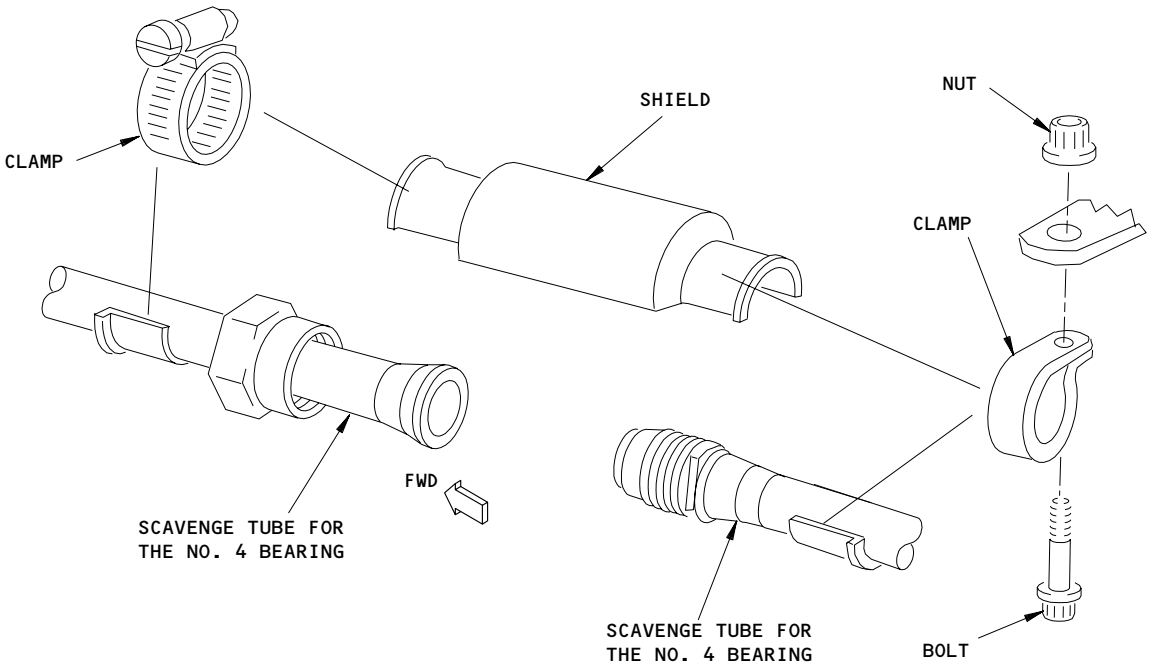


L-B2787 (0000)

ENGINES POST-PW-SB 79-76

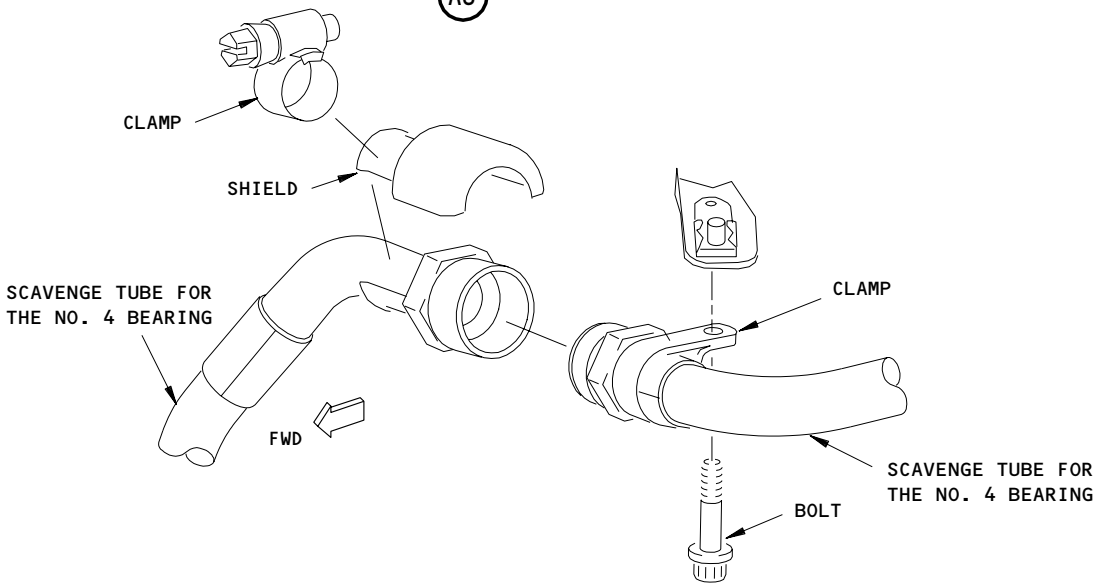
Turbine Case Cooling (TCC) LPT Manifold Installation
Figure 401 (Sheet 15)

G86432



ENGINES PRE-PW-SB 79-75

AU



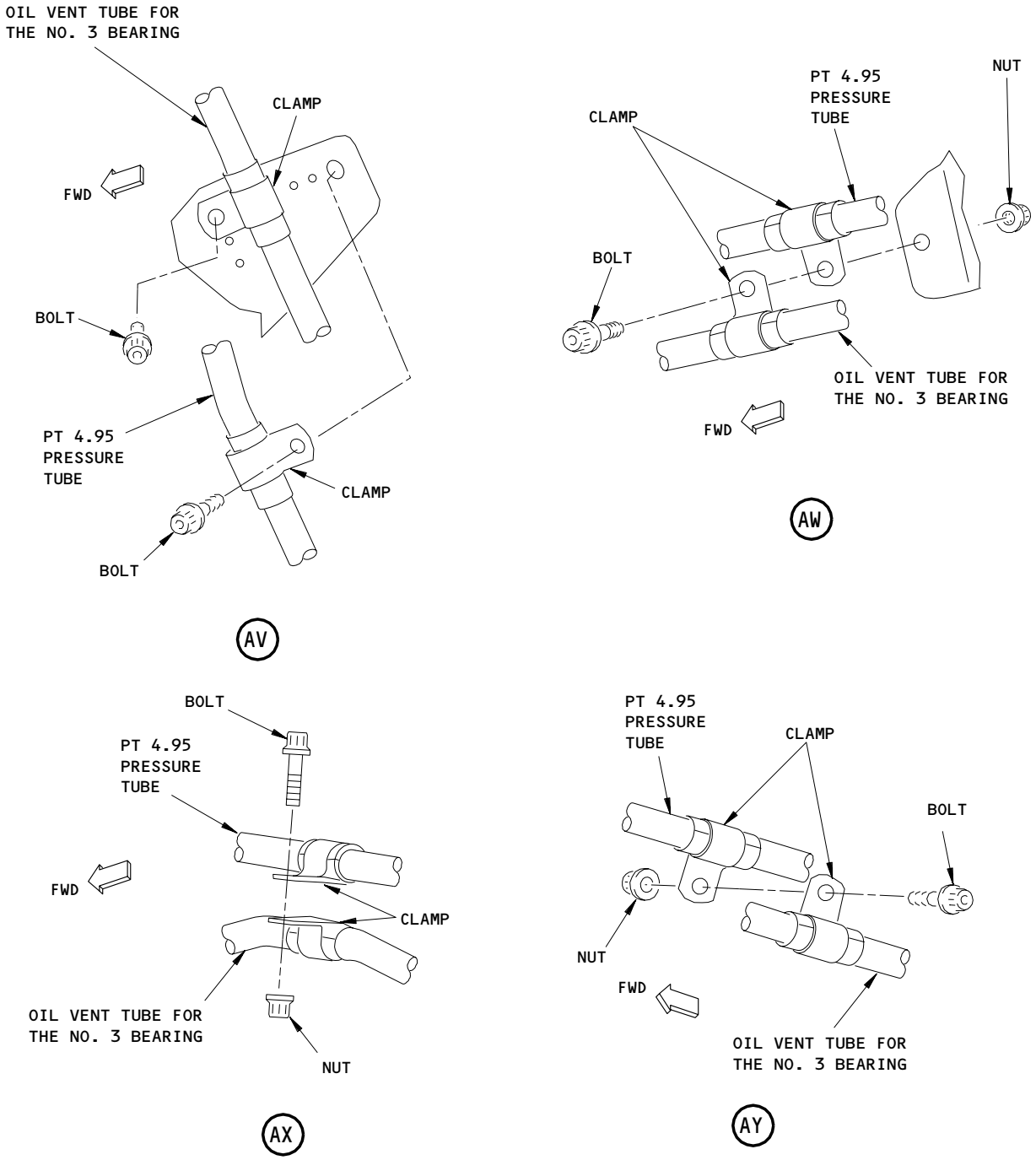
ENGINES POST-PW-SB 79-75

AU

ENGINES POST-PW-SB 79-76

L-B2786 (0000)

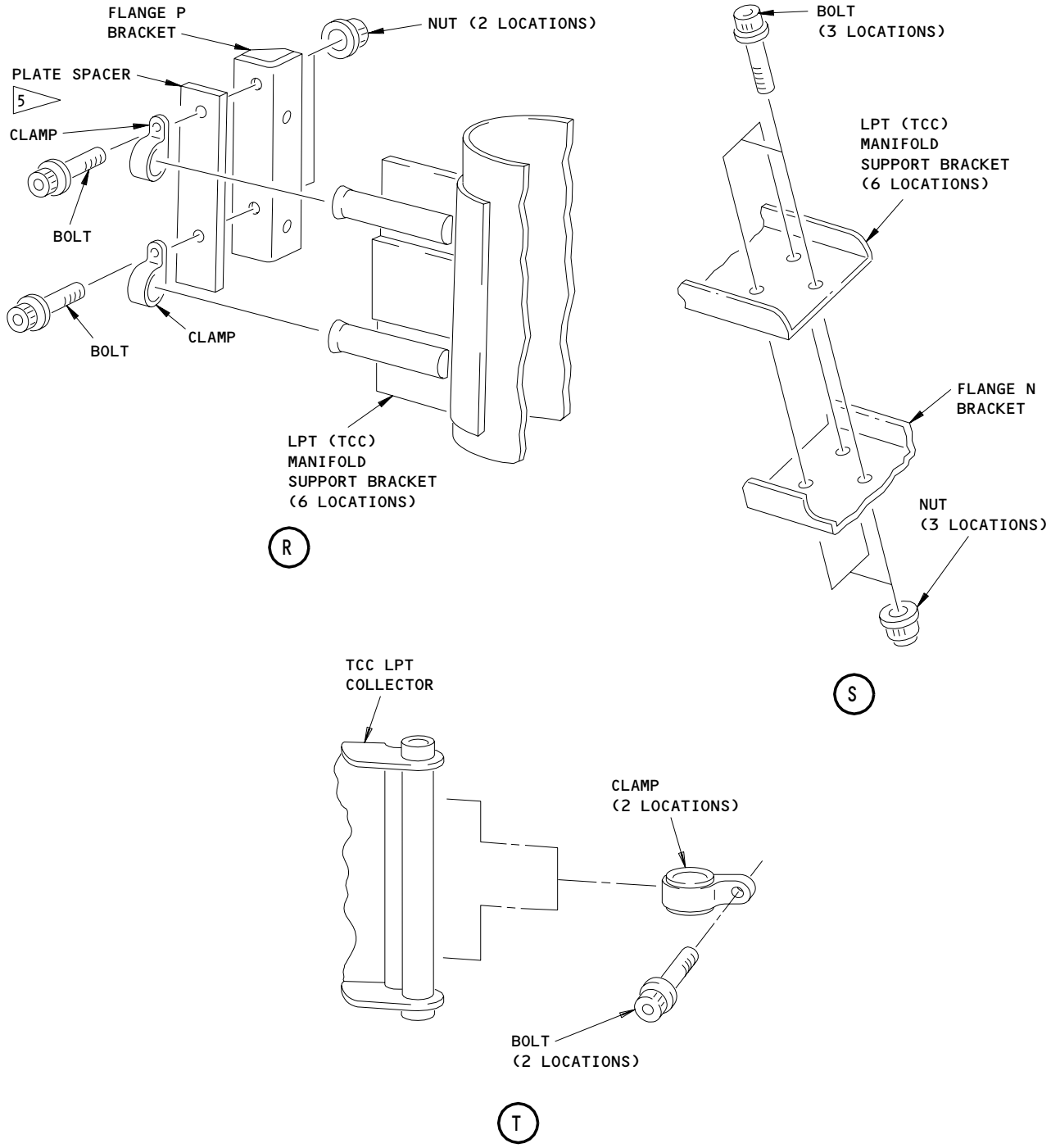
Turbine Case Cooling (TCC) LPT Manifold Installation
Figure 401 (Sheet 16)



ENGINES POST-PW-SB 79-76

L-B2794 (0000)

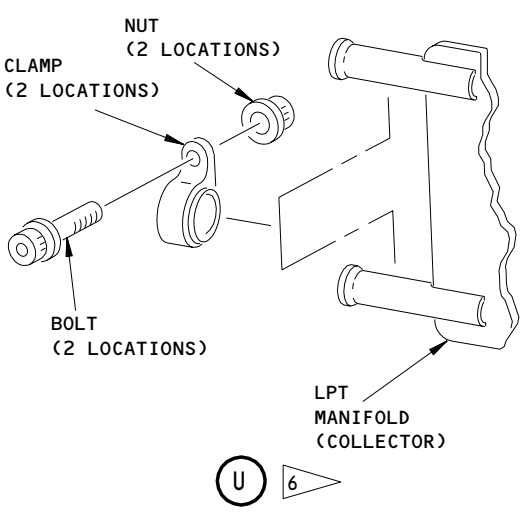
Turbine Case Cooling (TCC) LPT Manifold Installation
Figure 401 (Sheet 17)

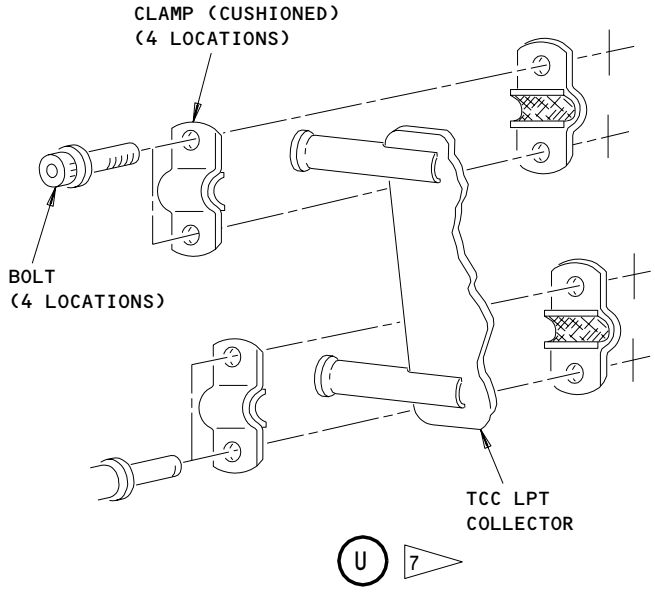


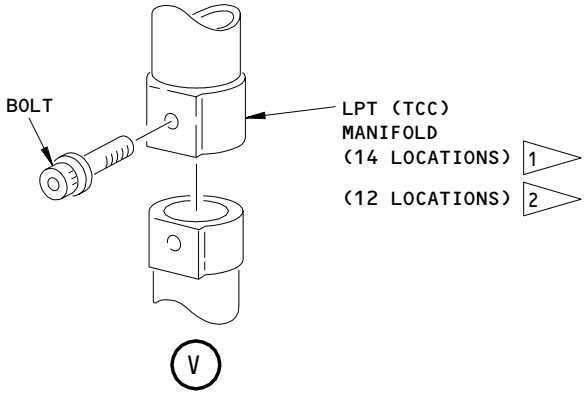
5 ENGINES WITH PLATE SPACER (PRE-PW-SB 75-50)

L-A3489
L-A1233
0989

Turbine Case Cooling (TCC) LPT Manifold Installation
Figure 401 (Sheet 18)







6 ENGINES PRE-PW-SB 72-217
7 ENGINES POST-PW-SB 72-217

L-A3489
L-A1233
0989

Turbine Case Cooling (TCC) LPT Manifold Installation
Figure 401 (Sheet 19)

(b) Remove the spray shield from the engine.
(c) Disconnect the tube nut forward of Flange M from the tube adapter.
(d) Remove the clamps which attach the spray shield at the tube nut aft of Flange P.
(e) Remove the spray shield from the engine.
(f) Disconnect the tube nut aft of Flange P from the tube adapter.
(g) Remove the tube clamps which attach the center section of the oil pressure tube to the brackets on Flanges M, N, and P.
(h) Remove the tube clamp which attaches the center section of the oil pressure tube to the No. 4 bearing scavenge tube.
(i) Remove the tube clamp which attaches the center section of the oil pressure tube to the No. 4 bearing scavenge tube.
(j) Remove the center section of the oil pressure tube from the engine.
(k) Install protective caps.

S 014-073-N00

(2) ENGINES POST-PW-SB 79-76;
Remove the oil pressure tube for the No. 4 bearing:
(a) Remove the hose clamps to remove the three shields from the pressure tubes for the No.4 bearing (Views AA, AK and AL).
(b) Disconnect the tube nut of the rear pressure tube for the No.4 bearing from the strainer housing (View AA).
(c) Remove the strainer element and the packing from the strainer housing.
1) Discard the packing.
(d) Remove the strainer housing from the internal tube nut on the turbine exhaust case.
(e) Disconnect the forward tube nut of the pressure tube for the No.4 bearing (View AL).
(f) Disconnect the middle tube nut of the pressure tube for the No.4 bearing (View AK).
(g) Remove the three bolts and nuts that attach the clamps for the pressure tubes for the No.4 bearing (Views AB, AG and AH).

(h) Remove the six bolts that attach the clamps for the pressure tubes for the No.4 bearing (Views AC, AD, AF, AJ and AI).
(i) Remove the two pressure tubes for the No.4 bearing from the engine.
(j) Install protection caps to the open ends of the pressure tubes for the No.4 bearing.

S 014-058-N00
(3) ENGINES PRE-PW-SB 79-76;
Remove the oil scavenge tube for the No. 4 bearing:
(a) Disconnect the scavenge tube elbow at the rear from the internal tube on the engine case.
(b) Remove the bolt which attaches the tube clamp to the bracket on Flange P.
1) Remove the tube clamp.
(c) Remove the bolts which attach the tube clamps to the brackets on Flange N.
1) Remove the tube clamps.
(d) ENGINES PRE-PW-SB 79-75;
Do the steps that follow:
1) Remove the bolt which attaches the clamp and the aft end of the spray shield to the bracket on Flange M.
a) Remove the clamp.
2) Remove the clamp which attaches the forward end of the spray shield to the tube.
a) Remove the spray shield.
(e) ENGINES POST-PW-SB 79-75;
Do the steps that follow:
1) Remove the hose clamp that attaches the tube shield to the oil scavenge tube for the No.4 bearing at the Flange M location.
a) Remove the tube shield.
2) Remove the bolt that attaches the clamp to the loop clamp bracket.
(f) Disconnect the tube nut at Flange M from the tube adapter.

(g) Remove the aft end of the scavenge tube from the engine.

S 014-074-N00

(4) ENGINES POST-PW-SB 79-76;
Remove the oil scavenge tube for the No. 4 bearing:
(a) ENGINES PRE-PW-SB 79-75;
Do the steps that follow:
1) Remove the hose clamp at the forward end of the shield (View AU).
2) Remove the bolt and the nut that attach the clamp at the rear side of the shield.
3) Remove the shield.
(b) ENGINES POST-PW-SB 79-75;
Do the steps that follow:
1) Remove the bolt that attaches the clamp to the bracket at the Flange M location (View AU).
2) Remove the hose clamp that attaches the forward end of the shield.
a) Remove the shield.
(c) Disconnect the tube nuts of the scavenge tubes for the No.4 bearing at the Flange M and Flange N locations (Views AM and AU).
(d) Disconnect the elbow end of the rear scavenge tube for the No.4 bearing from the internal tube on the turbine exhaust case (View AN).
(e) Remove the eight bolts that attach the clamps for the scavenge tubes for the No.4 bearing (Views AS, AT, A0, AP, AQ and AR).
(f) Remove the four bolts and nuts that attach the clamps for the scavenge tubes for the No.4 bearing (Views AE, AG, AH and AM).
(g) Remove the two scavenge tubes for the No.4 bearing from the engine.
(h) Install protection caps to the open ends of the scavenge tubes for the No.4 bearing.

S 014-059-N00

(5) ENGINES PRE-PW-SB 79-76;
Remove the oil vent tube of the No. 3 bearing:
(a) Disconnect the tube nut from the adapter on the turbine exhaust case.

(b) Remove the bolts which attach the tube clamps to the Flange P brackets.
1) Remove the tube clamps.
(c) Remove the bolt which attaches the tube clamp to the PT4.95 pressure tube clamp in the middle of Flanges P and N.
1) Remove the tube clamps.
(d) Remove the bolt which attaches the tube clamp to the bracket on Flange N.
1) Remove the tube clamp.
(e) Remove the bolt and nut that attaches the tube clamp to the adjacent PT4.95 tube assembly at approximately the 7:30 o'clock position.
(f) Remove the tube clamp from the tube.
(g) Disconnect the tube nut at the tube connection just aft of Flange M.
(h) Remove the oil vent tube from the engine.
(i) Install protective caps on the tube fittings.

S 014-060-N00

(6) ENGINES PRE-PW-SB 79-76;
Remove the PT4.95 pressure tube:
(a) Disconnect the tube nut from the tube coupling at the rear of Flange P at approximately the 7 o'clock position.
(b) Remove the bolt and nut that attaches the tube clamp to the Flange P bracket at the 7 o'clock position.
(c) Remove the bolt which attaches the tube clamp to the Flange N bracket.
1) Remove the tube clamp.
(d) Remove the bolt which attaches the tube clamp to the diffuser case bracket.
1) Remove the tube clamp.
(e) Disconnect the tube nut from the tube adapter aft of Flange N at approximately the 8 o'clock position.
(f) Remove the PT4.95 pressure tube from the engine.
(g) Install protective caps on the tube fittings.

S 014-075-N00

(7) ENGINES POST-PW-SB 79-76;
Remove the oil vent tube for the No. 3 bearing and the PT4.95 pressure tube:
(a) Disconnect the tube nut of the vent tube for the No.3 bearing from the internal tube on the turbine exhaust case.
(b) Disconnect the tube nut of the vent tube for the No.3 bearing from the tube adapter to the rear of the Flange N.
(c) Disconnect the PT4.95 pressure tube from the tube nut at the turbine exhaust case.
(d) Disconnect the tube nut at the PT4.95 pressure tube connection to the rear of the Flange N.
(e) Remove the three bolts and nuts that attach the clamps for the oil vent tube for the No.3 bearing and the PT4.95 pressure tube (Views AW, AX, AY).
(f) Remove the two bolts that attach the clamps for the oil vent tube for the No.3 bearing and the PT4.95 pressure tube (View AV).
(g) Remove the oil vent tube for the No.3 bearing and the PT4.95 pressure tube from the engine.
(h) Install protection caps to the open ends of the tubes.

S 014-061-N00

(8) Disconnect the TT4.95 harness.
(a) Remove the bolts which attach the harness clamps to the bracket of the cooling air tube.
1) Remove the harness clamps.

S 014-062-N00

(9) Remove the lower starter air duct.
(a) Remove the coupling which attaches the lower starter air duct to the start control valve.
(b) Remove the coupling which attaches the lower starter air duct to the upper starter air duct.

(c) Remove the bolts which attach the support brackets with the adjustable links to the turbine case.
(d) Remove the bolts which attach the support brackets of the lower starter air duct to Flange P.

S 024-063-N00
(10) Remove the TCC LPT manifolds.
(a) Remove the bolts which attach the upper LPT cooling air tubes to the LPT collector.
(b) Remove the bolts which attach the lower LPT cooling air tubes to the LPT collector.
(c) ENGINES WITHOUT THE NO. 7 COOLING TUBE;
Remove the bolts which attach the upper and lower cover assemblies from the rear of the TCC LPT collector.
(d) Remove the bolts which attach the forward support brackets of the LPT bridge brackets to the Flange N brackets.
(e) ENGINES PRE-PW-SB 75-50;
Remove the bolts, nuts, spacers, and clamps which attach the rear mounts of the cooling manifolds to the brackets on Flange P.
(f) ENGINES POST-PW-SB 75-50;
Remove the bolts, nuts, and clamps which attach the rear mounts of the cooling manifolds to the brackets on Flange P.
(g) Remove the lower LPT cooling air tubes from the engine.
1) Turn the lower LPT cooling air tubes around the LPT case.
2) Disengage the lower LPT cooling air tubes from the LPT collector.
(h) Remove the upper LPT cooling air tubes from the engine.
1) Turn the upper LPT cooling air tubes around the LPT case.
2) Disengage the upper LPT cooling air tubes from the LPT collector.
(i) ENGINES WITHOUT THE NO. 7 COOLING AIR TUBE;
Remove the upper and lower cover assemblies from the rear of the TCC LPT collector.

S 024-064-N00
(11) Install protective covers where necessary.

TASK 75-24-09-404-018-N00

2. Install the TCC LPT Manifolds

A. Equipment

(1) M303, M305, or M307 Bergen Mechanical Crimper
Bergen Cable Technologies Inc
170 Gregg St
P.O. Box 1300
Lodi, NJ 07644-9982

B. Consumable Materials

(1) D00137 Oil, PWA 521B
(2) D50124 Paste - Anti-seize - P06-054
(3) G02334 Lockwire - AS3214-02
(4) G02332 Ferrule - P05-292 (Optional)
(5) G02335 Cable - Safety - P05-291 (Optional)

C. References

(1) AMM 71-00-00/501, Power Plant - General
(2) AMM 71-11-06/201, Core Cowl Panels
(3) AMM 78-31-00/201, Thrust Reverser System

D. Access

(1) Location Zones

411 Left Engine
421 Right Engine

(2) Access Panels

417AL Core Cowl (Left), Left Engine
418AR Core Cowl (Right), Left Engine
427AL Core Cowl (Left), Right Engine
428AR Core Cowl (Right), Right Engine

E. Procedure (Fig. 401)

S 424-065-N00

(1) Remove the protective covers.

S 424-066-N00

(2) Install the TCC LPT manifolds.
(a) Install the upper LPT cooling air tubes on the engine.
1) Put the upper LPT cooling air tubes in position on the LPT case.

2) Turn the upper LPT cooling air tubes around the LPT case (under the TT4.95 harness).
3) Engage the ends of the upper LPT cooling air tubes with the LPT collector.
4) Lubricate the threads of the bolts which attach the upper LPT cooling air tubes to the LPT collector.
5) Attach the upper LPT cooling air tubes to the LPT collector with the bolts.
   a) Tighten the bolts with your hand.

(b) Install the lower LPT cooling air tubes on the engine.
1) Put the lower LPT cooling air tubes in position on the LPT case.
2) Turn the lower LPT cooling air tubes around the LPT case (under the TT4.95 harness).
3) Engage the ends of the lower LPT cooling air tubes with the LPT collector.
4) Lubricate the threads of the bolts, which attach the lower LPT cooling air tubes to the LPT collector, with oil.
5) Attach the lower LPT cooling air tubes to the LPT collector with the bolts.
   a) Tighten the bolts with your hand.

(c) ENGINES WITHOUT THE NO. 7 COOLING AIR TUBE;
Do the steps that follow:
1) Lubricate the threads of the bolts, which attach the cover assemblies, with engine oil.
2) Install the upper and lower cover assemblies to the rear of the TCC LPT collector with the bolts.
3) Tighten the bolts with your hand.

(d) Lubricate the threads of the bolts, which attach the clamps of the LPT bridge brackets to the Flange P brackets, with oil.

(e) ENGINES PRE-PW-SB 75-50;
Install the clamps of the LPT bridge brackets on the rear mounts of the LPT bridge brackets with the bolts, nuts and spacers.

(f) ENGINES POST-PW-SB 75-50;
Install the clamps of the LPT bridge brackets on the rear mounts of the LPT bridge brackets with the bolts and nuts.
1) Tighten the bolts with your hand.

(g) Lubricate the threads of the bolts, which attach the LPT bridge brackets to the Flange N bracket, with oil.
(h) Attach the forward end of the LPT bridge brackets to the Flange N bracket with the bolts and nuts.

NOTE: The bolt and nut at approximately the 8 o'clock position also attach the tube clamp to Flange N.

1) Tighten the bolts with your hand.
(i) Tighten the bolts, which attach the clamps on the rear mounts of the LPT bridge brackets to the Flange P brackets, to 36-40 pound-inches (4.1-4.5 newton-meters).
(j) Tighten the bolts, which attach the forward support brackets of the LPT bridge brackets to the Flange N brackets, to 36-40 pound-inches (4.1-4.5 newton-meters).
(k) Tighten the bolts which attach the LPT cooling air tubes to the LPT collector to 36-40 pound-inches (4.1-4.5 newton-meters).
(l) ENGINES WITHOUT THE NO. 7 COOLING AIR TUBE;
Tighten the bolts, which attach the cover assemblies, to 36-40 pound-inches (4.1-4.5 newton-meters).

S 414-067-N00
(3) Install the lower starter air duct.
(a) Put the lower starter air duct on the engine case.
(b) Lubricate the threads of the bolts, which attach the support brackets of the lower starter air duct, with oil.
(c) Attach the support brackets of the lower starter air duct to Flange P with the bolts and nuts.
1) Tighten the bolts with your hand.
(d) Attach the support brackets with the adjustable links to the turbine case with the bolts, nuts, and washers.

NOTE: Find the countersunk washer adjacent to the bolt head.

(e) Install the coupling which attaches the lower starter air duct to the upper starter air duct.
1) Tighten the coupling to 100-115 pound-inches (11.3-13.0 newton-meters).

(f) Install the coupling which attaches the lower starter air duct to the start control valve.
1) Tighten the coupling to 100-115 pound-inches (11.3-13.0 newton-meters).
(g) Tighten the bolts, which attach the support brackets of the starter air duct to the engine case, to 50-75 pound-inches (5.6-8.5 newton-meters).

S 414-068-N00

(4) Attach the TT4.95 harness.
(a) Install the harness clamps on the TT4.95 harness.
(b) Lubricate the threads of the harness clamp bolts with oil.
(c) Attach the harness clamps and the tube clamp and tube bracket of the HPT cooling air tube with the harness clamp bolts and nuts.
1) Tighten the harness clamp bolts to 36-40 pound-inches (4.1-4.5 newton-meters).

S 414-076-N00

CAUTION: DO NOT USE LUBRICANTS ON THE TUBE NUTS OF THE PT4.95 PRESSURE TUBE FOR THE EEC. THE USE OF LUBRICANTS CAN CAUSE CONTAMINATION OF THE EEC.

(5) ENGINES PRE-PW-SB 79-76;
Install the PT4.95 pressure tube:
(a) Remove protective caps from the tube fittings.
(b) Install the tube nut to the tube coupling at approximately the 7 o'clock position and rearward of Flange P.
(c) Install the tube nut to the tube coupling at approximately the 8 o'clock position and rearward of Flange N.

NOTE: You will tighten the tube nut after you install the oil vent tube for the No. 3 bearing.

(d) Lubricate the threads of the tube clamp bolt, which attaches the tube clamp to the bracket location on Flange N, with oil.
(e) Install the tube clamp on the PT4.95 pressure tube at the bracket location on Flange N with the tube clamp bolt.
1) Tighten the tube clamp bolt with your hand.
(f) Lubricate the threads of the tube clamp bolt, which attaches the tube clamp to the diffuser case, with oil.
(g) Install the tube clamp on the PT4.95 pressure tube to the diffuser case location with the tube clamp bolt.
1) Tighten the tube clamp bolt with your hand.
(h) Tighten the tube nuts to 270-300 pound-inches (30.5-33.9 newton-meters).
1) Safety the tube nuts with lockwire or safety cable and safety cable ferrule.
(i) Tighten all tube clamp bolts to 36-40 pound-inches (4.1-4.5 newton-meters).

S 414-070-N00

(6) ENGINES PRE-PW-SB 79-76;
Install the oil vent tube of the No. 3 bearing:
(a) Remove protective caps from the tube fittings.
(b) Lubricate the tube nuts of the oil vent tube with anti-seize paste.
(c) Put the aft end of the oil vent tube to the exhaust adapter.
(d) Put the forward end of the oil vent tube to the adapter aft of Flange M.
(e) Tighten the tube nuts for the oil vent tube with your hand.
(f) Install the tube clamp on the oil vent tube at the bracket location on Flange N.
(g) Lubricate the threads of the bolts, which attach the tube clamps to the brackets on Flange P, with oil.
(h) Attach the tube clamps to the brackets on Flange P with the bolts and nuts.
1) Tighten the bolts with your hand.
(i) Install the tube clamps to the oil vent tube and adjacent to the PT4.95 tube assembly.

(j) Lubricate the threads of the bolts, which attach the tube clamps to the brackets on Flange P, with oil.
(k) Attach the tube clamps to the brackets on Flange P with bolts and nuts.
1) Tighten the bolts with your hand.
(l) Install the tube clamps to the oil vent tube at approximately the 7:30 o'clock position.
(m) Lubricate the threads of the bolt, which attaches the tube clamp of the oil vent tube, with oil.
(n) Attach the tube clamp to the adjacent PT4.95 tube assembly rearward of Flange P with the bolt and nut.
(o) Tighten the bolt with your hand.
(p) Lubricate the threads of the bolt, for the tube clamp between the oil vent tube and the PT4.95 pressure tube, with oil.
(q) Install the tube clamps to the oil vent tube and the PT4.95 pressure tube in the middle of Flanges P and N with the bolt and nut.
(r) Tighten all tube clamp bolts to 36-40 pound-inches (4.1-4.5 newton-meters).
(s) Tighten the tube nuts to 200-225 pound-inches (22.6-25.4 newton-meters).
1) Safety the tube nuts with lockwire or safety cable and safety cable ferrule.

S 414-077-N00

CAUTION: DO NOT USE LUBRICANTS ON THE TUBE NUTS OF THE PT4.95 PRESSURE TUBE FOR THE EEC. THE USE OF LUBRICANTS CAN CAUSE CONTAMINATION OF THE EEC.

(7) ENGINES POST-PW-SB 79-76;
Install the vent tube for the No.3 bearing and the PT4.95 pressure tube:
(a) Remove the protection caps from the open ends of the vent tube for the No.3 bearing and the PT4.95 pressure tube.

(b) Put the vent tube for the No.3 bearing in position on the engine.
(c) Connect the forward end of the vent tube for the No.3 bearing to the adapter forward of the Flange M.
1) Tighten the tube nut with your hand.
(d) Connect the aft end of the vent tube for the No.3 bearing to the internal tube adapter on the turbine exhaust case.
1) Tighten the tube nut with your hand.
(e) Put the PT4.95 pressure tube in position on the engine.
(f) Connect the forward end of the PT4.95 pressure tube to the adapter aft of the Flange N.
1) Tighten the tube nut with your hand.
(g) Connect the aft end of the PT4.95 pressure tube to the tube nut at the turbine exhaust case.
1) Tighten the tube nut with your hand.
(h) Lubricate the threads of the attaching bolts for the tube clamps with engine oil.
(i) Install the two bolts that attach the clamps for the oil vent tube for the No.3 bearing and the PT4.95 pressure tube (View AV).
(j) Install the three bolts and nuts that attach the clamps for the oil vent tube for the No.3 bearing and the PT4.95 pressure tube (Views AW, AX, AY).
(k) Tighten the tube nuts of the vent tube for the No.3 bearing to 200-225 pound-inches (22.5-25.4 newton-meters).
1) Safety the tube nuts with lockwire or safety cable and safety cable ferrule.
(l) Tighten the tube nuts of PT4.95 pressure tube to 200-225 pound-inches (22.5-25.4 newton-meters).
1) Safety the tube nuts with lockwire or safety cable and safety cable ferrule.
(m) Tighten all bolts which attach the tube clamps to 36-40 pound-inches (4.1-4.5 newton-meters).

S 414-071-N00

(8) ENGINES PRE-PW-SB 79-76;
Install the scavenge tube for the No.4 bearing:
(a) Put the No. 4 bearing scavenge tube inboard of the deoiler outlet tube and LPT bridge brackets.
(b) Lubricate the tube elbow threads with anti-seize paste.
(c) Attach the tube elbow to the tube nut on the exhaust case.
1) Tighten the tube nut with your hand.
(d) Lubricate the tube adapter threads with anti-seize paste.
(e) Attach the tube adapter to the tube nut at Flange M.
1) Tighten the tube nut with your hand.
(f) Lubricate the threads of the bolt, which attaches the tube clamp to the bracket location on Flange P, with oil.
(g) Install the tube clamp at the bracket location on Flange P with the bolt and nut.
1) Tighten the bolt with your hand.

(h) Lubricate the threads of the bolts, which attach the tube clamps to the bracket locations on Flange N, with oil.
(i) Install the tube clamps at the bracket locations on Flange N.
    1) Tighten the bolt with your hand.
(j) Tighten the bolts , which attach the tube clamps on the No. 4 bearing scavenge tube, to 36-40 pound-inches (4.1-4.5 newton-meters).
(k) Tighten the tube nut at the exhaust case to 200-225 pound-inches (22.6-25.4 newton-meters).
    1) Safety the tube nut with lockwire or safety cable and safety cable ferrule.
(l) Tighten the tube nut at the Flange M location to 475-525 pound-inches (53.7-59.3 newton-meters).
    1) Safety the tube nut with lockwire or safety cable and safety cable ferrule.
(m) ENGINES PRE-PW-SB 79-75;
    Do the steps that follow:
    1) Put the spray shield to the inboard side of the No. 4 bearing scavenge tube at the tube nut on Flange M.
    2) Attach the forward end of the spray shield with a clamp.
    3) Tighten the clamp to 15-18 pound-inches (1.7-2.0 newton-meters).
    4) Install the tube clamp over the aft end of the spray shield.
    5) Lubricate the threads of the bolt with oil.
    6) Attach the tube clamp to the Flange M bracket with the bolt and nut.
    7) Tighten the bolt to 36-40 pound-inches (4.1-4.5 newton-meters).
(n) ENGINES POST-PW-SB 79-75;
    Do the steps that follow:
    1) Install the shield on the forward tube connection of the oil scavenge tube for the No.4 bearing.
    2) Attach the shield with the hose clamp.
        a) Tighten the hose clamp to 15-18 pound-inches (1.7-2.0 newton-meters).

3) Lubricate the threads of the attaching bolt of the clamp with engine oil.
4) Attach the clamp of the oil scavenge tube for the No.4 bearing to the loop clamp bracket with the bolt.
a) Tighten the bolt to 36-40 pound-inches (4.1-4.5 newton-meters).

S 414-078-N00

(9) ENGINES POST-PW-SB 79-76;
Install the scavenge tubes for the No.4 bearing:
(a) Remove the protection caps from the open ends of the scavenge tubes for the No.4 bearing.
(b) Lubricate the attaching bolts of the clamps of the scavenge tubes for the No.4 bearing with engine oil.
(c) Put the forward scavenge tube for the No.4 bearing in position on the engine.
(d) Connect the forward scavenge tube for the No.4 bearing to the tube nut at the Flange M location (View AU).
1) Tighten the tube nut with your hand.
(e) ENGINES PRE-PW-SB 79-75;
Install the two bolts that attach the clamps for the forward scavenge tube for the No.4 bearing (Views AS and AT).
1) Tighten the bolts with your hand.
(f) ENGINES POST-PW-SB 79-75;
Install the three bolts that attach the clamps for the forward scavenge tube for the No.4 bearing (Views AS, AT and AU).
1) Tighten the bolts with your hand.
(g) Install the four bolts and nuts that attach the clamps for the forward scavenge tube for the No.4 bearing (Views AM, AH, AG and AE).
1) Tighten the bolts with your hand.
(h) Lubricate the threads of the internal tube nut on the turbine exhaust case with engine oil (View AN).
(i) Put the aft scavenge tube for the No.4 bearing in position on the engine.
(j) Connect the forward tube nut to the forward scavenge tube for the No.4 bearing (View AM).
1) Tighten the tube nut with your hand.
(k) Connect the elbow-end of the scavenge tube for the No.4 bearing to the internal tube nut on the turbine exhaust case (View AN).
1) Tighten the tube nut with your hand.
(l) Install the six bolts that attach the clamps for the aft scavenge tube for the No.4 bearing (Views A0, AP, AQ and AR).
1) Tighten the bolts with your hand.
(m) Hold the elbow of the aft scavenge tube for the No.4 bearing and tighten the internal tube-nut to 270-300 pound-inches (30.5-33.9 newton-meters) (View AN).
1) Safety the internal tube-nut with lockwire or safety cable and safety cable ferrule.

(n) Tighten the two tube nuts of the scavenge tubes for the No.4 bearing to 475-525 pound-inches (56.7-59.3 newton-meters) (Views AM and AU).
    1) Safety the two tube nuts with lockwire or safety cable and safety cable ferrule.
(o) Tighten all tube clamp bolts 36-40 pound-inches (4.1-4.5 newton-meters).
(p) Install the shields at the connections of the scavenge tube for the No.4 bearing with the steps that follow:
    1) Put the shields in position at the connections of the scavenge tube for the No.4 bearing (Views AM and AU).
    2) Attach the shields with the hose clamps.
    3) ENGINES PRE-PW-SB 79-75;
       Install the clamp on the forward tube shield and attach the clamp with the bolt and the nut (View AU).
       a) Tighten the bolt with your hand.
    4) Tighten the hose clamps to 15-18 pound-inches (1.7-2.0 newton-meters).
    5) ENGINES PRE-PW-SB 79-75;
       Tighten the bolt that attaches the clamp of the forward shield to 36-40 pound-inches (4.1-4.5 newton-meters).

S 414-072-N00

(10) ENGINES PRE-PW-SB 79-76;
Install the oil pressure tube for the No. 4 bearing:
(a) Remove protective caps from the tube fittings.
(b) Lubricate the tube nut threads of the center piece of the oil pressure tube with anti-seize paste.
(c) Attach the center piece of the oil pressure tube with the tube nuts.
    1) Tighten the tube nut with your hand.
(d) Install the tube clamp on the oil pressure tube to attach the No. 4 bearing scavenge tube with the bolt and nut.
    1) Lubricate the threads of the bolt with oil.
    2) Tighten the bolts with your hand.

(e) Install the tube clamp on the oil pressure tube at the bracket locations on Flanges M, N and P.
1) Lubricate the threads of the bolts with oil.
2) Tighten the bolts with your hand.

(f) Tighten all bolts of the tube clamps to 36-40 pound-inches (4.1- 4.5 newton-meters).

(g) Tighten the tube nuts of the oil pressure tube to 450-500 pound-inches (50.8-56.5 newton-meters).
1) Safety the tube nuts with lockwire or safety cable and safety cable ferrule.

(h) Install the spray shield between the engine case and tube nut on the oil pressure tube aft of Flange P, with the clamps.

(i) ENGINES PRE-PW-SB 79-54;
Attach the spray shield to the inboard side of the forward tube connection with the steps that follow:
1) Install the spray shield to the forward tube connection with the clamps.
2) Attach the rear of the spray shield with a hose clamp.
3) Tighten the hose clamp to 15-18 pound-inches (1.7-2.0 newton-meters).

(j) ENGINES POST-PW-SB 79-54;
Attach the spray shield to the inboard side of the forward tube connection with the steps that follow:
1) Install the spray shield to the inboard side of the forward tube connection to the front of the flange M.
2) Lubricate the threads of the bolt, which attaches the clamp, with engine oil.
3) Attach the forward end of the spray shield to the bracket on the diffuser case with a clamp and bolt.
4) Tighten the bolt for the clamp to 36-40 pound-inches (4.1-4.5 newton-meters).
5) Attach the rear end of the spray shield with a hose clamp.
6) Tighten the hose clamp to 15-18 pound-inches (1.7-2.0 newton-meters).

S 414-079-N00

(11) ENGINES POST-PW-SB 79-76;
Install the pressure tubes for the No.4 bearing:

(a) Remove the protection caps from the open ends of the pressure tubes for the No.4 bearing.

(b) Lubricate the packing for the strainer element with engine oil (View AA).
(c) Install the packing to the groove in the strainer element.
(d) Lubricate the threads of the strainer element with engine oil.
(e) Install the strainer element in the strainer housing.
    1) Tighten the strainer element with your hand.
(f) Lubricate the threads of the strainer housing with engine oil.
(g) Install the strainer housing to the internal tube-nut on the turbine exhaust case at the approximately 7 o'clock position.
    1) Tighten the tube nut with your hand.
(h) Put the forward pressure tube for the No.4 bearing in position on the engine.
(i) Connect the forward tube nut of the pressure tubes for the No.4 bearing (View AL).
    1) Tighten the tube nut with your hand.
(j) Put the rear pressure tube for the No.4 bearing in position on the engine.
(k) Connect the rear pressure tube for the No.4 bearing to the middle tube nut and to the strainer housing (Views AA and AK).
    1) Tighten the tube nuts with your hand.
(l) Install the three bolts and nuts that attach the clamps for the pressure tubes for the No.4 bearing (Views AB, AG and AH).
    1) Tighten the bolts with your hand.
(m) Install the six bolts that attach the clamps for the pressure tubes for the No.4 bearing (Views AC, AD, AF, AJ and AI).
    1) Tighten the bolts with your hand.
(n) Hold the strainer housing and tighten the strainer element to 150-170 pound-inches (16.9-19.2 newton-meters).
    1) Safety the strainer element with lockwire or safety cable and safety cable ferrule.
(o) Hold the strainer housing aligned with the pressure tube for the No.4 bearing and tighten the internal tube-nut to 270-300 pound-inches (30.5-33.9 newton-meters).
    1) Safety the internal tube-nut with lockwire or safety cable and safety cable ferrule.
(p) Tighten the three tube nuts of the pressure tubes for the No.4 bearing to 340-375 pound-inches (38.4-32.4 newton-meters) (Views AA, AK and AL).
    1) Safety the three tube nuts with lockwire or safety cable and safety cable ferrule.
(q) Tighten all clamp bolts 36-40 pound-inches (4.1-4.5 newton-meters).
(r) Install the shields at the connections of the pressure tube for the No.4 bearing with the steps that follow:
    1) Put the shields in position at the connections of the pressure tube for the No.4 bearing (Views AA, AK and AL).
    2) Attach the shields with the hose clamps.
    3) Tighten the three hose clamps to 15-18 pound-inches (1.7-2.0 newton-meters).

F. Return the Aircraft to Its Usual Condition.

S 414-035-N00
(1) Close the core cowl panels (AMM 71-11-06/201).

S 444-036-N00
(2) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

S 714-038-N00
(3) Do the test of the TCC LPT manifolds that is shown in the Power Plant Test Reference Table (AMM 71-00-00/501).

TURBINE CASE COOLING (TCC) AIR VALVE CONTROL CABLE - REMOVAL/ INSTALLATION

TASK 75-24-11-004-001-N00

1. Remove the TCC Air Valve Control Cable

A. References

(1) AMM 71-11-04/201, Fan Cowl Panels
(2) AMM 71-11-06/201, Core Cowl Panels
(3) AMM 78-31-00/201, Thrust Reverser System

B. Access

(1) Location Zones

411 Left Engine
421 Right Engine

(2) Access Panels

414AR Fan Cowl Panel (Right), Left Engine
416AR Thrust Reverser (Right), Left Engine
418AR Core Cowl Panel (Right), Left Engine
424AR Fan Cowl Panel (Right), Right Engine
426AR Thrust Reverser (Right), Right Engine
428AR Core Cowl Panel (Right), Right Engine

C. Prepare to Remove the TCC Air Valve Control Cable

S 014-002-N00

(1) Open the right fan cowl panel (AMM 71-11-04/201).

S 044-003-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT OPERATION OF THE THRUST REVERSER. ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(2) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

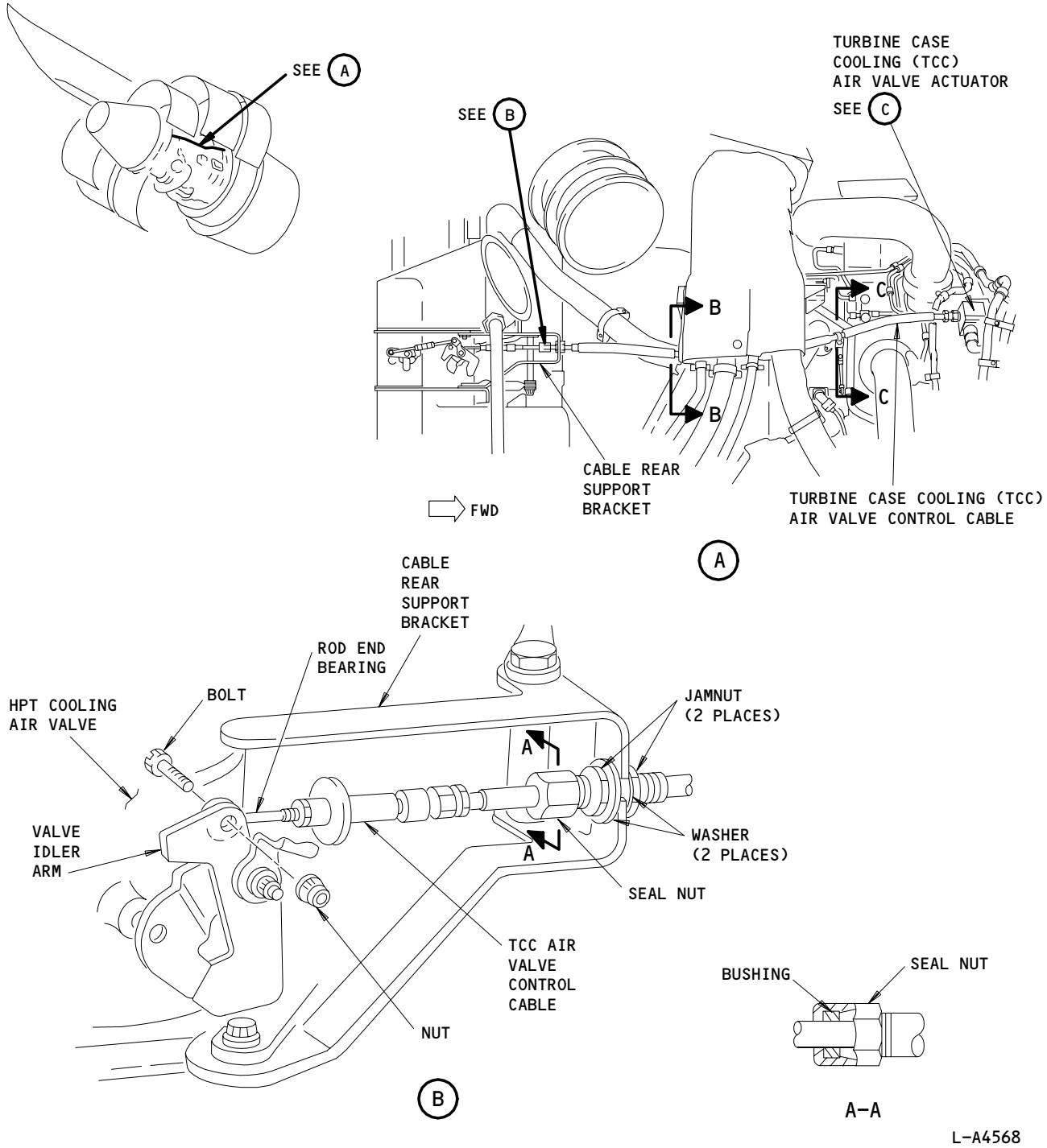
S 014-004-N00

(3) Open the right core cowl panel (AMM 71-11-06/201).

S 014-005-N00

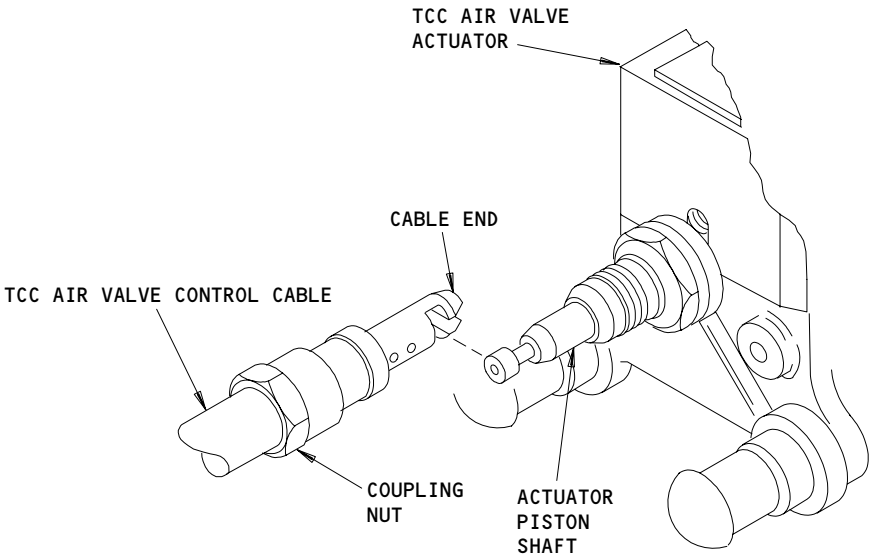
WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT COULD OCCUR.

(4) Open the right thrust reverser (AMM 78-31-00/201).

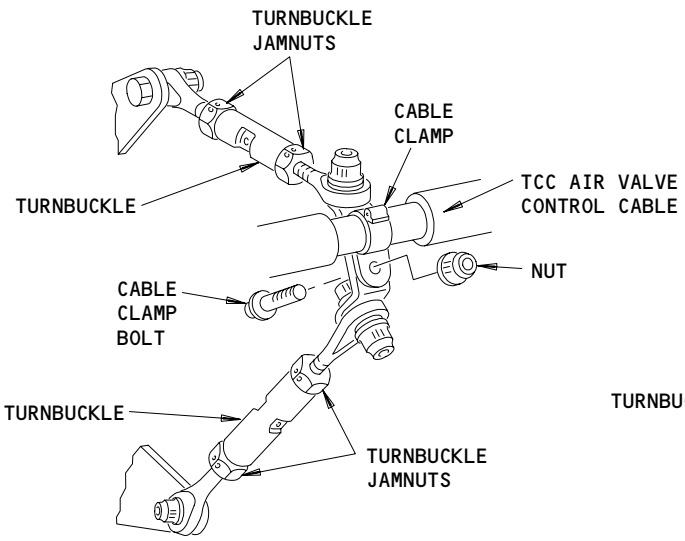


Turbine Case Cooling (TCC) Air Valve Control Cable Installation
Figure 401 (Sheet 1)

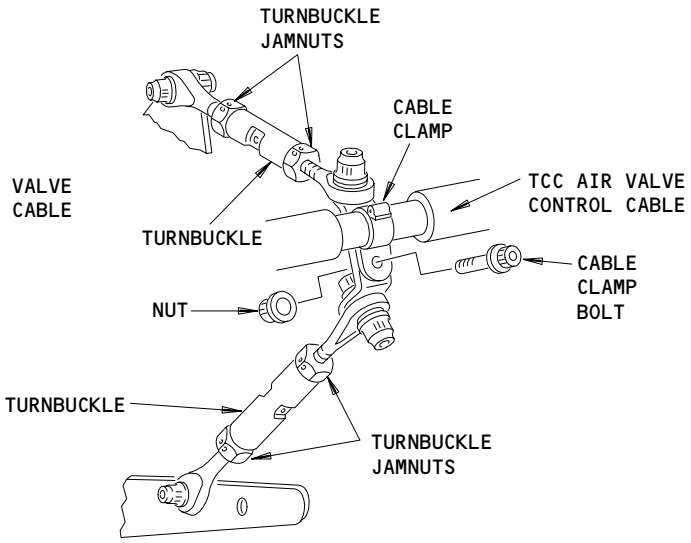
299451



C



ADJUSTABLE BRACKET
B–B



ADJUSTABLE BRACKET
C–C

Turbine Case Cooling (TCC) Air Valve Control Cable Installation
Figure 401 (Sheet 2)

D. Procedure

S 024-030-N00

(1) Remove the control cable of the TCC air valve (Fig. 401):
  (a) Disconnect the coupling nut from the TCC air valve actuator.
  (b) Remove the bolt and nut which attach the rod end bearing to the valve idler arm on the HPT cooling air valve.
  (c) Loosen the jamnuts at the rear support bracket on the control cable.
  (d) Remove the bolts and nuts which attach the cable clamps to the adjustable brackets (two places).
    1) Remove the cable clamps from the control cable.
  (e) Release the forward end of control cable from the actuator piston shaft on the TCC air valve actuator.
  (f) Remove the control cable from the engine.

TASK 75-24-11-404-012-N00

2. Install the TCC Air Valve Control Cable

A. Consumable Materials
  (1) D00137 Oil - PWA 521B
  (2) G02334 Lockwire - AS3214-02

B. References
  (1) AMM 71-00-00/501, Power Plant
  (2) AMM 71-11-04/201, Fan Cowl Panels
  (3) AMM 71-11-06/201, Core Cowl Panels
  (4) AMM 75-24-00/501, Turbine Cooling System
  (5) AMM 78-31-00/201, Thrust Reverser System

C. Access
  (1) Location Zones
    411 Left Engine
    421 Right Engine

  (2) Access Panels
    414AR Fan Cowl Panel (Right), Left Engine
    416AR Thrust Reverser (Right), Left Engine
    418AR Core Cowl Panel (Right), Left Engine
    424AR Fan Cowl Panel (Right), Right Engine
    426AR Thrust Reverser (Right), Right Engine
    428AR Core Cowl Panel (Right), Right Engine

D. Procedure

S 424-031-N00

(1) Install the control cable of the TCC air valve (Fig. 401):

(a) Connect the ends of the control cable of the TCC air valve as follows:

1) Tighten the seal nut on the aft end of the control cable to 150-200 pound-inches (16.9-22.6 newton-meters).

NOTE: While you tighten the seal nut, hold the control cable with a wrench. The bushing is engaged when the resistant load increases rapidly.

2) Loosen the seal nut on the aft end of the control cable one-quarter to one-half of a turn.
3) Move the TCC air valve actuator forward on the mount rails until it touches the front bracket stop.
4) Lubricate the threads of the coupling nut on the forward end of the control cable with oil.
5) Engage the forward end of the control cable with the actuator piston shaft.
6) Tighten the coupling nut with your hand until the end of the control cable engages with the actuator piston shaft.
7) Loosen the coupling nut one-quarter to one-half of a turn.
8) Lubricate the jamnuts on the aft end of the control cable with oil.
9) Put the aft end of control cable at 90 degrees to the slot on the rear support bracket on the control cable.

NOTE: Put the jamnuts on each side of the U-shaped slot in the rear support bracket. Install the washers between the jamnuts and bracket.

10) Tighten the jamnuts with your hand.

(b) Make sure the TCC air valve actuator is against the front bracket stop and that the coupling nut turns freely.

1) If the coupling nut does not turn freely, do the steps to connect the ends of the control cable again.

(c) Tighten the forward jamnut against the rear support bracket with your hand.

1) Keep the TCC air valve actuator forward.
2) Make sure the rearward end of the control cable is at 90 degrees to the slot in the rear support bracket.

(d) Tighten the rear jamnut with your hand to the position against the rear support bracket.

(e) While you hold the rear jamnut with a wrench, tighten the forward jamnut to 675-750 pound-inches (76.3-84.7 newton-meters).

1) Install lockwire to the jamnuts.

(f) Make sure the TCC air valve actuator is against the forward bracket stop, and that the coupling nut turns freely.
1) Tighten the coupling nut to 100-175 pound-inches (11.3-14.1 newton-meters).
2) Install lockwire on the coupling nut.

(g) Attach the control cable to the adjustable brackets as follows:
1) Install a cable clamp at each bracket location.
2) If the attached cable clamps apply stress to the control cable, adjust the adjustable brackets as follows:
a) Remove the lockwire from the turnbuckle jamnuts.
b) Loosen the turnbuckle jamnuts.
c) Adjust the turnbuckles as necessary to remove the stress on the control cable.
d) Lubricate the turnbuckle jamnuts with oil.
e) Tighten the turnbuckle jamnuts to 14-16 pound-inches (1.6-1.8 newton-meters).
f) Install lockwire on the turnbuckle jamnuts.
3) Lubricate the threads of the cable clamp bolts with oil.
4) Install the cable clamps to the adjustable brackets with the cable clamp bolts and nuts.
5) Tighten the cable clamp bolts to 85-95 pound-inches (9.6-10.7 newton-meters).

(h) Adjust the turbine cooling system (AMM 75-24-00/501).

NOTE: The rod end bearing is connected to the TCC cooling air valve when you adjust the turbine cooling system.

E. Return the Aircraft to Its Usual Condition

S 414-028-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT COULD OCCUR.

(1) Close the right thrust reverser (AMM 78-31-00/201).

S 414-025-N00

(2) Close the right core cowl panel (AMM 71-11-06/201).

S 444-027-N00

(3) Do the activation procedure for the thrust reversers (AMM 78-31-00/201).

S 414-026-N00

(4) Close the right fan cowl panel (AMM 71-11-04/201).

S 714-032-N00

(5) Do the test of the TCC air valve control cable that is shown in the Power Plant Test Reference Table (AMM 71-00-00/501).

TURBINE CASE COOLING (TCC) CONTROL CABLE BALL JOINT ASSEMBLY - REMOVAL/INSTALLATION

TASK 75-24-12-004-021-N00

1. Remove the TCC Control Cable Ball Joint Assembly

A. References

(1) AMM 71-11-04/201, Fan Cowl Panels
(2) AMM 71-11-06/201, Core Cowl Panels
(3) AMM 78-31-00/201, Thrust Reverser System

B. Access

(1) Location Zones

411 Left Engine
421 Right Engine

(2) Access Panels

414AR Fan Cowl Panel (Right), Left Engine
416AR Thrust Reverser (Right), Left Engine
418AR Core Cowl Panel (Right), Left Engine
424AR Fan Cowl Panel (Right), Right Engine
426AR Thrust Reverser (Right), Right Engine
428AR Core Cowl Panel (Right), Right Engine

C. Prepare to Remove the TCC Control-Cable Ball-Joint Assembly

S 014-015-N00

(1) Open the right fan cowl panel (AMM 71-11-04/201).

S 444-016-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT OPERATION OF THE THRUST REVERSER. ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(2) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 014-017-N00

(3) Open the right core cowl panel (AMM 71-11-06/201).

S 014-018-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT COULD OCCUR.

(4) Open the right thrust reverser (AMM 78-31-00/201).

D. Procedure

S 024-024-N00

(1) Remove the TCC control-cable ball-joint assembly (Fig. 401):

(a) Make marks on the assembly to show the position of the parts for installation.

(b) Remove the bolt and nut which attach the cable rod-end bearing to the valve idler arm at the Turbine Case Cooling (TCC) air shutoff valve (HPT).

(c) Remove the lockwire from the jamnut and the flange of the ball joint assembly.

(d) Remove the cable rod-end bearing and the jamnut from the ball joint assembly.

NOTE: Do not change the position of the jamnut on the rod-end bearing.

(e) Remove the lockwire from the ball joint assembly and the jamnut.

(f) Remove the ball joint assembly from the end of the cable rod.

NOTE: Do not change the position of the jamnut on the end of the cable rod.

TASK 75-24-12-404-020-N00

2. Install the TCC Control Cable Ball Joint Assembly

A. Consumable Materials

(1) D00137 Oil - PWA 521B

(2) G02334 Lockwire - AS3214-02

B. References

(1) AMM 71-11-04/201, Fan Cowl Panels

(2) AMM 71-11-06/201, Core Cowl Panels

(3) AMM 75-24-00/501, Turbine Cooling System

(4) AMM 78-31-00/201, Thrust Reverser System

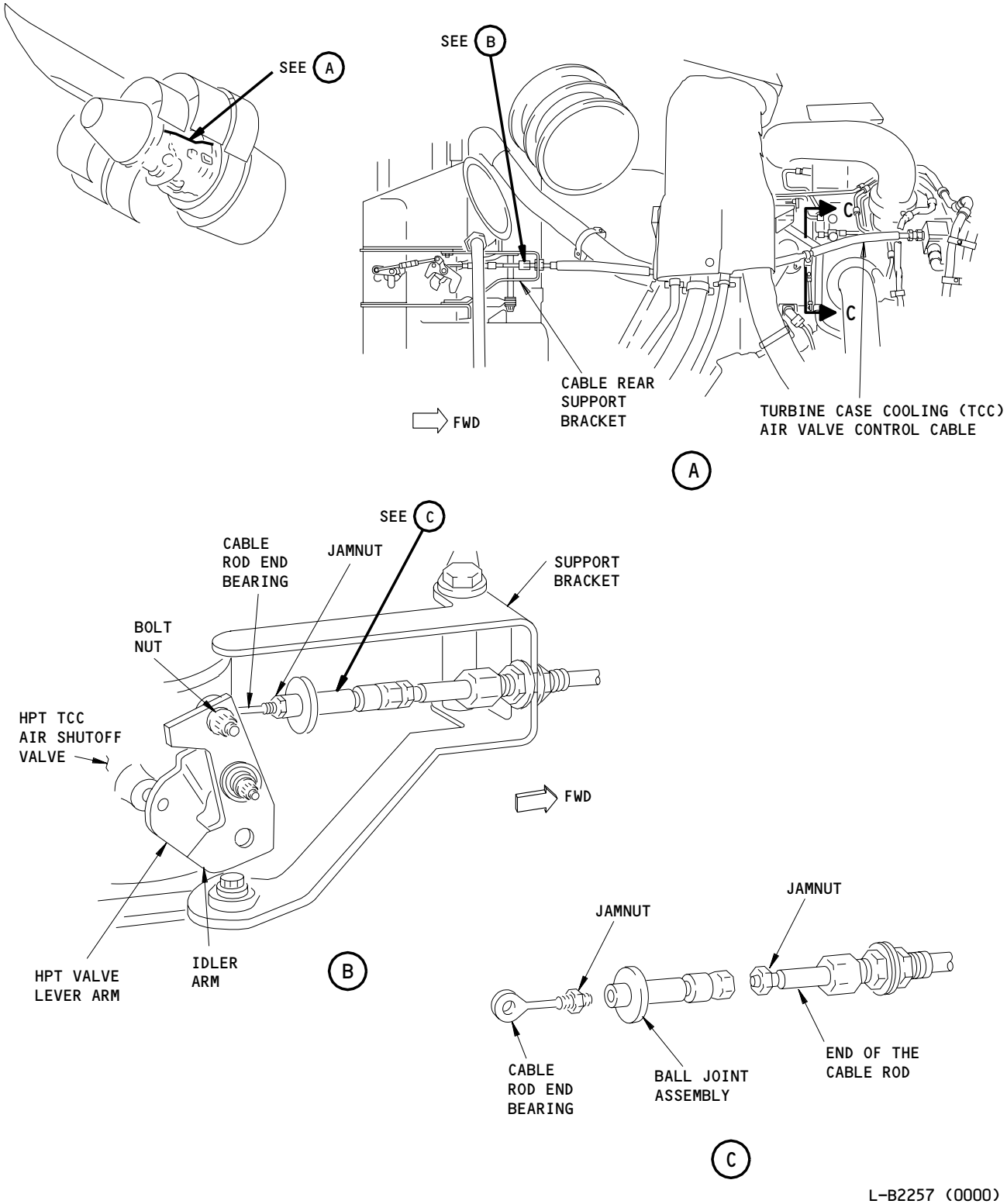
C. Access

(1) Location Zones

411 Left Engine
421 Right Engine

(2) Access Panels

414AR Fan Cowl Panel (Right), Left Engine
416AR Thrust Reverser (Right), Left Engine
418AR Core Cowl Panel (Right), Left Engine
424AR Fan Cowl Panel (Right), Right Engine
426AR Thrust Reverser (Right), Right Engine
428AR Core Cowl Panel (Right), Right Engine



Turbine Case Cooling (TCC) Control Cable Ball Joint Assembly Installation
Figure 401

D. Procedure

S 424-025-N00

(1) Install the TCC control-cable ball-joint assembly (Fig. 401):
   (a) Lubricate the threads of the cable rod-end bearing and the ball-joint assembly with engine oil.
   (b) Use the marks made on removal to assemble the parts to their correct position.
   (c) Install the ball joint assembly on the end of the cable rod against the jamnut.
      1) Tighten the jamnut to 32-36 pound-inches (3.6-4.1 newton-meters).
      2) Safety the jamnut to the ball joint assembly with lockwire.
   (d) Install the cable rod-end bearing with the installed jamnut to the ball joint assembly.

      NOTE: Do not tighten or safety the jamnut at this time. The Adjustment/Test procedure gives the instructions to tighten and safety the jamnut to the ball joint assembly.

   (e) Do the adjustment of the turbine cooling system (AMM 75-24-00/501).

E. Return the Aircraft to Its Usual Condition

S 414-022-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT COULD OCCUR.

(1) Close the right thrust reverser (AMM 78-31-00/201).

S 414-012-N00

(2) Close the right core cowl panel (AMM 71-11-06/201).

S 444-013-N00

(3) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

S 414-014-N00

(4) Close the right fan cowl panel (AMM 71-11-04/201).

TURBINE VANE AND BLADE COOLING AIR VALVE POSITION SWITCH - REMOVAL/INSTALLATION

1. General
   A. This procedure is for engines without Pratt & Whitney SB 75-107 or Phase 3 changes.

      NOTE: Pratt & Whitney SB 75-107 and Phase 3 changes remove the Turbine Vane and Blade Cooling Air (TVBCA) Valve Position Switch.

   B. This procedure has two tasks. The first task removes the position switch from the turbine vane and blade (TVB) cooling air valve. The second task installs the position switch to the TVB cooling air valve.

   TASK 75-24-13-004-001-N00

2. Remove the Turbine Vane and Blade Cooling Air Valve Position Switch
   A. References
      (1) AMM 71-11-04/201, Fan Cowl Panels
      (2) AMM 71-11-06/201, Core Cowl Panels
      (3) AMM 78-31-00/201, Thrust Reverser System
   B. Access
      (1) Location Zones
          411 Left Engine
          421 Right Engine

      (2) Access Panels
          416AR Fan Reverser (Right)
          426AR Fan Reverser (Right)

   C. Prepare to Remove the Position Switch for the TVB Cooling Air Valve

      S 864-002-N00
      (1) For the left engine, open these circuit breakers on the overhead circuit breaker panel, P11, and attach the DO-NOT-CLOSE tags:
          (a) 11L3, L ENG PERF SOL CHAN A
          (b) 11L4, L ENG PERF SOL CHAN B

      S 864-003-N00
      (2) For the right engine, open these circuit breakers on the overhead circuit breaker panel, P11, and attach the DO-NOT-CLOSE tags:
          (a) 11L30, R ENG PERF SOL CHAN A
          (b) 11L31, R ENG PERF SOL CHAN B

      S 014-004-N00
      (3) Open the right fan cowl panel (AMM 71-11-04/201).

S 044-005-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

(4) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 014-006-N00

(5) Open the right core cowl panel (AMM 71-11-06/201).

S 014-007-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(6) Open the right thrust reverser (AMM 78-31-00/201).

D. Remove the Position Switch (Fig. 401)

S 034-008-N00

(1) Disconnect the electrical connector from the position switch on the right TVB cooling air valve.

S 024-009-N00

(2) Remove the bolts which attach the position switch to the outer surface of TVB cooling air valve.

S 024-010-N00

(3) Remove the position switch from the engine.

TASK 75-24-13-404-011-N00

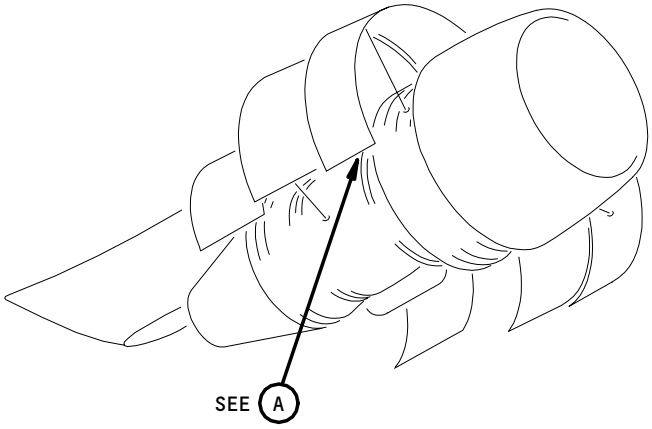
3. Install the Turbine Vane and Blade Cooling Air Valve Position Switch

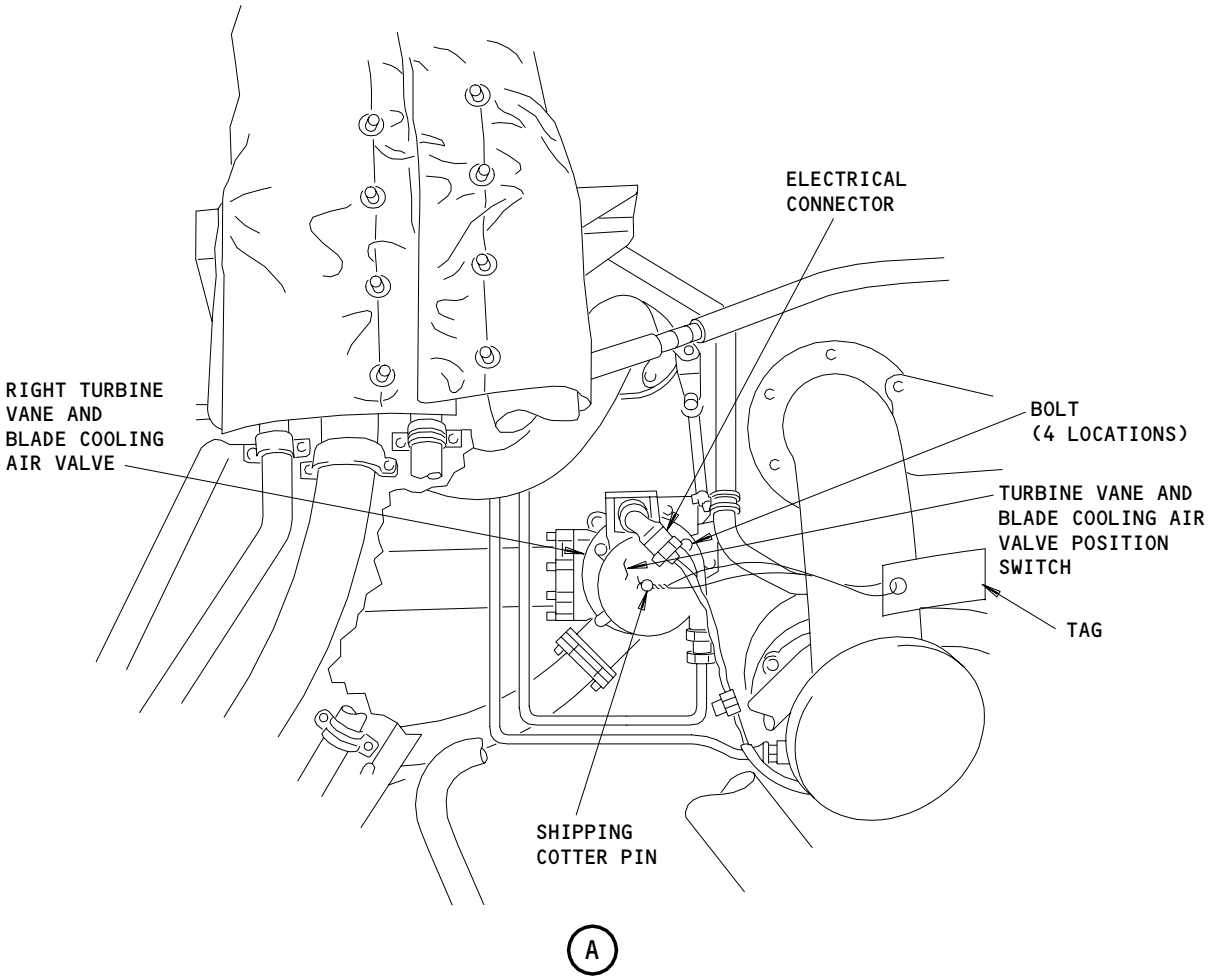
A. Equipment

(1) Wrench - Strap, Model TG-70, Glenair, Inc., 1211 Air Way, Glendale, CA 91201; or Model BT-BS -601, Daniels Mfg. Corp., 6103 Anno Ave., Orlando, FL 32809

B. Consumable Materials

(1) D00137 Engine Oil - PWA 521





Turbine Vane and Blade Cooling Air Valve Position Switch Installation
Figure 401

(2) GO2333 Lockwire (0.020 inch diameter) - AS3214-01

C. References
(1) AMM 71-00-00/501, Power Plant
(2) AMM 71-11-04/201, Fan Cowl Panels
(3) AMM 71-11-06/201, Core Cowl Panels
(4) AMM 78-31-00/201, Thrust Reverser System

D. Access
(1) Location Zones
411 Left Engine
421 Right Engine

(2) Access Panels
416AR Fan Reverser (Right)
426AR Fan Reverser (Right)

E. Procedure (Fig. 401)

S 424-012-N00
(1) Install the position switch on the TVB cooling air valve.
(a) Make sure you align the holes for the bolts.

S 644-013-N00
(2) Lubricate the threads of the bolts, which attach the position switch, with engine oil.

S 424-014-N00
(3) Attach the position switch to the TVB cooling air valve with the bolts.
(a) Tighten the bolts to 36-40 pound-inches (4.1-4.5 newton-meters).

S 434-015-N00
(4) Connect the electrical connector to the position switch.

S 434-023-N00

CAUTION: WHEN YOU USE THE STRAP WRENCH, YOU MUST ADJUST THE TORQUE WRENCH VALUE (AMM 70-24-05/201). IF YOU DO NOT ADJUST THE TORQUE WRENCH VALUE, THE INCORRECT TORQUE CAN CAUSE DAMAGE TO THE ELECTRICAL CONNECTOR AND UNSATISFACTORY LIGHTNING PROTECTION.

(5) Use the strap wrench to tighten the electrical connector to 30-35 pound-inches (3.4-4.0 newton-meters)(AMM 70-24-05/201).
(a) Install the lockwire (AS3214-01) to the electrical connector.

S 034-022-N00
(6) If it is necessary, remove the shipping cotter pin and tag from the face of the position switch.

F. Put the Airplane Back to Its Usual Condition

S 414-016-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Close the right thrust reverser (AMM 78-31-00/201).

S 414-017-N00

(2) Close the right core cowl panel (AMM 71-11-06/201).

S 414-018-N00

(3) Close the right fan cowl panel (AMM 71-11-04/201).

S 444-019-N00

(4) Do the activation procedure for the thrust reversers (AMM 78-31-00/201).

S 864-020-N00

(5) For the left engine, remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:
(a) 11L3, L ENG PERF SOL CHAN A
(b) 11L4, L ENG PERF SOL CHAN B

S 864-021-N00

(6) For the right engine, remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:
(a) 11L30, R ENG PERF SOL CHAN A
(b) 11L31, R ENG PERF SOL CHAN B

S 714-024-N00

(7) Do the test for the Turbine Vane and Blade Cooling Air Valve Position Switch that is shown in the Power Plant Test Reference Table (AMM 71-00-00/501).

TURBINE VANE AND BLADE COOLING AIR VALVE AND IDG AIR/OIL HEAT EXCHANGER VALVE OVERRIDE SOLENOID - REMOVAL/INSTALLATION

1. General
   A. This procedure is for engines with the Phase 3 engine changes. For engines without the Phase 3 changes, do this procedure: HPC Secondary Flow Control Valve and IDG Air/Oil Heat Exchanger Valve Override Solenoid (AMM 75-33-04/401).
   B. This procedure gives the instructions to remove and install the solenoid for the Turbine Vane and Blade Cooling Air (TVBCA) valve and the IDG air/oil heat exchanger valve override. The solenoid for the TVBCA valve and the IDG air/oil heat exchanger valve override will be referred to as the solenoid for this procedure.
   C. The solenoid is installed on the aft face of the intermediate case at the 1 o'clock position.
   D. You can get access to the solenoid through the right thrust reverser.

TASK 75-24-15-004-046-N00

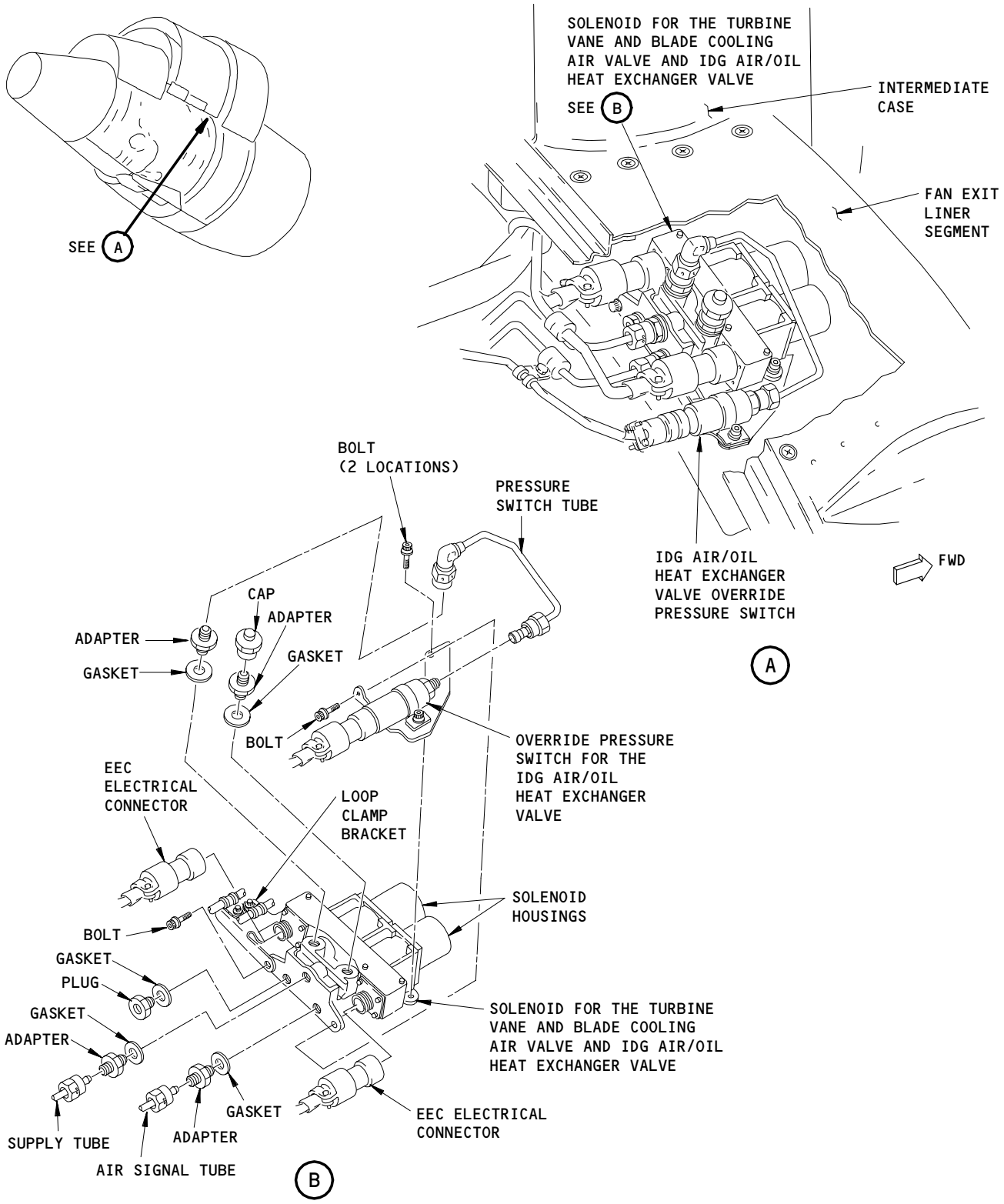
2. Remove the Turbine Vane and Blade Cooling Air Valve and IDG Air/Oil Heat Exchanger Valve Override Solenoid (Fig. 401)
   A. References
      (1) AMM 71-11-04/201, Fan Cowl Panels
      (2) AMM 71-11-06/201, Core Cowl Panels
      (3) AMM 72-34-03/401, Fan Exit Liner Segment
      (4) AMM 78-31-00/201, Thrust Reverser System
   B. Access
      (1) Location Zone
          411 Left Engine
          421 Right Engine

      (2) Access Panels
          414AR Fan Cowl Panel (Right), Left Engine
          416AR Thrust Reverser (Right), Left Engine
          418AR Core Cowl Panel (Right), Left Engine
          424AR Fan Cowl Panel (Right), Right Engine
          426AR Thrust Reverser (Right), Right Engine
          428AR Core Cowl Panel (Right), Right Engine

   C. Prepare to Remove the Solenoid

      S 864-042-N00
      (1) For the left engine, open these circuit breakers on the overhead circuit breaker panel, P11, and attach the DO-NOT-CLOSE tags:
          (a) 11L3, L ENG PERF SOL CHAN A
          (b) 11L4, L ENG PERF SOL CHAN B

      S 864-043-N00
      (2) For the right engine, open these circuit breakers on the overhead circuit breaker panel, P11, and attach the DO-NOT-CLOSE tags:
          (a) 11L30, R ENG PERF SOL CHAN A
          (b) 11L31, R ENG PERF SOL CHAN B



Solenoid for the Turbine Vane and Blade Cooling Air Valve and IDG Air/Oil Heat Exchanger Valve - Installation
Figure 401

D17749

EFFECTIVITY
ENGINES WITH THE TVBCA VALVE AND IDG AIR/OIL HEAT EXCHANGER VALVE OVERRIDE SOLENOID (WITH PHASE 3 CHANGES)

S 014-047-N00

(3) Open the right fan cowl panel (AMM 71-11-04/201).

S 044-048-N00

WARNING: DO THE DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

(4) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).

S 014-050-N00

(5) Open the right core cowl panel (AMM 71-11-06/201).

S 014-051-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 TO OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(6) Open the right thrust reverser (AMM 78-31-00/201).

S 014-052-N00

(7) Remove the No. 1 segment of the fan exit liner (AMM 72-34-03/401).

D. Procedure

S 024-094-N00

(1) Remove the solenoid:
   (a) Disconnect the EEC electrical connectors from the solenoid.
      1) Install protection caps to the EEC electrical connectors.
   (b) Disconnect the tube nuts of the supply tube and air signal tube from the solenoid.
   (c) Disconnect the tube nut of the pressure switch tube from the top of the solenoid.
   (d) Disconnect the tube nut of the pressure switch tube from the pressure switch.
   (e) Remove the pressure switch tube from the engine.

(f) Remove the four bolts which attach the solenoid, pressure switch bracket and loop clamp bracket to the intermediate case.
(g) Move the pressure switch and bracket assembly away from the work area.
(h) Remove the solenoid from below the loop clamp bracket.

S 024-095-N00

(2) If it is necessary to replace the solenoid, do the steps that follow:
(a) Remove the plug, the two adapters and the gaskets from the rear of the solenoid.
1) Discard the gaskets.
(b) Remove the cap from the adapter on the top of the solenoid.
(c) Remove the two adapters and gaskets from the top of the solenoid.
1) Discard the gaskets.

S 024-096-N00

(3) Install protection covers to all openings in the solenoid and to all open tube ends.

TASK 75-24-15-404-018-N00

3. Install the Turbine Vane and Blade Cooling Air Valve and IDG Air/Oil Heat Exchanger Valve Override Solenoid (Fig. 401)

A. Equipment
(1) M303, M305, or M307 Bergen Mechanical Crimper
Bergen Cable Technologies Inc
170 Gregg St
P.O. Box 1300
Lodi, NJ 07644-9982

B. Consumable Materials
(1) D00390 Oil - Engine
(2) D50124 Paste - Anti-seize - P06-054
(3) G02334 Lockwire - AS3214-02
(4) G02332 Ferrule - P05-292 (Optional)

(5) GO2335 Cable - Safety - PO5-291 (Optional)

C. References
(1) AMM 70-24-05/201, Electrical Harnesses
(2) AMM 71-00-00/501, Power Plant
(3) AMM 71-11-04/201, Fan Cowl Panels
(4) AMM 71-11-06/201, Core Cowl Panels
(5) AMM 72-34-03/401, Fan Exit Liner Segment
(6) AMM 78-31-00/201, Thrust Reverser System

D. Access
(1) Location Zone
411 Left Engine
421 Right Engine

(2) Access Panels
414AR Fan Cowl Panel (Right), Left Engine
416AR Thrust Reverser (Right), Left Engine
418AR Core Cowl Panel (Right), Left Engine
424AR Fan Cowl Panel (Right), Right Engine
426AR Thrust Reverser (Right), Right Engine
428AR Core Cowl Panel (Right), Right Engine

E. Prepare to Install the Solenoid

S 424-097-N00
(1) Remove the protection covers from all openings in the solenoid.

S 424-098-N00
(2) If it is necessary to install a new solenoid, do the steps that follow:
(a) Lubricate the threads of the two adapters, which are to be installed on the top of the override solenoid, with engine oil.
(b) Install the two adapters with the new gaskets to the threaded ports on the top of the solenoid.
1) Tighten the adapters to 65-75 pound-inches (7.3-8.5 newton-meters).
(c) Lubricate the threads of the cap with engine oil.
(d) Install the cap to the adapter on the right rear of the solenoid.
1) Hold the adapter and tighten the cap to 90-100 pound-inches (10.2-11.3 newton-meters).
(e) Lubricate the threads of the larger adapter with engine oil.
(f) Install a new gasket to the larger adapter.
(g) Install the larger adapter in the center port on the rear of the solenoid.
1) Tighten the larger adapter to 150-170 pound-inches (16.9-19.2 newton-meters).
(h) Lubricate the threads of the smaller adapter with engine oil.
(i) Install a new gasket to the smaller adapter.

(j) Install the smaller adapter in the right port on the rear of the solenoid.
1) Tighten the smaller adapter to 110-120 pound-inches (12.4-13.6 newton-meters).
(k) Lubricate the threads of the plug with engine oil.
(l) Install a new gasket to the plug.
(m) Install the plug in the left port on the rear of the override solenoid.
1) Tighten the plug to 110-120 pound-inches (12.4-13.6 newton-meters).

F. Procedure

S 424-099-N00
(1) Install the solenoid:
(a) Lubricate the threads of the four bolts, which attach the solenoid, with engine oil.
(b) Put the solenoid in position below the loop clamp bracket on the intermediate case with the electrical receptacles to the rear.
1) Align the bolt holes on the solenoid lugs with the bolt holes on the intermediate case.
(c) Put the pressure switch and bracket assembly in position on the intermediate case.
1) Align the bolt holes of the bracket assembly with the bolt holes of the solenoid.
(d) Attach the bracket, the loop clamp bracket and the solenoid to the intermediate case with the four bolts.
1) Tighten the bolts to 85-95 pound-inches (9.6-10.7 newton-meters).
(e) Remove the protection covers from all open tube ends.
(f) Lubricate the threads of the center (larger) adapter on the rear of the solenoid with the anti-seize paste.
(g) Connect the supply tube to the center (larger) adapter on the rear of the solenoid.
1) Tighten the tube nut to 225-250 pound-inches (25.4-28.2 newton-meters).
(h) Lubricate the threads of the lower (smaller) adapter on the rear of the override solenoid with engine oil.

(i) Connect the air signal tube to the lower (smaller) adapter on the rear of the solenoid.
   1) Tighten the tube nut to 270-300 pound-inches (30.5-33.9 newton-meters).
(j) Safety the plug and the tube nuts of the air signal tube and the supply tube with lockwire or safety cable and safety cable ferrule.
(k) Lubricate the threads of the tube nuts of the pressure switch tube:
   1) Lubricate the threads of the tube nut on the elbow end with engine oil.
   2) Lubricate the threads of the tube nut on the straight end with anti-seize paste.
(l) Put the pressure switch tube in position between the pressure switch and the adapter on top of the solenoid.
(m) Connect the tube nut (elbow end) of the pressure switch tube to the adapter on the top of the solenoid.
   1) Tighten the tube nut with your hand.
(n) Connect the tube nut (straight end) of the pressure switch tube to the pressure switch.
   1) Tighten the tube nut with your hand.
(o) Hold the adapter and tighten the tube nut on the elbow end of the pressure switch tube to 90-100 pound-inches (10.2-11.3 newton-meters).
(p) Hold the pressure switch and tighten the tube nut on the straight end of the pressure switch tube to 65-75 pound-inches (7.3-8.5 newton-meters).
(q) Safety the two tube nuts and the cap with lockwire or safety cable and safety cable ferrule.
(r) Remove the protection caps from the EEC electrical connectors.

CAUTION: USE THE CORRECT ASSEMBLY PROCEDURE, AND TOOLS, FOR THE HARNESS CONNECTOR INSTALLATION (AMM 70-24-05/201). IF YOU USE THE INCORRECT ASSEMBLY PROCEDURE, OR TOOLS, A DAMAGED OR LOOSE CONNECTOR CAN OCCUR. A LOOSE CONNECTOR PERMITS VIBRATION, WHICH CAUSES THE CONTACTS TO WEAR AND DECREASES THE LIGHTNING PROTECTION.

(s) Connect the EEC electrical connectors to the connectors on the solenoid (AMM 70-24-05/201).

G. Return the Aircraft to Its Usual Condition.

S 414-079-N00
(1) Install the No. 1 segment of the fan exit liner (AMM 72-34-03/401).

S 414-080-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 TO CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Close the right thrust reverser (AMM 78-31-00/201).

S 414-081-N00
(3) Close the right core cowl panel (AMM 71-11-06/201).

S 414-082-N00
(4) Close the right fan cowl panel (AMM 71-11-04/201).

S 444-083-N00
(5) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

S 864-084-N00
(6) For the left engine, remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:
(a) 11L3, L ENG PERF SOL CHAN A
(b) 11L4, L ENG PERF SOL CHAN B

S 864-045-N00
(7) For the right engine, remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:
(a) 11L30, R ENG PERF SOL CHAN A
(b) 11L31, R ENG PERF SOL CHAN B

S 714-085-N00
(8) Do the test of the turbine vane and blade cooling air valve and IDG Air/oil heat exchanger valve override solenoid that is shown in the Power Plant Test Reference Table (AMM 71-00-00/501).

TURBINE VANE COOLING AIR VALVE - REMOVAL/INSTALLATION

1. General
   A. This procedure gives the instructions for the removal and the installation of the Turbine Vane Cooling Air (TVCA) valve. This procedure is for engines with the Phase 3 changes only. Engines without the Phase 3 changes do not have this valve.
   B. There is one TVCA valve located on the HPC case on the right side of the engine at the 2:30 o'clock position.
   C. You can get access to the TVCA valve through the right thrust reverser half.

TASK 75-24-16-004-001-N00

2. Remove the Turbine Vane Cooling Air Valve (Fig. 401)
   A. References
      (1) AMM 71-11-04/201, Fan Cowl Panel
      (2) AMM 71-11-06/201, Core Cowl Panel
      (3) AMM 78-31-00/201, Thrust Reverser System
   B. Access
      (1) Location Zones
          411 Left Engine - HPC Rear Case
          421 Right Engine - HPC Rear Case

      (2) Access Panels
          414AR Fan Cowl Panel (Right), Left Engine
          416AR Thrust Reverser (Right), Left Engine
          418AR Core Cowl Panel (Right), Left Engine
          424AR Fan Cowl Panel (Right), Right Engine
          426AR Thrust Reverser (Right), Right Engine
          428AR Core Cowl Panel (Right), Right Engine

   C. Procedure

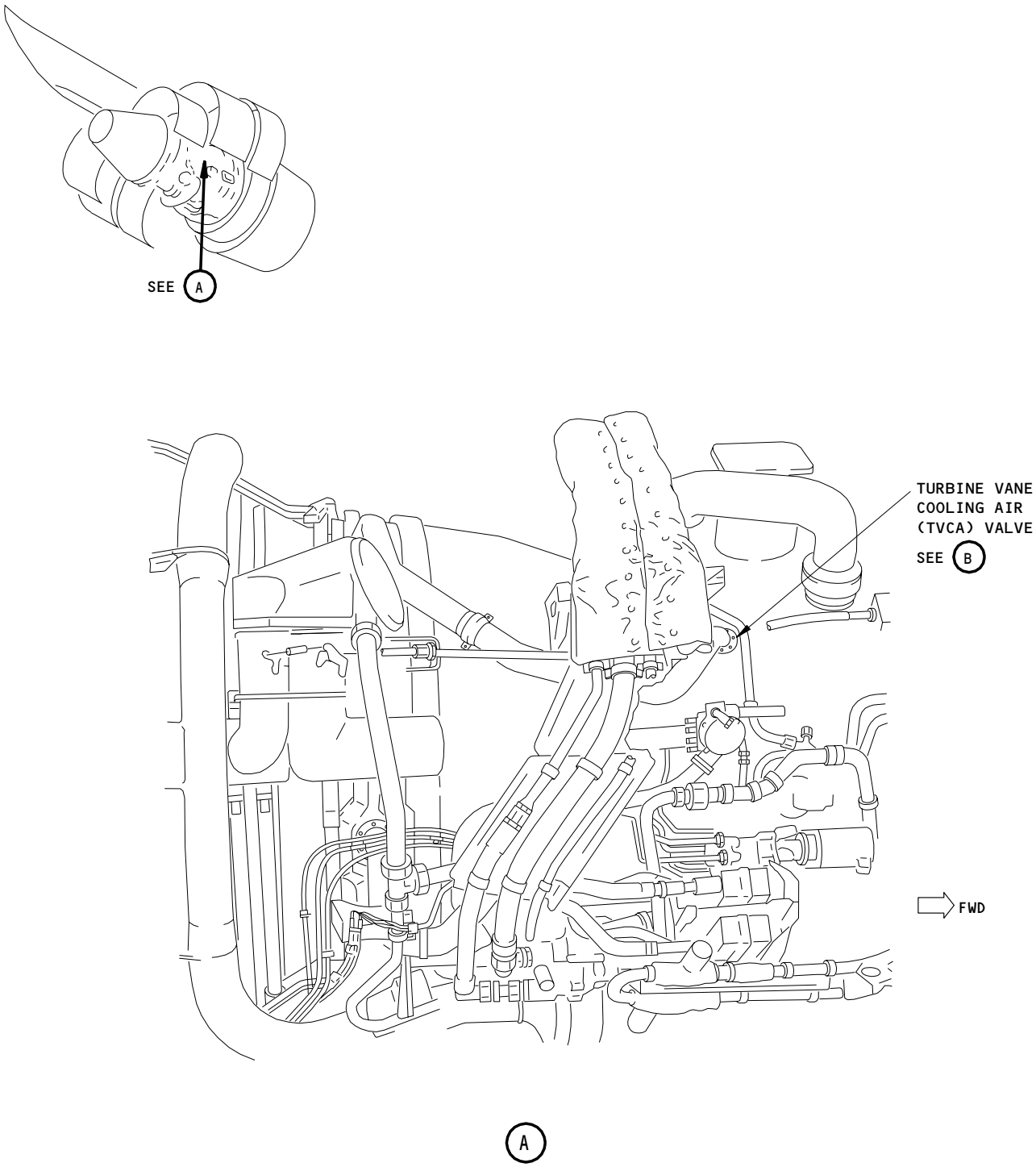
      S 044-002-N00

      WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

      (1) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).

      S 014-003-N00
      (2) Open the right fan cowl panel (AMM 71-11-04/201).

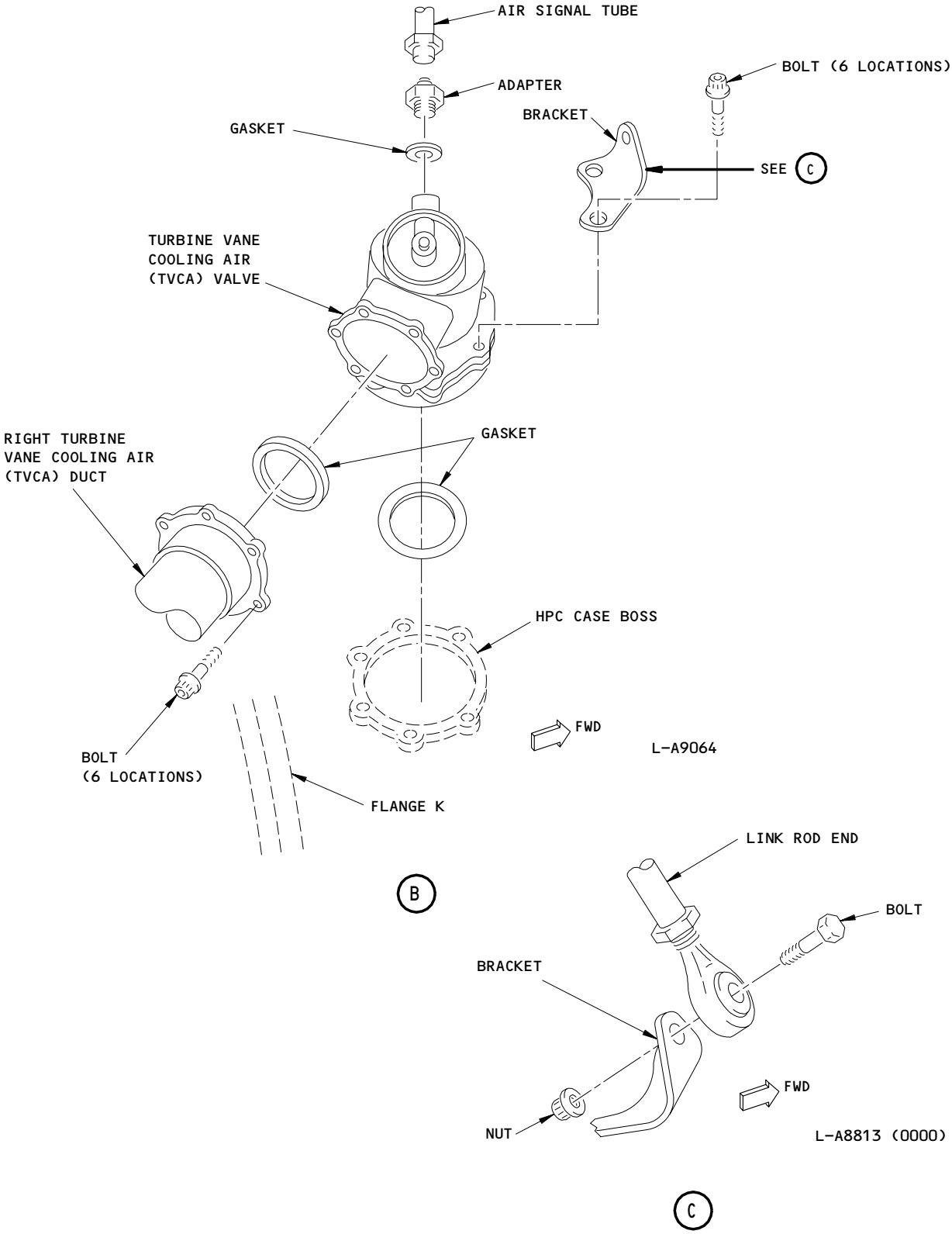
      S 014-004-N00
      (3) Open the right core cowl panel (AMM 71-11-06/201).



Valve for the Turbine Vane Cooling Air - Installation
Figure 401 (Sheet 1)

D17753

EFFECTIVITY
ENGINES WITH THE TURBINE VANE COOLING AIR VALVE (ENGINES WITH PHASE 3 CHANGES)



Valve for the Turbine Vane Cooling Air - Installation
Figure 401 (Sheet 2)

S 014-005-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(4) Open the right thrust reverser (AMM 78-31-00/201).

D. Procedure

S 024-033-N00

(1) Remove the TVCA valve.
  (a) Remove the lockwire from the tube nut of the air signal tube.
  (b) Disconnect the air signal tube from the TVCA valve.
  (c) Remove the bolts that attach the flange of the right TVCA duct to the TVCA valve.
    1) Discard the gasket.
  (d) Remove the bolt and nut that attach the link rod end to the bracket on the TVCA valve flange.
  (e) Remove the bolts that attach the TVCA valve and the bracket to the HPC case boss.
  (f) Remove the TVCA valve and the bracket from the engine.
    1) Discard the gasket.

S 024-035-N00

(2) If it is necessary to replace the TVCA valve, do the steps that follow:
  (a) Remove the adapter with the gasket.
    1) Discard the gasket.

S 024-034-N00

(3) Install protection covers on the TVCA duct, the air signal tube, the HPC case boss and the openings in the TVCA valve.

TASK 75-24-16-404-014-N00

3. Install the Turbine Vane Cooling Air Valve

A. Equipment
  (1) M303, M305, or M307 Bergen Mechanical Crimper
    Bergen Cable Technologies Inc
    170 Gregg St
    P.O. Box 1300
    Lodi, NJ 07644-9982

B. Consumable Materials
  (1) D00390 Oil - Engine
  (2) G00964 Compound - Antigalling, Fel-Pro C-200
  (3) G00767 Wax - Paraffin, PMC 9552

(4) GO2334 Lockwire - AS3214-02
(5) GO2332 Ferrule - PO5-292 (Optional)
(6) GO2335 Cable - Safety - PO5-291 (Optional)

C. References
(1) AMM 71-00-00/501, Power Plant
(2) AMM 71-11-04/201, Fan Cowl Panel
(3) AMM 71-11-06/201, Core Cowl Panel
(4) AMM 78-31-00/201, Thrust Reverser System

D. Access
(1) Location Zones
411 Left Engine - Fwd HPT Case
421 Right Engine - Fwd HPT Case

(2) Access Panels
414AR Fan Cowl Panel (Right), Left Engine
416AR Thrust Reverser (Right), Left Engine
418AR Core Cowl Panel (Right), Left Engine
424AR Fan Cowl Panel (Right), Right Engine
426AR Thrust Reverser (Right), Right Engine
428AR Core Cowl Panel (Right), Right Engine

E. Prepare to Install the TVCA valve

S 424-016-N00
(1) If it is necessary to install a new TVCA valve, do the steps that follow:
(a) Remove the protection cover from the port of the air signal tube connection in the TVCA valve.
(b) Install a new gasket to the adapter.
(c) Lubricate the adapter threads with engine oil.
(d) Install the adapter in the port in the TVCA valve.
1) Tighten the adapter to 110-120 pound-inches (12.4-13.6 newton-meters).

F. Procedure

S 424-036-N00
(1) Install the TVCA valve.
(a) Remove the protection covers from the TVCA duct, the air signal tube, the HPC case boss and the openings in the TVCA valve.
(b) Install a new gasket to the HPC case boss.
1) Attach the gasket to the HPC case boss with paraffin wax.
(c) Install a new gasket to the flange of the right TVCA duct.
1) Attach the gasket to the flange with paraffin wax.
(d) Lubricate the threads of the bolts that attach the TVCA valve and the bracket with engine oil.

(e) Install the TVCA valve and the bracket to the HPC case boss with the bolts.
1) Tighten the bolts to 85-95 pound-inches (9.6-10.7 newton-meters).
2) Without loosening, tighten the bolts again until the torque is kept.
(f) Lubricate the threads of the bolts that attach the right TVCA duct to the TVCA valve with engine oil.
(g) Attach the right TVCA duct to the TVCA valve with the bolts.
1) Tighten the bolts to 85-95 pound-inches (9.6-10.7 newton-meters).
2) Without loosening, tighten the bolts again until the torque is kept.
(h) Lubricate the threads of the bolt that attaches the link rod end to the bracket with engine oil.
(i) Attach the link rod end to the bracket with the bolt and the nut.
1) Tighten the bolt to 36-40 pound-inches (4.1-4.5 newton-meters).
(j) Lubricate the threads of the adapter for the air signal tube with antigalling compound.
(k) Connect the air signal tube to the adapter.
1) Hold the adapter and tighten the tube nut to 200-225 pound-inches (22.6-25.4 newton-meters).
2) Safety the tube nut with lockwire or safety cable and safety cable ferrule.

G. Return the Aircraft to Its Usual Condition.

S 414-026-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Close the right thrust reverser (AMM 78-31-00/201).

S 414-027-N00
(2) Close the right core cowl panel (AMM 71-11-06/201).

S 414-028-N00
(3) Close the right fan cowl panel (AMM 71-11-04/201).

S 444-029-N00
(4) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

S 714-030-N00

(5) Do the test for the turbine vane cooling air valve that is shown in the Power Plant Test Reference Table (AMM 71-00-00/501).

TURBINE VANE COOLING AIR VALVE AND TURBINE VANE AND BLADE COOLING AIR VALVE SOLENOID - REMOVAL/INSTALLATION

1. General
   A. This procedure is for engines with the Phase 3 changes. For engines without the Phase 3 changes, do this procedure: HPC Secondary Flow Control Valve and Turbine Vane and Blade Cooling Air Valve Solenoid (AMM 75-33-03/401).
   B. This procedure gives the instructions for the removal and the installation of the solenoid for the Turbine Vane Cooling Air (TVCA) Valve and the Turbine Vane and Blade Cooling Air (TVBCA) Valve. The solenoid for the TVCA Valve and the TVBCA Valve will be referred to as the solenoid for this procedure.
   C. The solenoid is installed on the aft face of the intermediate case at the 10 o'clock position.
   D. You can get access to the solenoid through the left thrust reverser.

TASK 75-24-17-004-001-N00

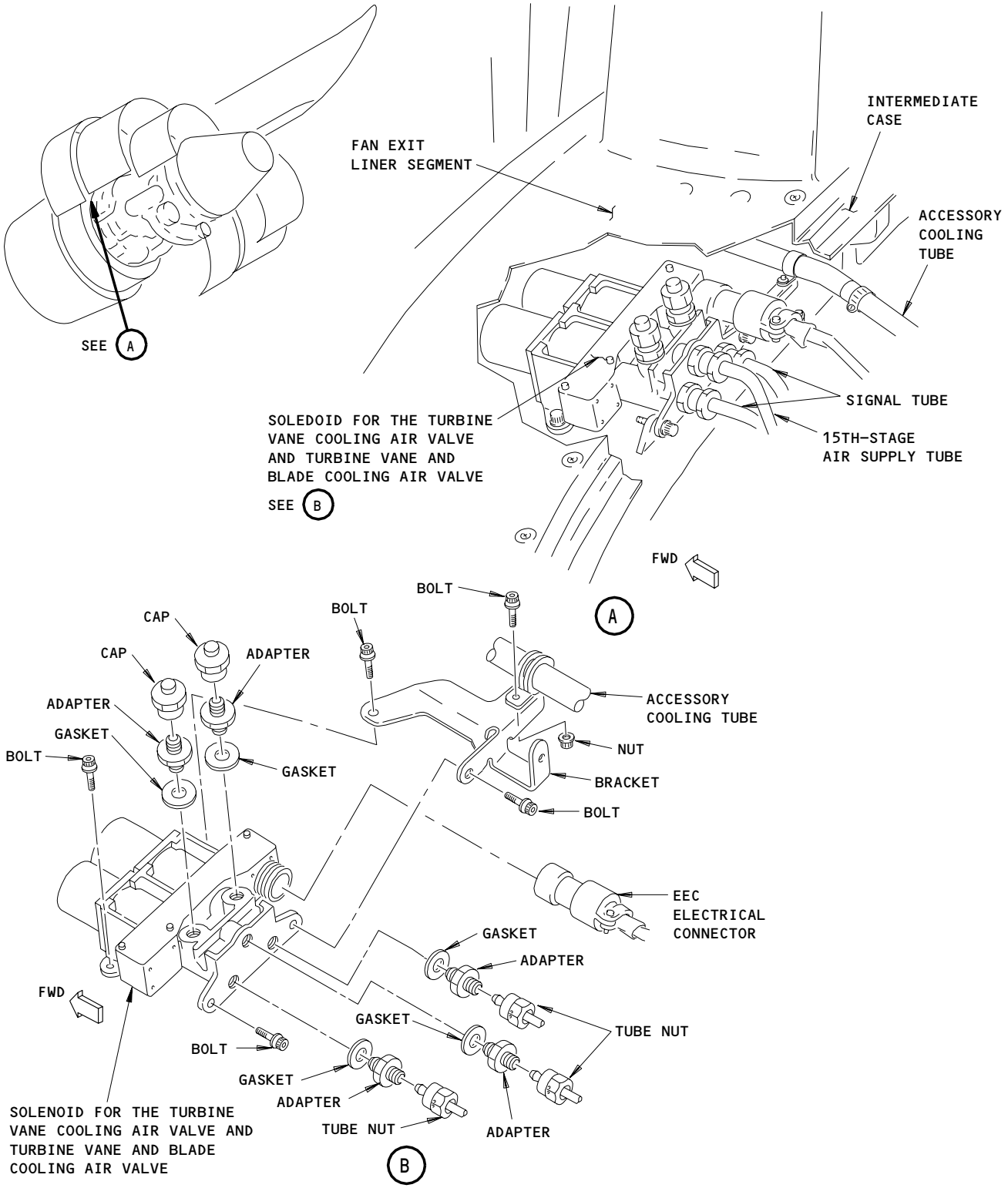
2. Remove the Turbine Vane Cooling Air Valve and Turbine Vane and Blade Cooling Air Valve Solenoid (Fig. 401)
   A. References
      (1) AMM 71-11-04/201, Fan Cowl Panels
      (2) AMM 71-11-06/201, Core Cowl Panels
      (3) AMM 72-34-03/401, Fan Exit Liner Segment
      (4) AMM 78-31-00/201, Thrust Reverser System
   B. Access
      (1) Location Zones
          411 Left Engine
          421 Right Engine

      (2) Access Panels
          413AL Fan Cowl Panel (Left), Left Engine
          415AL Thrust Reverser (Left), Left Engine
          417AL Core Cowl Panel (Left), Left Engine
          423AL Fan Cowl Panel (Left), Right Engine
          425AL Thrust Reverser (Left), Right Engine
          427AL Core Cowl Panel (Left), Right Engine

   C. Prepare to Remove the Solenoid

      S 864-003-N00
      (1) For the left engine, open these circuit breakers on the overhead circuit breaker panel, P11, and attach the DO-NOT-CLOSE tag:
          (a) 11L3, L ENG PERF SOL CHAN A
          (b) 11L4, L ENG PERF SOL CHAN B

      S 864-002-N00
      (2) For the right engine, open these circuit breakers on the overhead circuit breaker panel, P11, and attach the DO-NOT-CLOSE tags:
          (a) 11L30, R ENG PERF SOL CHAN A
          (b) 11L31, R ENG PERF SOL CHAN B



HPC Secondary Flow Control Valve, Turbine Vane and Blade Cooling Air Valve Solenoid Installation
Figure 401

D14997

EFFECTIVITY
ENGINES WITH THE TVCA VALVE AND TVBCA VALVE SOLENOID (WITH PHASE 3 CHANGES)

S 014-004-N00

(3) Open the left fan cowl panel (AMM 71-11-04/201).

S 044-005-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

(4) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 014-006-N00

(5) Open the left core cowl panel (AMM 71-11-06/201).

S 014-007-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(6) Open the left thrust reverser (AMM 78-31-00/201).

S 014-008-N00

(7) Remove the No. 7 segment of the fan exit liner (AMM 72-34-03/401).

D. Procedure

S 024-040-N00

(1) Remove the solenoid:
   (a) Disconnect the EEC electrical connector from the solenoid.
      1) Install protection caps on the EEC electrical connector and the receptacle on the solenoid.
   (b) Disconnect the tube nuts of the signal tubes and the 15th-stage air-supply tube from the solenoid.
   (c) Remove the bolts which attach the solenoid and the bracket to the intermediate case lugs.

      NOTE: If it is necessary, loosen the bolt and nut which attach the clamp for the accessory cooling tube to the bracket to get the clearance for the removal of the solenoid.

   (d) Remove the solenoid from the engine.

S 024-041-N00

(2) If it is necessary to replace the solenoid, do the steps that follow:
   (a) Remove the three adapters and gaskets from the rear of the solenoid.
   (b) Remove the two caps from the adapters on the top of the solenoid.
   (c) Remove the adapters and gaskets from the top of the solenoid.

S 024-042-N00

(3) Install protection covers to all open line ends and the openings in the solenoid.

TASK 75-24-17-404-015-N00

3. Install Turbine Vane Cooling Air Valve and Turbine Vane and Blade Cooling Air Valve Solenoid (Fig. 401)

A. Equipment

(1) M303, M305, or M307 Bergen Mechanical Crimper
Bergen Cable Technologies Inc
170 Gregg St
P.O. Box 1300
Lodi, NJ 07644-9982

B. Consumable Materials

(1) D00390 Oil - Engine
(2) D50124 Paste - Anti-seize - P06-054
(3) G02334 Lockwire - AS3214-02
(4) G02332 Ferrule - P05-292 (Optional)
(5) G02335 Cable - Safety - P05-291 (Optional)

C. References

(1) AMM 70-24-05/201, Electrical Harnesses
(2) AMM 71-00-00/501, Power Plant
(3) AMM 71-11-04/201, Fan Cowl Panels
(4) AMM 71-11-06/201, Core Cowl Panels
(5) AMM 72-34-03/401, Fan Exit Liner Segment
(6) AMM 78-31-00/201, Thrust Reverser System

D. Access

(1) Location Zones
   411 Left Engine
   421 Right Engine

(2) Access Panels

413AL	Fan Cowl Panel (Left), Left Engine
415AL	Thrust Reverser (Left), Left Engine
417AL	Core Cowl Panel (Left), Left Engine
423AL	Fan Cowl Panel (Left), Right Engine
425AL	Thrust Reverser (Left), Right Engine
427AL	Core Cowl Panel (Left), Right Engine

E. Prepare to Install the Solenoid

S 424-043-N00

(1) If it is necessary to install a new solenoid, do the steps that follow:
   (a) Remove the protection covers from all openings in the solenoid.
   (b) Lubricate the two adapters, which are to be installed on the top of the solenoid, with engine oil.
   (c) Install the two adapters with the new gaskets into the openings on the top of the solenoid.
      1) Tighten the two adapters to 65-75 pound-inches (7.3-8.5 newton-meters).
   (d) Lubricate the threads of the caps, which are to be installed to the adapters on top of the solenoid, with engine oil.
   (e) Install the caps to the adapters.
      1) Hold the adapters and tighten the caps to 90-100 pound-inches (10.2-11.3 newton-meters).
      2) Safety the caps with lockwire or safety cable and safety cable ferrule.
   (f) Lubricate the threads of the three remaining adapters with engine oil.
   (g) Install the larger adapter with the new gasket in the center of the solenoid.
   (h) Install the remaining two adapters with the new gaskets in the outer ports.
   (i) Tighten the center adapter to 150-170 pound-inches (16.9-19.2 newton-meters).
   (j) Tighten the outer adapters to 110-120 pound-inches (12.4-13.6 newton-meters).

F. Procedure

S 424-044-N00

(1) Install the solenoid.
   (a) Remove the protection covers from the open line ends.
   (b) Put the solenoid in position on the intermediate case with the two capped adapters on the top.

      NOTE: The mounting lug of the solenoid must be to the rear of the lugs on the intermediate case.

   (c) Lubricate the threads of the bolts, which attach the solenoid, with engine oil.

(d) Attach the solenoid and bracket to the intermediate case with the bolts.
1) Tighten the bolts to 85-95 pound-inches (9.6-10.7 newton-meters).
(e) If it was necessary to loosen the bolt and nut which attach the accessory cooling tube to the bracket, tighten the bolt to 36-40 pound-inches (4.1-4.5 newton-meters).
(f) Lubricate the threads of the center adapter with the anti-seize paste.
(g) Connect the 15th-stage air supply tube to the center adapter.
1) Hold the adapter and tighten the tube nut to 225-250 pound-inches (25.4-28.2 newton-meters).
(h) Lubricate the threads of the two remaining adapters on the solenoid with engine oil.
(i) Connect the two signal tubes to the adapters.
1) Tighten the tube nuts to 270-300 pound-inches (30.5-33.9 newton-meters).
(j) Safety the three tube nuts with lockwire or safety cable and safety cable ferrule.
(k) Remove the protection caps from the EEC electrical connector and the receptacle on the solenoid.

CAUTION: USE THE CORRECT ASSEMBLY PROCEDURE, AND TOOLS, FOR THE HARNESS CONNECTOR INSTALLATION (AMM 70-24-05/201). IF YOU USE THE INCORRECT ASSEMBLY PROCEDURE, OR TOOLS, A DAMAGED OR LOOSE CONNECTOR CAN OCCUR. A LOOSE CONNECTOR PERMITS VIBRATION, WHICH CAUSES THE CONTACTS TO WEAR AND DECREASES THE LIGHTNING PROTECTION.

(l) Connect the EEC electrical connector to the solenoid (AMM 70-24-05/201).

G. Return the Aircraft to Its Usual Condition

S 414-028-N00
(1) Install the No. 7 segment of the fan exit liner (AMM 72-34-03/401).

S 414-038-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Close the left thrust reverser (AMM 78-31-00/201).

S 414-029-N00

(3) Close the left core cowl panel (AMM 71-11-06/201).

S 414-030-N00

(4) Close the left fan cowl panel (AMM 71-11-04/201).

S 444-031-N00

(5) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

S 864-032-N00

(6) For the left engine, remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:
(a) 11L3, L ENG PERF SOL CHAN A
(b) 11L4, L ENG PERF SOL CHAN B

S 864-033-N00

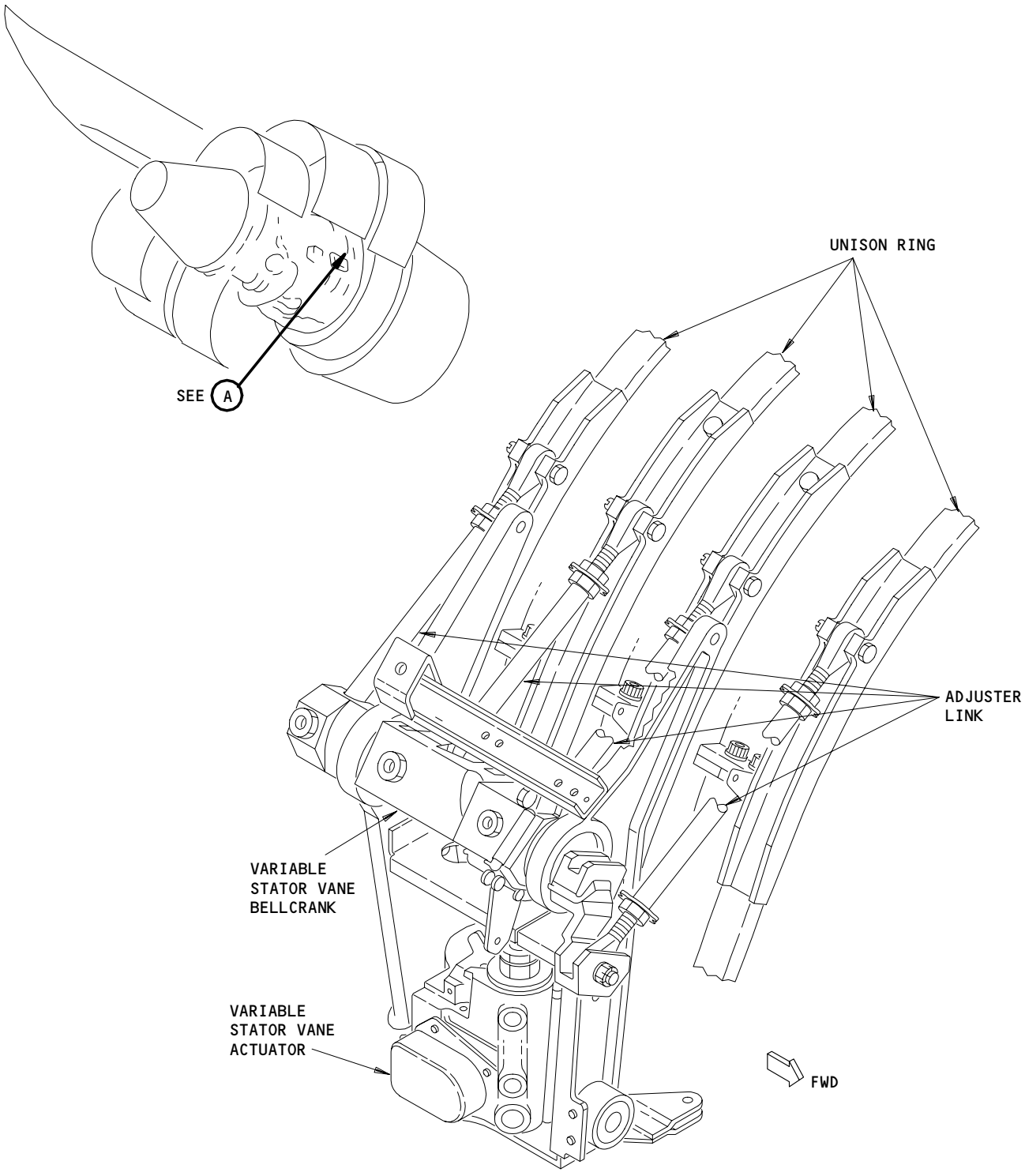
(7) For the right engine, remove the DO NOT CLOSE tags and close these circuit breakers on the P11 panel:
(a) 11L30, R ENG PERF SOL CHAN A
(b) 11L31, R ENG PERF SOL CHAN B

S 714-034-N00

(8) Do the test of the turbine vane cooling air valve and turbine vane and blade cooling air valve solenoid that is shown in the Power Plant Test Reference Table (AMM 71-00-00/501).

COMPRESSOR STATOR VANE CONTROL SYSTEM - DESCRIPTION AND OPERATION

1. General
   A. The control system for the variable stator vane changes the angle of the stator vanes that are included on the inlet guide vanes and the 5th, 6th, and 7th stages of the high pressure compressor (HPC). When the stator vane angle is adjusted, this can improve the engine performance and the stall limit. Also, this can prevent a compressor surge.
   B. The electronic engine control (EEC) controls the system as a function of low rotor speed (N1), high rotor speed (N2), and engine inlet total temperature (T2).
   C. The system includes the variable stator vane actuator, bellcrank, adjuster links, unison rings, and variable stator vanes.
2. Component Details
   A. Variable Stator Vane Actuator (Fig. 1)
      (1) The variable stator vane (VSV) actuator is on the front case of the high pressure compressor (HPC) at the 4:30 o'clock position.
      (2) The VSV actuator is a linear actuator that is hydraulically operated with fuel pressure from the fuel control. The EEC controls the fuel pressure from a dual-coil torque motor.
      (3) The dual linear variable differential transformers (LVDT) in the VSV actuator gives the EEC a feedback signal which shows the actuator piston position.
   B. Variable Stator Vane Bellcrank, Adjuster Links and Unison Rings
      (1) The bellcrank and adjuster links are on the front case of the high pressure compressor (HPC) at the 3:30 o'clock position.
      (2) The unison rings are installed around the inlet guide vanes, and the 5th-, 6th-, and 7th-stages of the HPC.
      (3) The bellcrank, adjuster links, and unison rings, mechanically transmit the linear movement of the VSV actuator to the variable stator vanes.
      (4) The adjuster links also supply adjustment of the unison rings to the bellcrank.
3. Operation
   A. Functional Description (Fig. 1)
      (1) The electronic engine control (EEC) sends a signal to the torque motor in the fuel control. The torque motor controls the position of a pilot valve which changes the hydraulic pressures sent to the VSV actuator.
      (2) As the VSV actuator receives the different hydraulic pressures on opposite sides of the piston, the piston extends or retracts. The dual LVDTs find the position of the piston and send a feedback signal to the EEC.
      (3) The linear movement of the actuator piston turns the bellcrank. This movement is transmitted through the mechanical linkage of the adjuster links and the unison rings to the variable stator vanes.



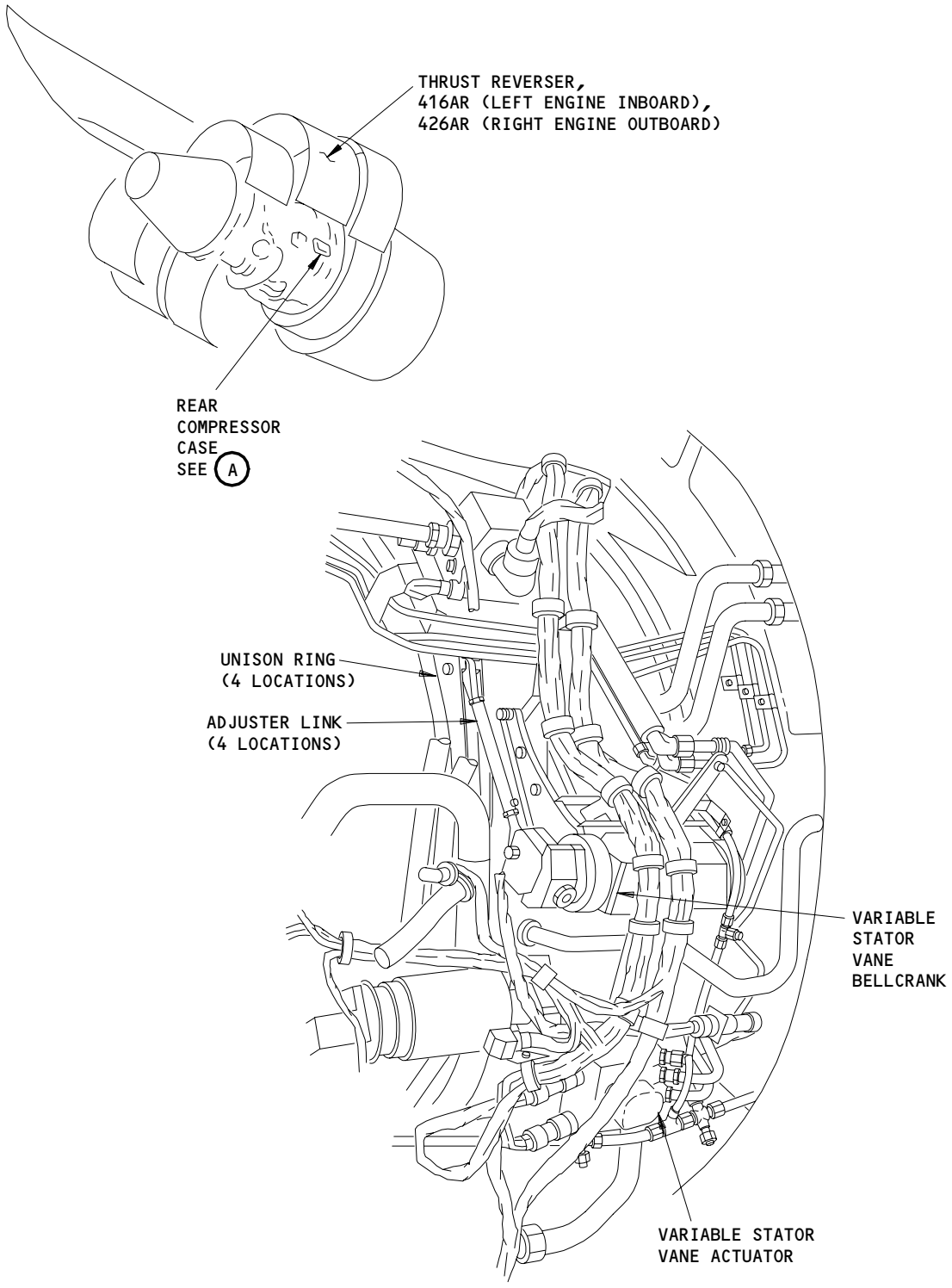
Compressor Stator Vane Control System
Figure 1

(4) At low engine speeds (N1 and N2), the variable stator vanes are in the closed position, which permits a minimum airflow through the compressor. At high engine speeds, the variable stator vanes are open for maximum airflow.
(5) If the EEC thinks there is a possible engine surge, the variable stator vanes start to close. If there is a decrease in electrical power to the VSV actuator, the variable stator vanes will open.

COMPRESSOR STATOR VANE CONTROL SYSTEM

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	AMM REFERENCE
ACTUATOR - VARIABLE STATOR VANE	--	2	416AR,426AR, REAR COMPRESSOR CASE	75-31-02
BELLCRANK - VARIABLE STATOR VANE	--	2	416AR,426AR, REAR COMPRESSOR CASE	
CONTROL - (FIM 73-21-00/101) ELECTRONIC ENGINE, M7198				
LINK - ADJUSTER	--	8	416AR,426AR, REAR COMPRESSOR CASE	
RING - UNISON	--	8	416AR,426AR, REAR COMPRESSOR CASE	

Compressor Stator Vane Control System - Component Index
Figure 101



Compressor Stator Vane Control System - Component Location
Figure 102

COMPRESSOR STATOR VANE CONTROL SYSTEM - ADJUSTMENT/TEST

1. General
   A. There are two tasks for the rigging of the compressor stator vane control system. The first procedure is the mechanical rigging procedure. The second task is the hydraulic rigging procedure. You can use one procedure or the other to do the rigging of the system.

TASK 75-31-00-825-106-N00

2. Adjustment - Compressor Stator Vane Control System (Mechanical Rigging)
   A. Equipment

      NOTE: The PWA 85675 Rigging Pin Kit contains the rig pins in the list that follows.

      (1) PWA 85393 Rig Pin (3 are necessary)
      (2) PWA 85394 Rig Pin (Optional to the PWA 86197 Rig Pin)
      (3) ENGINES PRE-PW-SB 72-246; PWA 85395 Rig Pin
      (4) ENGINES POST-PW-SB 72-246; PWA 86097 Rig Pin
      (5) PWA 86197 Rig Pin
      (6) PWA 86344 Holder - Rigging

   B. Consumable Materials
      (1) D00137 Engine Oil - PWA 521

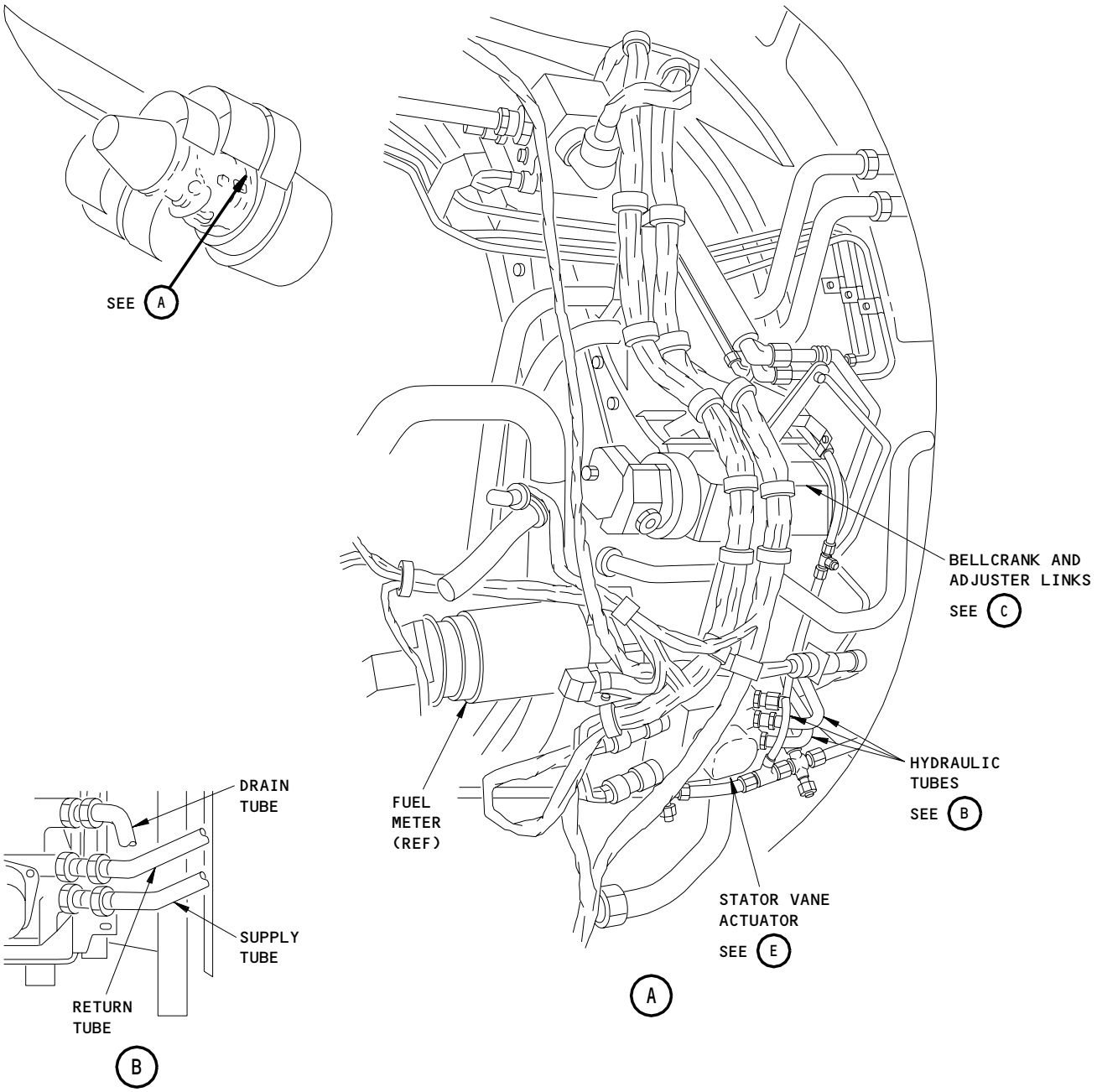
   C. References
      (1) AMM 71-00-00/501, Power Plant
      (2) AMM 71-11-04/201, Fan Cowl Panels
      (3) AMM 71-11-06/201, Core Cowl Panels
      (4) AMM 75-31-00/601, Compressor Stator Vane Control System
      (5) AMM 78-31-00/201, Thrust Reverser System

   D. Access
      (1) Location Zones
          411 Left Engine
          421 Right Engine

      (2) Access Panels
          414AR Fan Cowl Panel (Right)
          416AR Fan Reverser (Right)
          424AR Fan Cowl Panel (Right)
          426AR Fan Reverser (Right)

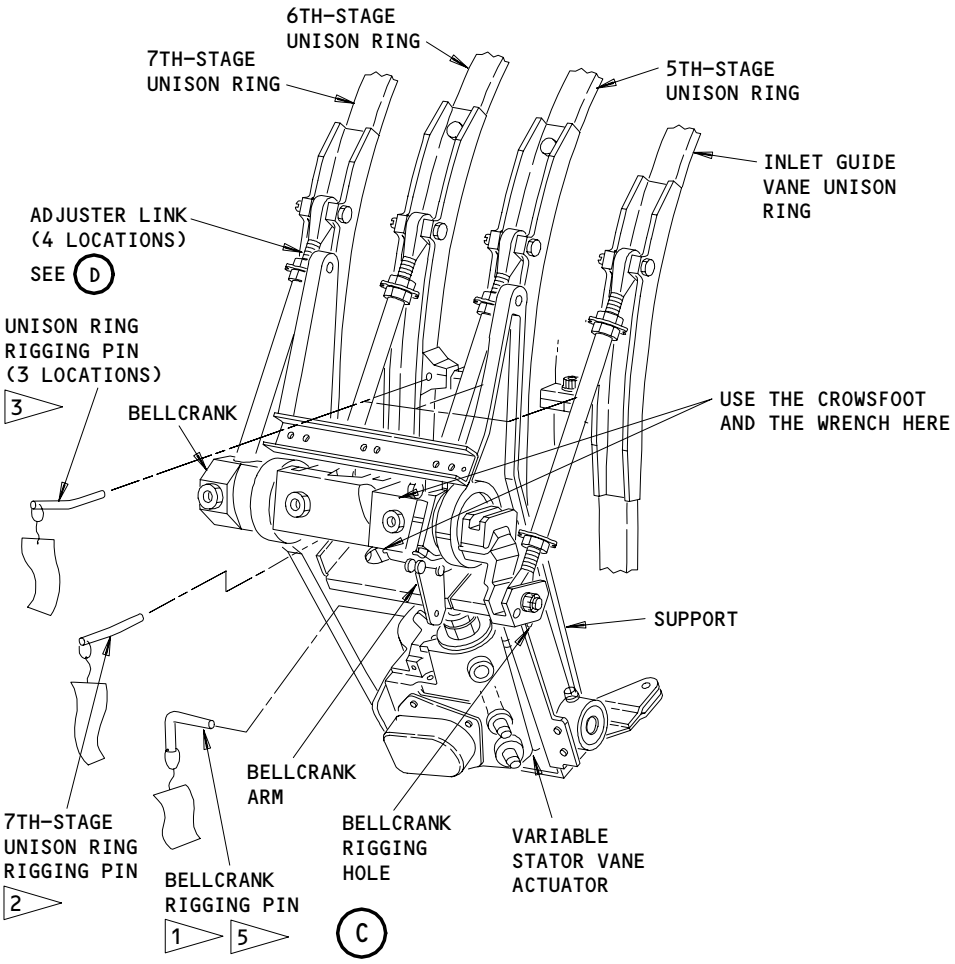
   E. Prepare to Do the Mechanical Rigging Procedure

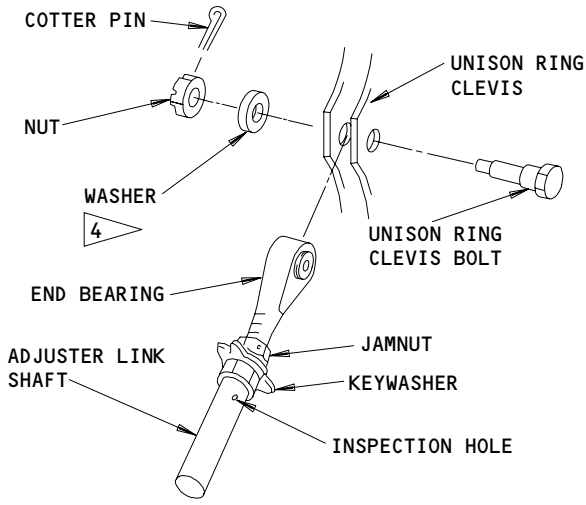
      S 015-002-N00
      (1) Open the right fan cowl panel (AMM 71-11-04/201).



1. RIGGING PIN PWA 85395 (ENGINES PRE-PW-SB 72-246)
2. RIGGING PIN PWA 85394 OR PWA 86197
3. RIGGING PIN PWA 85393
4. A WASHER IS NOT INCLUDED AT THE 6TH-STAGE UNISON RING/ADJUSTER LINK CONNECTION
5. RIGGING PIN PWA 86097 (ENGINES POST-PW-SB 72-246)

Compressor Stator Vane Control System
Figure 501 (Sheet 1)

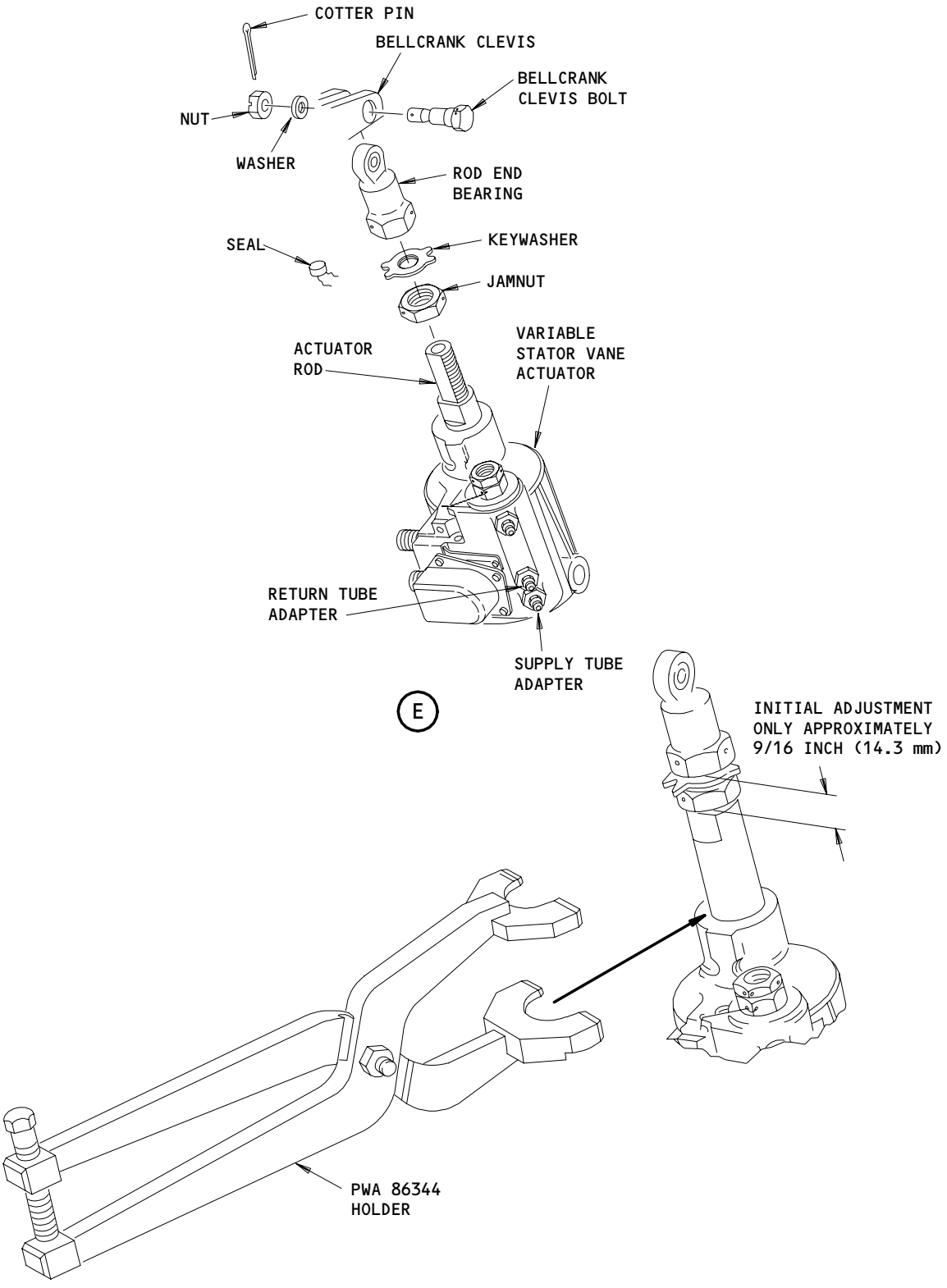




ADJUSTER LINK

D

Compressor Stator Vane Control System
Figure 501 (Sheet 2)



Compressor Stator Vane Control System
Figure 501 (Sheet 3)

S 045-003-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(2) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 015-004-N00

(3) Open the right core cowl panel (AMM 71-11-06/201).

S 015-005-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(4) Open the right thrust reverser (AMM 78-31-00/201).

F. Do the Mechanical Rigging Procedure

S 825-048-N00

(1) With a standard crowsfoot and a wrench on the flats of the bellcrank adjacent to the 5th-stage adjuster link, do the steps that follow:

CAUTION: MAKE SURE YOU DO NOT PUT TOO MUCH TORQUE ON THE BELLCRANK. TOO MUCH TORQUE CAN BEND THE BELLCRANK BRACKET WHICH CAN CAUSE A BAD RIGGING.

(a) Pull down on the wrench until you feel the internal stop of the variable stator-vane actuator.
(b) Push up on the wrench until you are off of the internal stop.
(c) Pull down on the wrench again until you feel the internal stop.
(d) Hold the bellcrank when the actuator rod is fully extended against the internal stop (stator vanes are open).
(e) Hold the actuator rod fully extended against the internal stop with 300-400 pound-inches (33.9-45.2 newton-meters) on the crowsfoot.
(f) While you hold the actuator rod fully extended against the internal stop, install the PWA 86344 holder between the jamnut and the top of the actuator housing.
1) Tighten the detail bolt to 8-10 pound-inches (0.9-1.1 newton-meters).

NOTE: Do not tighten the detail bolt too much.

2) Tighten the detail jamnut with your hand.

S 825-095-N00

CAUTION: MAKE SURE YOU KEEP THE ACTUATOR ROD FULLY EXTENDED WHEN YOU INSTALL THE BELLCRANK RIG PIN. IF YOU LET THE ACTUATOR ROD RETRACT, YOU WILL NOT GET AN ACCURATE CHECK. A BAD RIGGING CAN CAUSE A DANGEROUS STABILITY AND EFFECTS ON THE LENGTH OF LIFE.

MAKE SURE THAT THE END OF THE RIG PINS ARE CORRECTLY AND FULLY INSTALLED.

CAUTION: MAKE SURE TO USE THE CORRECT BELLCRANK RIG PIN.
ENGINES PRE-PW-SB 72-246, USE THE LARGER PWA 85395 RIG PIN.
ENGINES POST-PW-SB 72-246, USE THE SMALLER PWA 86097 RIG PIN.

(2) ENGINES PRE-PW-SB 72-246;
Install the PWA 85395 rig pin into the bellcrank arm slot and into the two holes of the support.

S 825-096-N00

(3) ENGINES POST-PW-SB 72-246;
Install the PWA 86097 rig pin into the bellcrank arm slot and into the two holes of the support.

S 825-098-N00

(4) If you can install the bellcrank rig pin, do the steps that follow:
   (a) Remove the bellcrank rig pin.
   (b) Remove the PWA 86344 holder.
   (c) Push up on the wrench to retract the actuator rod.
   (d) Pull down on the wrench to fully extend the actuator rod again.
   (e) Hold the actuator rod fully extended against the internal stop with 300-400 pound-inches (33.9-45.2 newton-meters) on the crowsfoot.
   (f) While you hold the actuator rod fully extended against the internal stop, install the PWA 86344 holder between the jamnut and the top of the actuator housing.
      1) Tighten the detail bolt to 8-10 pound-inches (0.9-1.1 newton-meters).

         NOTE: Do not tighten the detail bolt too much.

      2) Tighten the detail jamnut with your hand.
   (g) Install the bellcrank rig pin again with the actuator rod fully extended.

S 825-052-N00

(5) If you cannot install the bellcrank rig pin, adjust the rod-end bearing with the steps that follow:
   (a) Remove the PWA 86344 holder.

(b) Remove the cotter pin from the bellcrank clevis bolt at the rod-end bearing.
1) Discard the cotter pin.
(c) Remove the nut, washer and bellcrank clevis bolt from the rod-end bearing.
(d) Remove the seal from the actuator rod.
(e) Make the tabs of the key washer straight.
(f) Loosen the jamnut.
(g) Remove the rod-end bearing.
(h) Remove the key washer.
(i) Install a new key washer.
(j) Lubricate the threads of the rod-end bearing with engine oil.
(k) Install the rod-end bearing on the actuator rod.
(l) Tighten the rod-end bearing until the flat surface below the hex is approximately 9/16 inch (14.288 mm) from the flat surface of the actuator rod threads (this is only an approximate initial adjustment).

S 425-099-N00
(6) Connect the rod-end bearing to the bellcrank with the bellcrank clevis bolt.

NOTE: Make sure the head of the bolt stays against the surface of the bellcrank. Do not let the bellcrank clevis bolt move out of the bolt hole.

S 825-100-N00
(7) With a standard crowsfoot and a wrench on the flats of the bellcrank, do the steps that follow:

CAUTION: MAKE SURE YOU DO NOT PUT TOO MUCH TORQUE ON THE BELLCRANK. TOO MUCH TORQUE CAN BEND THE BELLCRANK BRACKET WHICH CAN CAUSE A BAD RIGGING.

(a) Pull down on the wrench until the actuator rod is fully extended against the internal stop (stator vanes are open).
(b) Hold the actuator rod fully extended against the internal stop with 300-400 pound-inches (33.9-45.2 newton-meters) on the crowsfoot.
(c) While you hold the actuator rod fully extended against the internal stop, install the PWA 86344 holder between the jamnut and the top of the actuator housing.
1) Tighten the detail bolt to 8-10 pound-inches (0.9-1.1 newton-meters).

NOTE: Do not tighten the detail bolt too much.

2) Tighten the detail jamnut with your hand.

CAUTION: MAKE SURE YOU KEEP THE ACTUATOR ROD FULLY EXTENDED WHEN YOU INSTALL THE BELLCRANK RIG PIN. IF YOU LET THE ACTUATOR ROD RETRACT, YOU WILL NOT GET AN ACCURATE CHECK. A BAD RIGGING CAN CAUSE A DANGEROUS STABILITY AND EFFECTS ON THE LENGTH OF LIFE.

MAKE SURE THAT THE END OF THE RIG PINS ARE CORRECTLY AND FULLY INSTALLED.

CAUTION: MAKE SURE TO USE THE CORRECT BELLCRANK RIG PIN. ON ENGINES PRE-PW-SB 72-246, USE THE LARGER PWA 85395 RIG PIN. ON ENGINES POST-PW-SB 72-246, USE THE SMALLER PWA 86097 RIG PIN.

(d) Install the bellcrank rig pin into the bellcrank arm slots and into the two holes of the support.

S 425-101-N00

(8) Lock the jamnut and the rod-end bearing with the key washer.
   (a) Bend one set of the tabs on the key washer to the rod-end bearing.
   (b) Bend the other set of tabs on the jamnut.
   (c) Install the lockwire and the seal.

S 825-102-N00

(9) With the actuator rod fully extended and the rig pin fully installed, do the steps that follow:
   (a) Install the three PWA 85393 rig pins into applicable rig pin holes for the IGV, 5th- and 6th-stage unison rings.
   (b) Install the PWA 85394 rig pin into the rig pin hole for the 7th-stage unison ring.

S 085-103-N00

(10) If you can install all of the rig pins, remove all of the rig pins and the PWA 86344 holder from the bellcrank and the unison rings because the system is correctly adjusted.

S 825-059-N00

(11) If you cannot install all of the rig pins, do the steps that follow:
   (a) Remove all of the rig pins from the unison rings and the bellcrank.
   (b) Remove the PWA 86344 holder.
   (c) Disconnect the adjuster link.
   (d) Disassemble the adjuster link.
      1) Discard the key washers.
   (e) Assemble the adjuster link with the new key washers.

(f) Adjust the adjuster link with the steps that follow:
1) ENGINES PRE-PW-SB 72-246;
Install the PWA 85395 rig pin.
2) ENGINES POST-PW-SB 72-246;
Install the PWA 86097 rig pin.
a) Turn the adjuster links until you can install all of the rig pins in the unison ring.
3) Tighten the nut, at each of the rod ends which you changed, to 15-22 pound-inches (1.7-2.5 newton-meters) plus the torque necessary to turn the nut on the clevis bolt for the unison ring.
4) Install the cotter pins.
(g) Examine the adjuster links and the rod-end bearings for correct installation.
1) Install a piece of wire into the inspection holes at the two ends of each adjuster link.
2) If you cannot put the wire through the inspection holes, the installation is satisfactory.
3) If you can put the wire through the inspection holes, do the steps that follow:
a) Disassemble the adjuster link at the rod-end bearing.
b) Adjust the adjuster link, as it is necessary, until the wire will not go through the inspection holes.
4) With the rod-ends correctly installed, tighten the jamnuts at each of the rod-ends to 115-150 pound-inches (13.0-16.9 newton-meters).
5) With the bellcrank rig pin installed, install all of the rig pins in the unison rings.
a) If you cannot install all of the rig pins in the unison rings, you must do the steps from above to adjust the adjuster link.
b) If you can install all of the rig pins in the unison rings, remove all of the rig pins from the unison rings and the bellcrank (the system is correctly adjusted).
6) Bend one set of the tabs on the key washer on the flats of the adjuster.
7) Bend the other set of tabs on the jamnuts.
8) Install the lockwire and the seals to the rod end bearings.

G. Put the Aircraft Back to its Usual Condition

S 215-104-N00

CAUTION: MAKE SURE TO REMOVE ALL OF THE RIG PINS AND THE PWA 86344 HOLDER AFTER THE CHECK. IF YOU DO NOT REMOVE THE RIG PINS, DAMAGE TO THE ENGINE CAN OCCUR.

(1) Do an inspection of the stator-vane actuator (SVA) position indication (AMM 75-31-00/601).

S 415-012-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Close the right thrust reverser (AMM 78-31-00/201).

S 415-013-N00

(3) Close the right core cowl panel (AMM 71-11-06/201).

S 415-014-N00

(4) Close the right fan cowl panel (AMM 71-11-04/201).

S 445-015-N00

(5) Do the activation procedure for the thrust reversers (AMM 78-31-00/201).

S 715-016-N00

(6) Do the test of the compressor stator vane control system that is shown in the Power Plant Test Reference Table (AMM 71-00-00/501).

TASK 75-31-00-825-105-N00

3. Adjustment - Compressor Stator Vane Control System (Hydraulic Rigging)

A. Equipment

(1) PWA 49030 Hydraulic Cart (pneumatic) (Optional to CTE 5100)

(2) CTE 5100 Hydraulic Cart (pneumatic) (Optional to PWA 49030)
(3) PWA 86317 Electrical Switch Box (Recommended)

NOTE: All of the rig pins in the list that follows are part of the PWA 85675 Rigging Pin Kit.

(4) PWA 29451 Rig Pin
(5) PWA 85393 Rig Pin (3 are necessary)
(6) PWA 85394 Rig Pin (Optional to the PWA 86197 Rig Pin)
(7) ENGINES PRE-PW-SB 72-246;
PWA 85395 Rig Pin
(8) ENGINES POST-PW-SB 72-246;
PWA 86097 Rig Pin
(9) PWA 86197 Rig Pin
(10) PWA 86344 Holder, Rigging
(11) M303, M305, or M307 Bergen Mechanical Crimper
Bergen Cable Technologies Inc
170 Gregg St
P.O. Box 1300
Lodi, NJ 07644-9982

B. Consumable Materials
(1) D00137 Engine Oil - PWA 521
(2) D50124 Anti-seize paste - PWA 36246
(3) G00597 Calibrating Fluid
(4) G02334 Lockwire - AS3214-02
(5) G02332 Ferrule - P05-292 (Optional)
(6) G02335 Cable - Safety - P05-291 (Optional)

C. References
(1) AMM 70-24-05/201, Electrical Harnesses
(2) AMM 71-00-00/501, Power Plant
(3) AMM 71-11-04/201, Fan Cowl Panels
(4) AMM 71-11-06/201, Core Cowl Panels
(5) AMM 75-31-00/601, Stator Vane Actuator
(6) AMM 78-31-00/201, Thrust Reverser System

D. Prepare to Do the Hydraulic Rigging Procedure

S 015-018-N00
(1) Open the right fan cowl panel (AMM 71-11-04/201).

S 045-019-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(2) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 015-020-N00

(3) Open the right core cowl panel (AMM 71-11-06/201).

S 015-021-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(4) Open the right thrust reverser (AMM 78-31-00/201).

E. Do the Hydraulic Rigging Procedure

S 025-107-N00

WARNING: DO NOT LET THE ENGINE FUEL STAY ON YOUR SKIN FOR A LONG PERIOD OF TIME. THE ENGINE FUEL IS POISONOUS AND CAN BE ABSORBED THROUGH YOUR SKIN.

(1) Do the steps that follow to disconnect the supply and return tubes:
   (a) Disconnect the supply tube at the two ends.
   (b) Disconnect the return tube at the two ends.
   (c) Loosen the clamp bolts which attach the supply and return tubes to the engine.
   (d) Move the supply and return tubes away from the adapters on the variable stator-vane actuator.
      1) Install the protection caps.

S 485-064-N00

(2) Connect the Hydraulic Cart with the steps that follow:
   (a) Install the PWA 29451 adapter on the adapter at the PF port of the variable stator-vane actuator.
   (b) Tighten the PWA 29451 adapter to 225-250 pound-inches (25.4-28.2 newton-meters).

      NOTE: Make sure you hold the adapter on the variable stator-vane actuator while you tighten the PWA 29451 adapter.

   (c) Connect the hydraulic pressure hose A to the PWA 29451 adapter.

      NOTE: If it is necessary, use a standard 45 degree or 90 degree adapter or elbow on the end of the hydraulic pressure hose.

   (d) Connect the hydraulic return hose B to the adapter in the PFR port of the variable stator-vane actuator.

(e) Tighten the nuts on the hoses A and B to 200-225 pound-inches (22.6-25.4 newton-meters).

NOTE: Make sure you hold the adapters while you tighten the nuts.

(f) Remove the hose attached to the top of the pump reservoir.
(g) Examine the level of fluid in the pump reservoir.
1) If it is necessary, fill the pump reservoir to the top with the calibrating fluid.

S 485-065-N00
(3) Connect the PWA 86317 Electrical Switch Box with the steps that follow:

NOTE: Although the PWA 86317 Electrical Switch Box is recommended, you can do a check of the rigging without the electrical switch box when the switch box is not available.

(a) Disconnect the W4P3 and the W5P7 harness connectors from the electrical receptacles J7 and J3 on the variable stator-vane actuator.
1) Install the protection covers to the harness connectors.
(b) Connect the electrical lead from the electrical switch box to the top receptacle, J7.

S 985-108-N00
(4) Operate the hydraulic cart to fully extend the actuator rod (stator vanes are open) with the steps that follow:
(a) Before you connect the air source to the hydraulic cart, make sure you do the steps that follow:
1) Put the control handle to the neutral (center) position.
2) Turn the hydraulic valve handle to the closed position (perpendicular to the flow).
3) Turn the handle for the air supply valve to the closed position (perpendicular to the flow).
4) Turn the smaller adjustment knob clockwise to stop.
a) Do not tighten too much.
(b) Connect the air source to the air inlet.
(c) Turn the handle for the air supply valve to the open position (parallel with the flow).
(d) Lift and turn the larger adjustment knob clockwise to raise the air pressure to 25-30 psig.

NOTE: The pump ratio is 1 to 10 (30 psig air is the same as 300 psig hydraulic).

(e) Turn the hydraulic valve handle to the open position (parallel to the flow).

(f) Slowly turn the smaller adjustment knob counterclockwise until the air motor turns.

NOTE: The smaller adjustment knob controls the speed of the variable stator-vane actuator and the time it takes the pressure to come back after operation. Adjust the system as it is necessary.

With the control valve in the neutral position, the hydraulic pressure on the gage is 0 psig.

(g) Put the control handle on the hydraulic cart to the advance position (points to the hoses).

NOTE: The hydraulic pressure to the PF port on the variable stator-vane actuator is 250-300 psig.

The actuator rod is fully extended at this time (stator vanes are open).

S 985-109-N00

(5) If you have an electrical switch box, examine the rigging with the steps that follow:

NOTE: If an electrical switch box is not available, go to the subsequent step.

(a) Push the power switch on the electrical switch box to the on position.
(b) Push the actuation switch on the electrical switch box to the retract position (stator vanes are closed) to retract the actuator rod.
(c) Push the actuation switch a minimum of three more times to extend and retract the actuator rod.
(d) Stop the actuator rod in the fully extended position.

S 985-110-N00

(6) If you do not have an electrical switch box, operate the stator-vane system with the steps that follow:
(a) Turn the handle for the air supply valve to the closed position (perpendicular to the flow).
1) The hydraulic pressure will bleed off.
(b) Install a crowsfoot and a wrench on the flats of the bellcrank adjacent to the 5th-stage adjuster link.

CAUTION: MAKE SURE YOU DO NOT PUT TOO MUCH TORQUE ON THE BELLCRANK. TOO MUCH TORQUE CAN BEND THE BELLCRANK BRACKET WHICH CAN CAUSE A BAD RIGGING.

(c) Push up on the wrench to move the bellcrank to the closed position.
(d) Remove the crowsfoot and the wrench.
(e) Operate the hydraulic cart to supply 250-300 psig hydraulic pressure to the PF port.
1) The variable stator-vane actuator must move to the full open position.
2) The actuator rod is now extended against the internal stop.
(f) Do these steps one more time.

S 825-111-N00

CAUTION: MAKE SURE THAT THE END OF THE RIG PINS ARE CORRECTLY AND FULLY INSTALLED.

CAUTION: MAKE SURE TO USE THE CORRECT BELLCRANK RIG PIN. ON ENGINES PRE-PW-SB 72-246, USE THE LARGER PWA 85395 RIG PIN. ON ENGINES POST-PW-SB 72-246, USE THE SMALLER PWA 86097 RIG PIN.

(7) ENGINES PRE-PW-SB 72-246;
With the actuator rod fully extended (stator vanes are open), install the PWA 85395 rig pin into the bellcrank arm slot and into the two holes of the support.

S 825-112-N00
(8) ENGINES POST-PW-SB 72-246;
With the actuator rod fully extended (stator vanes are open), install the PWA 86097 rig pin into the bellcrank arm slot and into the two holes of the support.

S 825-071-N00
(9) If you can put the bellcrank rig pin in, do the check of the rigging of the unison rings.

S 825-072-N00
(10) If you cannot put the bellcrank rig pin in, do the steps that follow to adjust the rod-end bearing of the variable stator-vane actuator:

CAUTION: YOU MUST ALWAYS REMOVE THE RIG PINS BEFORE YOU RELEASE THE PRESSURE FROM THE VARIABLE STATOR-VANE ACTUATOR. IF YOU DO NOT REMOVE THE RIG PINS, YOU CAN CAUSE DAMAGE TO THE SYSTEM.

(a) Turn the handle of the air supply valve to the closed position (perpendicular to the flow).

(b) Remove the cotter pin from the bellcrank clevis bolt on the rod-end bearing.
    1) Discard the cotter pin.
(c) Remove the nut, washer and bellcrank clevis bolt from the rod-end bearing.
(d) Remove the lockwire and the seal from the actuator rod.
(e) Make the tabs of the key washer straight.
(f) Loosen the jamnut.
(g) Remove the rod-end bearing.
(h) Remove the key washer.
(i) Install a new key washer.
(j) Lubricate the threads of the rod-end bearing with engine oil.
(k) Install the rod-end bearing.
    1) Tighten the rod-end bearing until the flat surface below the hex is approximately 9/16 inch (14.288 mm) from the flat surface below the actuator rod threads (this is only an initial adjustment).
(l) Temporarily connect the rod end bearing to the bellcrank with the bellcrank clevis bolt.

NOTE: Make sure the head of the bolt stays against the surface of the bellcrank. Do not let the bolt move out of the bolt hole.

(m) Operate the hydraulic cart to supply 250-300 psig hydraulic pressure to the PF port.
    1) Fully extend the actuator rod to the full open position.

CAUTION: MAKE SURE YOU KEEP THE ACTUATOR ROD FULLY EXTENDED WHEN YOU INSTALL THE BELLCRANK RIG PIN. IF YOU LET THE ACTUATOR ROD RETRACT, YOU WILL NOT GET AN ACURATE CHECK. A BAD RIGGING CAN CAUSE A DANGEROUS STABILITY AND EFFECTS ON THE LENGTH OF LIFE.

(n) With the hydraulic pressure on, adjust the rod-end bearing until you can install the bellcrank rig pin into the bellcrank arm slot and the two holes of the support.
(o) Lubricate the threads of the nut, which attaches the bellcrank clevis bolt, with engine oil.
(p) Install the washer and the nut to the bellcrank clevis bolt.
(q) Tighten the nut to a minimum of 15 pound-inches (1.7 newton-meters) plus the torque which is necessary to turn the nut on the bellcrank clevis bolt.
(r) Continue to tighten the nut until the slot in the nut aligns with the hole in the clevis bolt.
    1) You must not have a torque more than 22 pound-inches (2.5 newton-meters) plus the torque which is necessary to turn the nut on the bolt.
(s) Install the cotter pin to the nut.
(t) Bend the cotter pin.

(u) Lock the rod-end bearing to the actuator rod with the jamnut.
1) Tighten the jamnut to 460-510 pound-inches (52.0-57.6 newton-meters).

CAUTION: MAKE SURE YOU REMOVE ALL OF THE RIG PINS FROM THE UNISON RINGS AND THE BELLCRANK. IF YOU DO NOT REMOVE ALL OF THE RIG PINS, YOU CAN CAUSE DAMAGE TO THE ENGINE.

(v) Remove the bellcrank rig pin.
(w) If an electrical switch box is used, push the actuation switch on the electrical switch box to retract and extend the actuator rod through its full movement.
1) Do this step a minimum of three times.
2) Stop with the actuator rod fully extended.
(x) If an electrical switch box is not used, operate the variable stator-vane actuator with the steps that follow:
1) Turn the handle for the air supply valve to the closed position (perpendicular to the flow).
2) Install a crowsfoot and a wrench on the flats of the bellcrank.
3) Push up on the wrench to move the system to the closed position.
4) Remove the crowsfoot and the wrench.
5) Operate the hydraulic cart to supply 250-300 psig hydraulic pressure to the PF port.
6) Fully extend the actuator rod to the full open position.
a) The actuator rod in the variable stator-vane actuator is now extended against the internal stop.
7) Do these steps one more time.
(y) With the actuator rod fully extended (stator vanes are open), install the bellcrank rig pin in the bellcrank arm slot and the two holes of the support.
(z) If you cannot install the bellcrank rig pin, do the adjustment for the rod-end bearing again.
(aa) If you can install the bellcrank rig pin, do the steps that follow:
1) Lock the jamnut and the rod-end bearing with the key washer.
2) Bend one set of the tabs on the jamnut.
3) Bend the other set of tabs on the rod-end bearing.
4) Install the lockwire and the seal.

S 085-114-N00

CAUTION: MAKE SURE YOU REMOVE ALL OF THE RIG PINS FROM THE UNISON RINGS AND THE BELLCRANK. IF YOU DO NOT REMOVE ALL OF THE RIG PINS, YOU CAN CAUSE DAMAGE TO THE ENGINE.

(11) Remove the bellcrank rig pin.

S 825-115-N00
(12) Operate the hydraulic cart to supply 250-300 psig hydraulic pressure to the PF port.

S 825-116-N00
(13) Fully extend the actuator rod to the full open position.

S 825-117-N00

CAUTION: MAKE SURE YOU KEEP THE ACTUATOR ROD FULLY EXTENDED WHEN YOU INSTALL THE BELLCRANK RIG PIN. IF YOU LET THE ACTUATOR ROD RETRACT, YOU WILL NOT GET AN ACCURATE CHECK. A BAD RIGGING CAN CAUSE A DANGEROUS STABILITY AND EFFECTS ON THE LENGTH OF LIFE.

MAKE SURE THAT THE END OF THE RIG PINS ARE CORRECTLY AND FULLY INSTALLED.

CAUTION: MAKE SURE TO USE THE CORRECT BELLCRANK RIG PIN. ON ENGINES PRE-PW-SB 72-246, USE THE LARGER PWA 86395 RIG PIN. ON ENGINES POST-PW-SB 72-246, USE THE SMALLER PWA 86097 RIG PIN.

(14) ENGINES PRE-PW-SB 72-246;
With the actuator rod fully extended (stator vanes are open), install the PWA 85395 rig pin into the bellcrank arm slot and into the two holes of the support.

S 825-118-N00
(15) ENGINES POST-PW-SB 72-246;
With the actuator rod fully extended (stator vanes are open), install the PWA 86097 rig pin into the bellcrank arm slot and into the two holes of the support.

S 825-119-N00
(16) Install the three PWA 85393 rig pins into the rig pin holes of the IGV, 5th- and 6th-stage unison rings.

S 825-120-N00
(17) Install the PWA 85394 or PWA 86197 rig pin into the rig pin hole on the 7th-stage unison ring.

S 085-121-N00
(18) If you can put the rig pins in, remove all of the rig pins from the unison rings and the bellcrank.

S 825-081-N00
(19) If you cannot put the rig pins in, do the steps that follow:
(a) Remove the rig pins from the unison rings and the bellcrank.
(b) Move the control handle on the hydraulic cart to the neutral position.

(c) Turn the handle on the air supply valve to the closed position (perpendicular to the flow).
(d) Disconnect the adjuster link.
(e) Disassemble the adjuster link.
    1) Discard the key washers.
(f) Assemble the adjuster link with the new key washers.
(g) Adjust the adjuster link with the steps that follow:
    1) ENGINES PRE-PW-SB 72-246;
       Install the PWA 85395 rig pin.
    2) ENGINES POST-PW-SB 72-246;
       Install the PWA 86097 rig pin.
    3) Turn the adjuster link shaft until you can install all of the rig pins into the unison ring.
    4) Tighten the nuts at each of the rod-end bearings which were changed to 15-22 pound-inches (1.7-2.5 newton-meters) plus the torque which is necessary to turn the nut on the bolt.
    5) Install the cotter pins.
    6) Examine the adjuster link shaft and the rod-end bearings for correct installation.
    7) Install a piece of wire into the inspection holes at the two ends of each adjuster link shaft.
    8) If you cannot put the wire through the inspection holes the installation is satisfactory.
    9) If you can put the wire through one of the inspection holes, do the steps above to disassemble and adjust the adjuster link as necessary. Do this until the wire does not go through the inspection holes.
    10) With the rod-end bearings correctly installed, tighten the jamnuts at each of the rod-ends to 115-150 pound-inches (13.0-16.9 newton-meters).

CAUTION: MAKE SURE YOU REMOVE ALL OF THE RIG PINS FROM THE UNISON RINGS AND THE BELLCRANK. IF YOU DO NOT REMOVE ALL OF THE RIG PINS, YOU CAN CAUSE DAMAGE TO THE ENGINE.

    11) With all of the rig pins removed, operate the hydraulic cart to supply 250-300 psig hydraulic pressure to the PF port.
    12) If an electrical switch box is used, push the actuation switch to retract and extend the variable stator-vane actuator through its full movement.
        a) Do this step a minimum of three times.
        b) Stop the actuator rod in the fully extended position.
    13) If an electrical switch box is not used, do the steps that follow:
        a) Install a crowsfoot and a wrench on the flats of the bellcrank adjacent to the 5th-stage adjuster link.
        b) Push up on the wrench to move the bellcrank to the closed position.

c) Remove the crowsfoot and the wrench.
d) Operate the hydraulic cart to supply 250-300 psig hydraulic pressure to the PF port.
e) Extend the variable stator-vane actuator to the full open position.
f) Do these steps one more time.

14) ENGINES PRE-PW-SB 72-246;
Install the PWA 85395 rig pin.
15) ENGINES POST-PW-SB 72-246;
Install the PWA 86097 rig pin.
16) Install the three PWA 85393 rig pins into the rig pin holes of the IGV, 5th- and 6th-stage unison rings.
17) Install the PWA 85394 or PWA 86197 rig pin into the rig pin hole on the 7th-stage unison ring.
18) If you cannot install one of the rig pins into the unison ring, you must do the above steps again to adjust the adjuster link.
19) Remove all of the rig pins.
20) Bend one set of the tabs on the key washer to the adjuster link shaft.
21) Bend the other set of tabs on the jamnuts.
22) Install the lockwire and the seals to the rod-end bearings.

S 085-082-N00

(20) With the rigging pins removed, do the steps that follow:
(a) Turn the handle on the air supply valve to the closed position (perpendicular to the flow).
(b) Move the control handle to the neutral (center) position.
(c) Disconnect the air supply.
(d) Disconnect the hoses A and B from the variable stator-vane actuator.

NOTE: Make sure you hold the adapters while you disconnect the hoses and the PWA 29451 adapter.

(e) Remove the PWA 29451 adapter from the PF port.
(f) Install the protection covers to the ends of the hoses.

S 085-083-N00

(21) Push the power switch on the electrical switch box to turn it off.

S 085-122-N00

(22) Disconnect the electrical connector from the variable stator-vane actuator.

S 425-123-N00

CAUTION: USE THE CORRECT ASSEMBLY PROCEDURE, AND TOOLS, FOR THE HARNESS CONNECTOR INSTALLATION (AMM 70-24-05/201). IF YOU USE THE INCORRECT ASSEMBLY PROCEDURE, OR TOOLS, A DAMAGED OR LOOSE CONNECTOR CAN OCCUR. A LOOSE CONNECTOR PERMITS VIBRATION, WHICH CAUSES THE CONTACTS TO WEAR AND DECREASES THE LIGHTNING PROTECTION.

(23) Connect the W4P3 and the W5P7 harness connectors to the receptacles J7 and J3 (AMM 70-24-05/201).

S 425-124-N00

(24) Connect the supply tube assembly with the steps that follow:
- (a) Remove the protection covers from the adapter.
- (b) Lubricate the threads of the adapter at each end with the anti-seize paste.
- (c) Install the tube nut to the large adapter on the variable stator-vane actuator.
- (d) Install the tube nut to the hydraulic manifold tee.
- (e) Tighten the tube nuts with your hand.
- (f) Lubricate the threads of the clamp bolt with engine oil.
- (g) Tighten the clamp bolt, which attaches the supply tube to the engine, to 36-40 pound-inches (4.1-4.5 newton-meters).
- (h) Tighten the tube nuts to 225-250 pound-inches (25.4-28.2 newton-meters).
- (i) Safety the tube nuts with lockwire or safety cable and safety cable ferrule.

S 425-125-N00

(25) Connect the return tube assembly with the steps that follow:
- (a) Remove the protection covers from the adapter.
- (b) Lubricate the threads of the adapter at each end with anti-seize paste.
- (c) Install the tube nut to the smaller adapter on the variable stator-vane actuator.
- (d) Install the tube nut to the tee on the inlet return manifold.
- (e) Tighten the tube nuts with your hand.

(f) Lubricate the threads of the clamp bolt with engine oil.
(g) Tighten the clamp bolt, which attaches the return tube to the engine, to 36-40 pound-inches (4.1-4.5 newton-meters).
(h) Tighten the tube nuts to 225-250 pound-inches (25.4-28.2 newton-meters).
(i) Safety the tube nuts with lockwire or safety cable and safety cable ferrule.

F. Put the Aircraft Back to its Usual Condition

S 215-126-N00

CAUTION: MAKE SURE TO REMOVE ALL OF THE RIG PINS AND THE PWA 86344 HOLDER AFTER THE CHECK. IF YOU DO NOT REMOVE THE RIG PINS, DAMAGE TO THE ENGINE CAN OCCUR.

(1) Do an inspection of the stator-vane actuator (VSV) position indication (AMM 75-31-00/601).

S 415-035-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Close the right thrust reverser (AMM 78-31-00/201).

S 415-036-N00
(3) Close the right core cowl panel (AMM 71-11-06/201).

S 415-037-N00
(4) Close the right fan cowl panel (AMM 71-11-04/201).

S 445-038-N00
(5) Do the activation procedure for the thrust reversers (AMM 78-31-00/201).

S 715-039-N00
(6) Do the test of the compressor stator vane control system that is shown in the Power Plant Test Reference Table (AMM 71-00-00/501).

COMPRESSOR STATOR VANE CONTROL SYSTEM - INSPECTION/CHECK

1. General
   A. Only do the procedure, which examines the rigging of the compressor stator vane control system, if it is necessary to do a quick check of the system. Only use the undersized rig check pins with this check.
   B. Use the rigging procedure in AMM 75-31-00/501 when you find unsatisfactory rigging during the check or if you replace parts of the system.

TASK 75-31-00-286-001-N00

2. Examine the Compressor Stator Vane Control System
   A. Equipment

      NOTE: The PWA 86335 Rig Check Pin Kit has the undersized rig check pins which are found below. The rig check pins are only used for a check of the system. Do not use the rig check pins to do the rigging procedure for the system.

      The rig check pins used in this check have a smaller diameter than the ones used in the adjustment procedure. This check will permit a satisfactory check of the systems with worn areas from engine operation.

      (1) PWA 86331 Rig Check Pin (3 are necessary)
      (2) PWA 86332 Rig Check Pin
      (3) ENGINES PRE-PW-SB 72-246;
          PWA 86333 Rig Check Pin
      (4) ENGINES POST-PW-SB 72-246;
          PWA 86334 Rig Check Pin
      (5) PWA 86344 Holder, Rigging
   B. References
      (1) AMM 24-22-00/201, Electrical Power - Control
      (2) FIM 71-07-00/101, Power Plant - Visual Check
      (3) FIM 71-08-00/101, Power Plant - Engine Checks
      (4) AMM 71-11-04/201, Fan Cowl Panels
      (5) AMM 71-11-06/201, Core Cowl Panels
      (6) AMM 75-31-00/501, Compressor Stator Vane Control System

(7) AMM 75-31-02/401, Variable Stator Vane Actuator
(8) AMM 78-31-00/201, Thrust Reverser System

C. Access
(1) Location Zones
411 Left Engine
421 Right Engine

(2) Access Panels
414AR Fan Cowl Panel (Right)
424AR Fan Cowl Panel (Right)

D. Prepare to Examine the Compressor Stator Vane Control System

S 016-002-N00
(1) Open the right fan cowl panel (AMM 71-11-04/201).

S 046-003-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSERS CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

(2) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 016-004-N00
(3) Open the right core cowl panel (AMM 71-11-06/201).

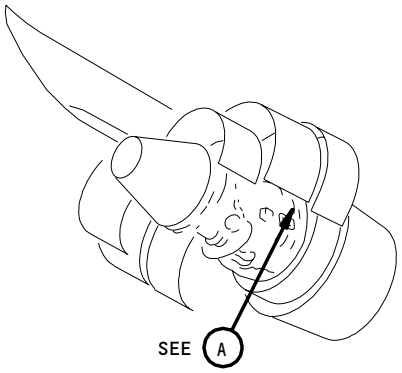
S 016-005-N00

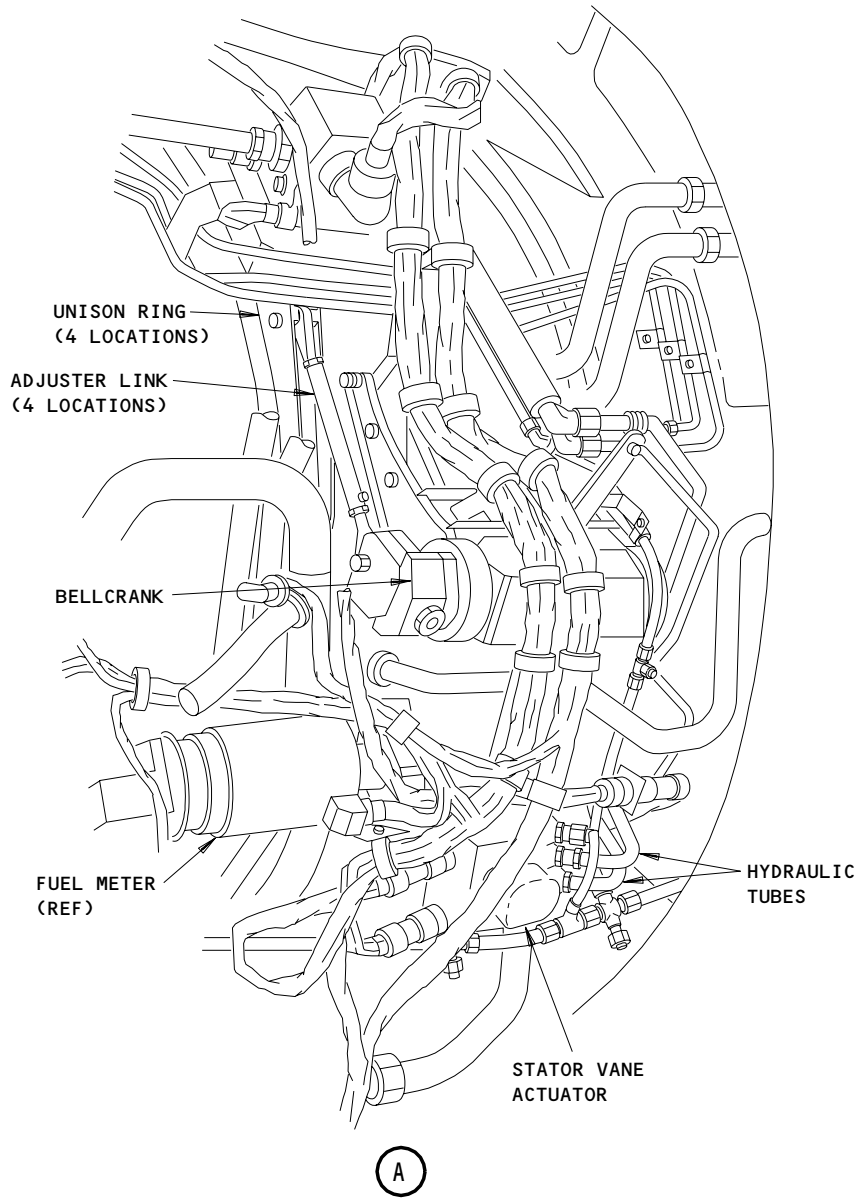
WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THESE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(4) Open the right thrust reverser (AMM 78-31-00/201).

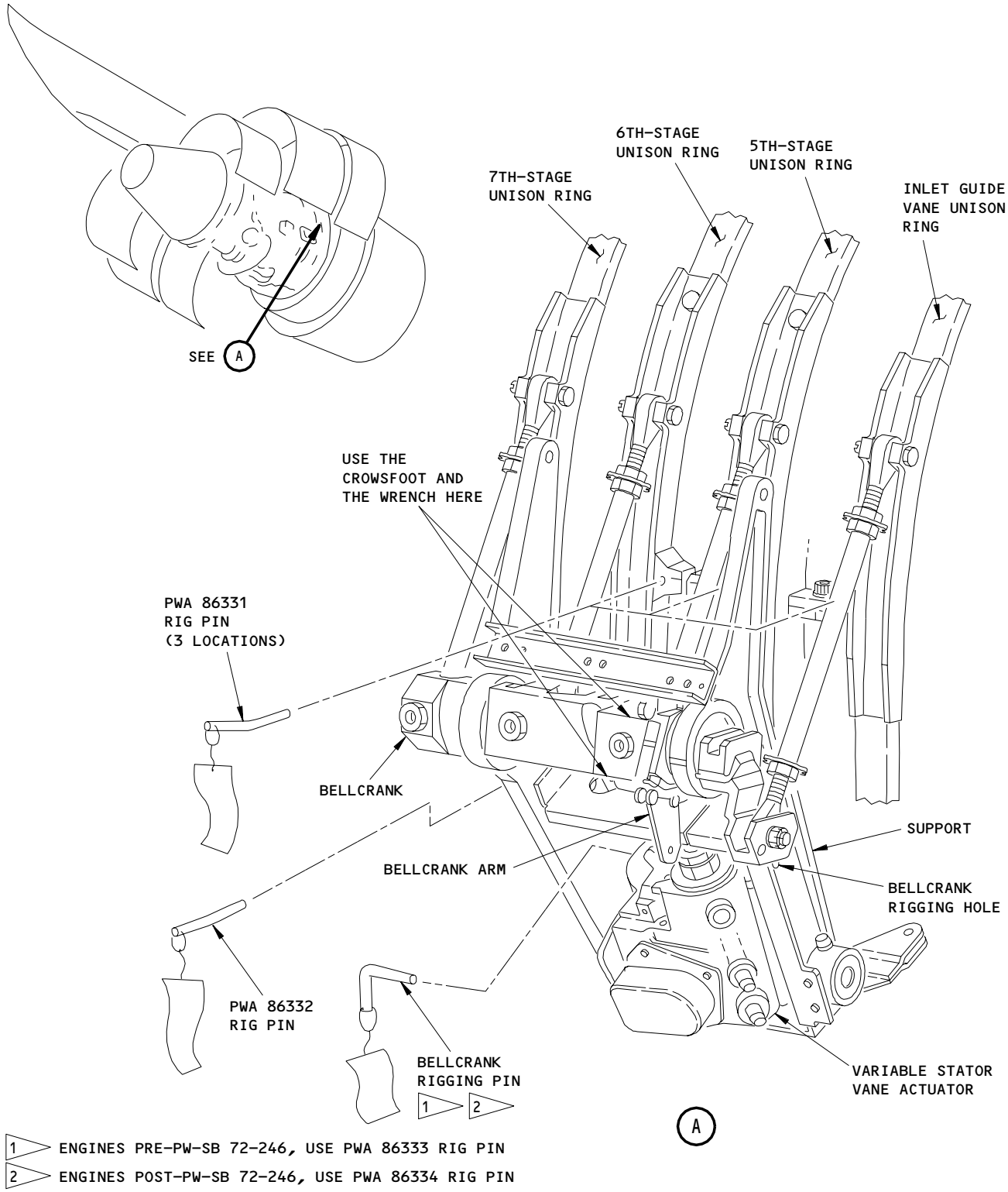
E. Examine the Compressor Stator Vane Control System (Fig. 602)

S 216-006-N00
(1) Examine the variable stator vane actuator and the hydraulic tubes for leaks.

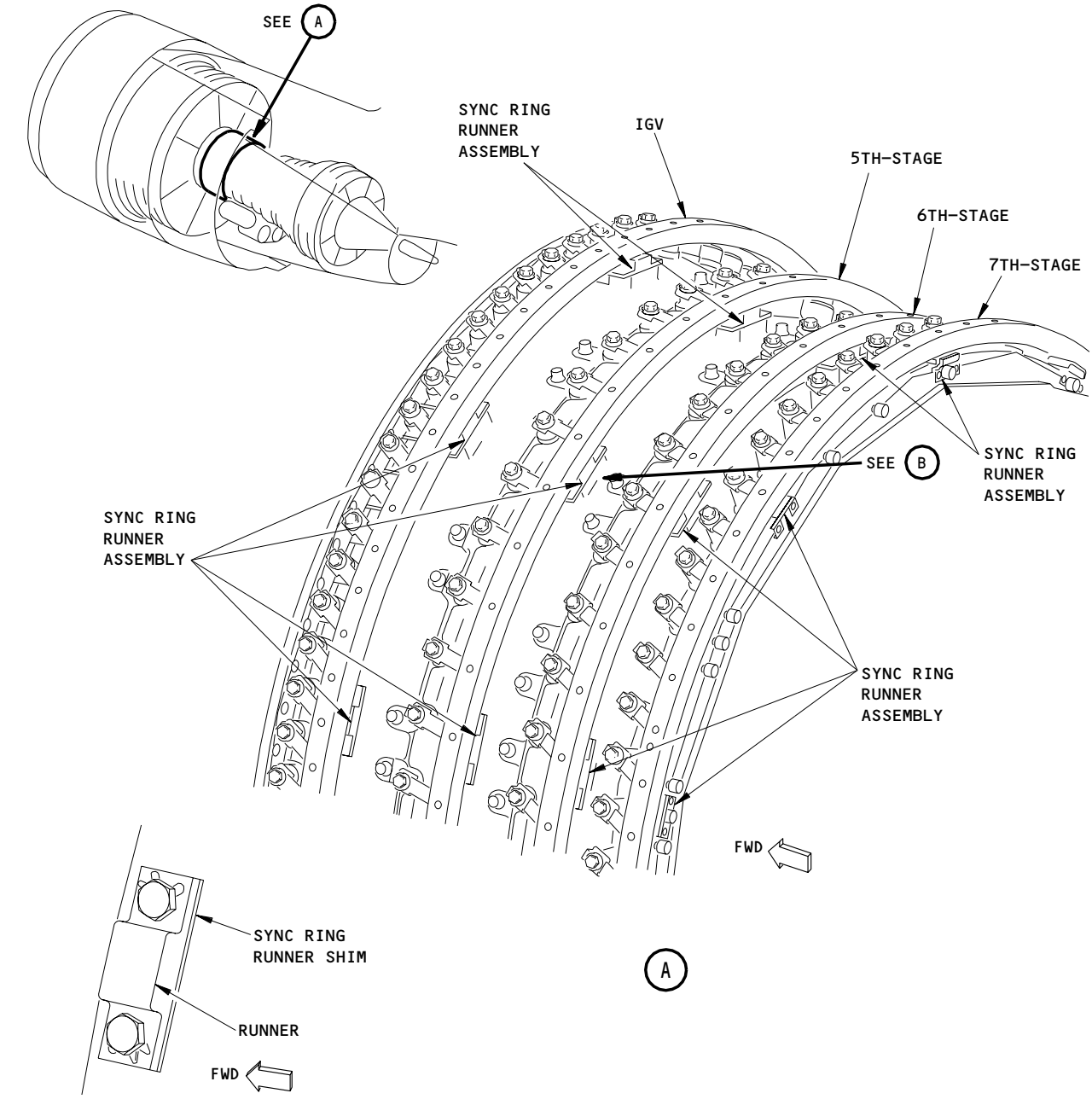




Compressor Stator Vane Control System
Figure 601

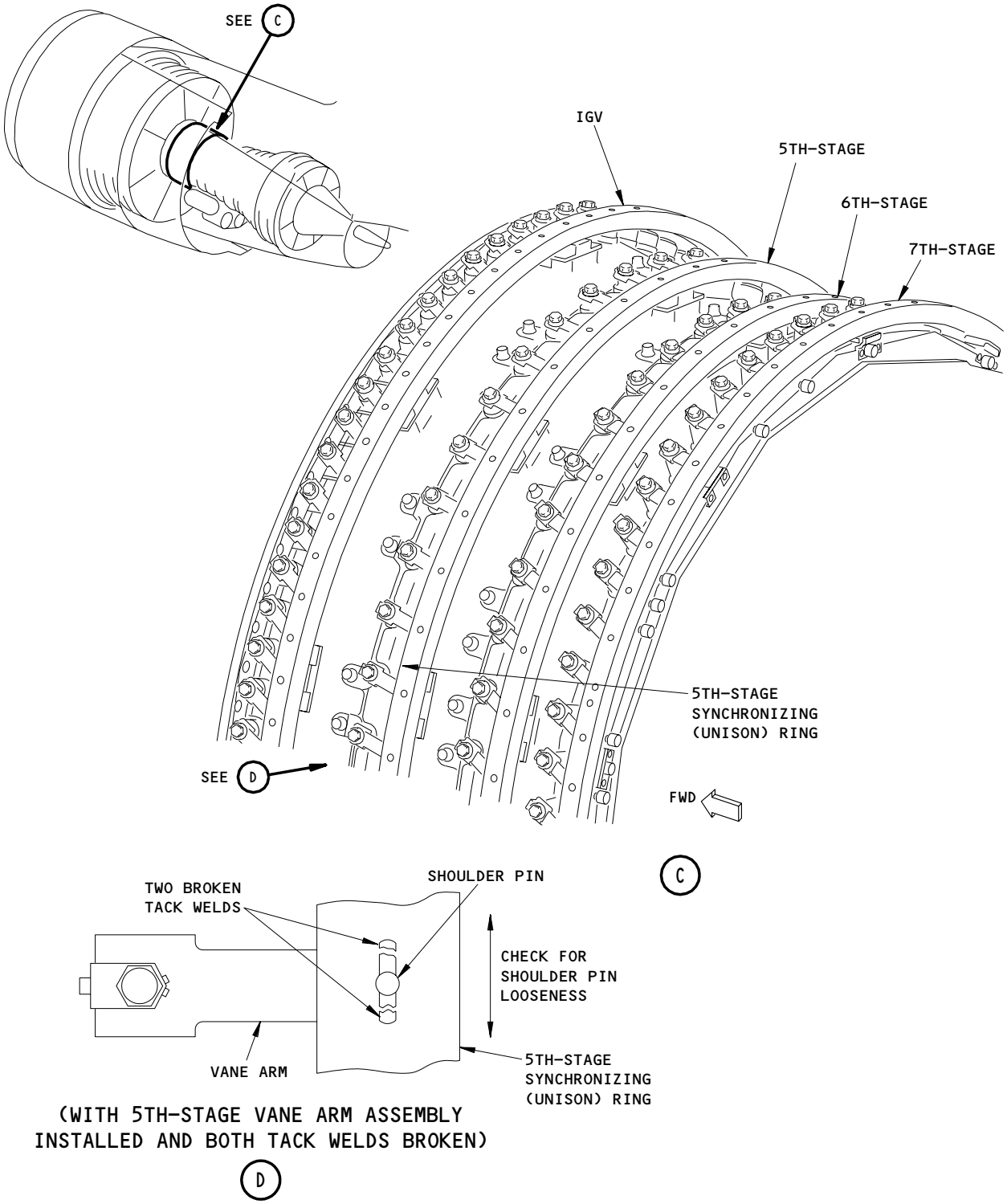


Compressor Stator Vane Control
Figure 602



SYNCHRONIZING RING RUNNER
(EXAMPLE WITH SYNCHRONIZING
RING REMOVED FOR CLARITY)

Synchronizing Ring Runner Inspection
Figure 602A (Sheet 1)



Synchronizing Ring Runner Inspection
Figure 602A (Sheet 2)

S 216-020-N00

(2) Examine the variable vane actuating linkage for damage or looseness.
   (a) No worn areas or end play is permitted in the spherical rod end bearings in the connecting rods between the levers sets and the VSV unison rings.
   (b) If you find damage or looseness, you must replace the the worn or loose parts.

S 216-021-N00

(3) Examine the stator vane arms and the retaining rivet pins of the Inlet Guide Vanes (IGV), and the 5th- thru 7th-stage vanes for correct installation, and for loose or detached vane arms.
   (a) If you find a loose vane arm, replace the synchronizing unison ring for that stage.
   (b) If you find a detached vane arm (the rivet pin is gone), remove the engine (AMM 71-00-02/401).

      NOTE: A detached vane arm is a loss of a rivet pin attachment to the synchronizing unison ring, an incorrect assembly of the vane trunnion, or a separation from the vane trunnion. Refer to PW Alert SB A72-419.

      1) Refer to the PWA Engine CIR Manual for the applicable inspections.
   (c) Examine the synchronizing ring runners (Fig. 602A).

      NOTE: The engine can continue in the service for the specified continued service cycles, if the inspection is meet with one of these conditions.

      1) Replace the ring runners at the next scheduled maintenance.
         a) For a maximum of one ring runner that is missing or loose per stage.
         b) For a maximum of three ring runners that are missing or loose for each engine, with no more than one missing or loose per stage.
      2) Replace the ring runners in 50 flights or less.
         a) For a maximum of three ring runners that are missing or loose for each engine, with no more than three missing or loose per stage, and no more than two adjacent missing or loose per stage.

3) Replace the ring runners immediately.
a) For more than three ring runners that are missing or loose per stage, no more than two adjacent missing or loose per stage.

(d) If you replace a part because of this inspection, rig the stator vane control system.

S 216-031-N00

(4) Examine the 5th-stage HPC synchronizing ring vane arm rivet pin tack welds (Fig. 602A).
(a) Maximum of three cracked vane arm pin locations are allows.
(b) At the locations with broken tack welds, examine the quantity of the loose pins between the rivet pin and the synchronizing ring.
1) You can examine the looseness visually or by moving the rivet pin.
(c) Tack welds that are 0.010 inch (0.254 mm) maximum loose can be repaired (refer to AMM 75-33-06/801).

S 216-007-N00

(5) Examine the bellcrank for damage and if it is attached correctly.

S 216-008-N00

(6) Examine the adjuster links for damage and if it is attached correctly.

S 216-009-N00

(7) Examine the unison rings for damage and if it is attached correctly.

S 216-010-N00

(8) Examine the stator vane arms and the retaining pins for the correct installation.

S 286-022-N00

WARNING: DO NOT PUT YOUR FINGERS IN THE LINE OF MOVEMENT OF THE LINKAGES, UNISON RINGS, OR LEVERS WHEN YOU OPERATE THE STATOR VANE SYSTEM. IF YOU DO NOT OBEY THIS, INJURY TO YOU CAN OCCUR.

CAUTION: IT IS VERY IMPORTANT TO DO THIS MECHANICAL RIGGING PROCEDURE WITH PRECISION. BAD RIGGING CAN CAUSE FATIGUE IN THE HPC BLADES TO INCREASE, INTERNAL ENGINE DAMAGE OR A COMPLETE ENGINE FAILURE.

YOU MUST REMOVE ALL RIG CHECK PINS BEFORE YOU MOVE THE STATOR VANE SYSTEM.

(9) Examine the rigging of the compressor stator vane control system with the steps that follow:

CAUTION: MAKE SURE YOU DO NOT PUT TOO MUCH TORQUE ON THE BELLCRANK. TOO MUCH TORQUE CAN BEND THE BELLCRANK BRACKET WHICH CAN CAUSE A BAD RIGGING.

(a) Use a wrench to pull down and hold the bellcrank until the actuator rod is fully extended against the internal stop (stator vanes are open).
(b) Hold the actuator rod fully extended against the internal stop with 300-400 pound-inches (33.9-45.2 newton-meters) on the crowsfoot.
(c) While you hold the actuator rod fully extended against the internal stop, install the PWA 86344 holder between the jamnut and the top of the actuator housing.
    1) Tighten the detail bolt to 8-10 pound-inches (0.9-1.1 newton-meters).

        NOTE: Do not tighten the detail bolt too much.

    2) Tighten the detail jamnut with your hand.

CAUTION: MAKE SURE YOU KEEP THE ACTUATOR ROD FULLY EXTENDED WHEN YOU INSTALL THE RIG CHECK PIN IN THE BELLCRANK. IF YOU LET THE ACTUATOR ROD RETRACT, YOU WILL NOT GET AN ACCURATE CHECK. A BAD RIGGING CAN CAUSE A DANGEROUS STABILITY AND EFFECTS ON THE LENGTH OF LIFE.

CAUTION: MAKE SURE TO USE THE CORRECT RIG CHECK PIN IN THE BELLCRANK. ON ENGINES PRE-PW-SB 72-246, USE THE LARGER PWA 86333 RIG CHECK PIN. ON ENGINES POST-PW-SB 72-246, USE THE SMALLER PWA 86334 RIG CHECK PIN.

(d) ENGINES PRE-PW-SB 72-246;
Install the PWA 86333 rig check pin into the bellcrank arm slot and into the bolt holes of the support.

(e) ENGINES POST-PW-SB 72-246;
Install the PWA 86334 rig check pin into the bellcrank arm slot and into the bolt holes of the support.

(f) If you can install the rig check pin for the bellcrank, do the steps that follow:
1) Remove the rig check pin.
2) Remove the PWA 86344 holder.
3) Push up on the wrench to retract the actuator rod.
4) Pull down on the wrench to fully extend the actuator rod again.
5) Hold the actuator rod fully extended against the internal stop with 300-400 pound-inches (33.9-45.2 newton-meters) on the crowsfoot.
6) While you hold the actuator rod fully extended against the internal stop, install the PWA 86344 holder between the jamnut and the top of the actuator housing.
a) Tighten the detail bolt to 8-10 pound-inches (0.9-1.1 newton-meters).

NOTE: Do not tighten the detail bolt too much.

b) Tighten the detail jamnut with your hand.
7) Install the rig check pin again with the actuator rod fully extended.

(g) If you cannot install the rig check pin, adjust the compressor stator vane control system (AMM 75-31-00/501).

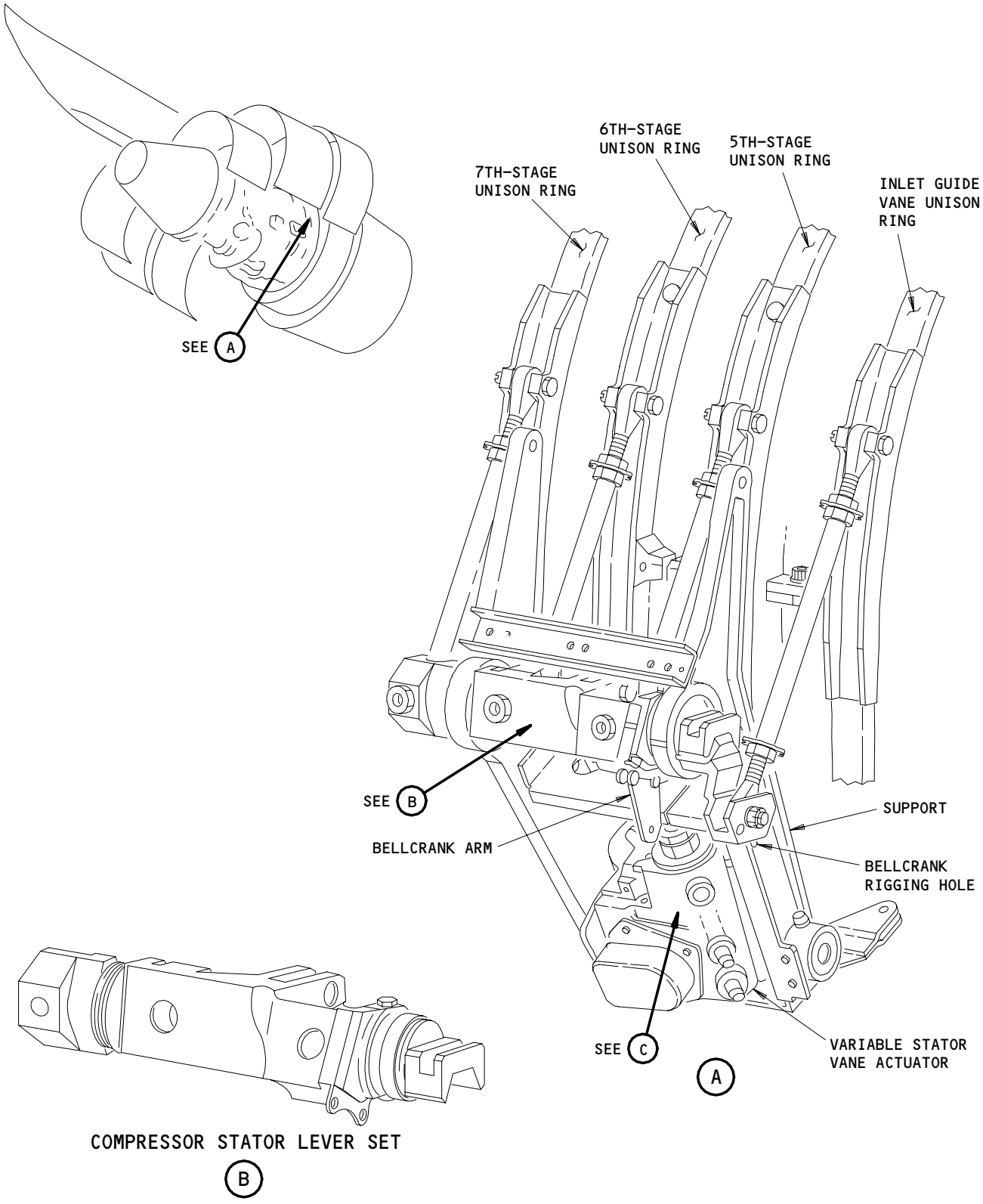
(h) With the actuator rod fully extended and the rig check pin fully installed, do the steps that follow:
1) Install the three PWA 86331 rig check pins into the applicable rig pin holes for the IGV, 5th- and 6th-stage unison ring.
2) Install the PWA 86332 rig check pin into the rig pin hole for the 7th-stage unison ring.

CAUTION: MAKE SURE TO REMOVE ALL OF THE RIG CHECK PINS AND THE PWA 86344 HOLDER AFTER THE CHECK. IF YOU DO NOT REMOVE THE RIG CHECK PINS, DAMAGE TO THE STATOR VANE SYSTEM CAN OCCUR.

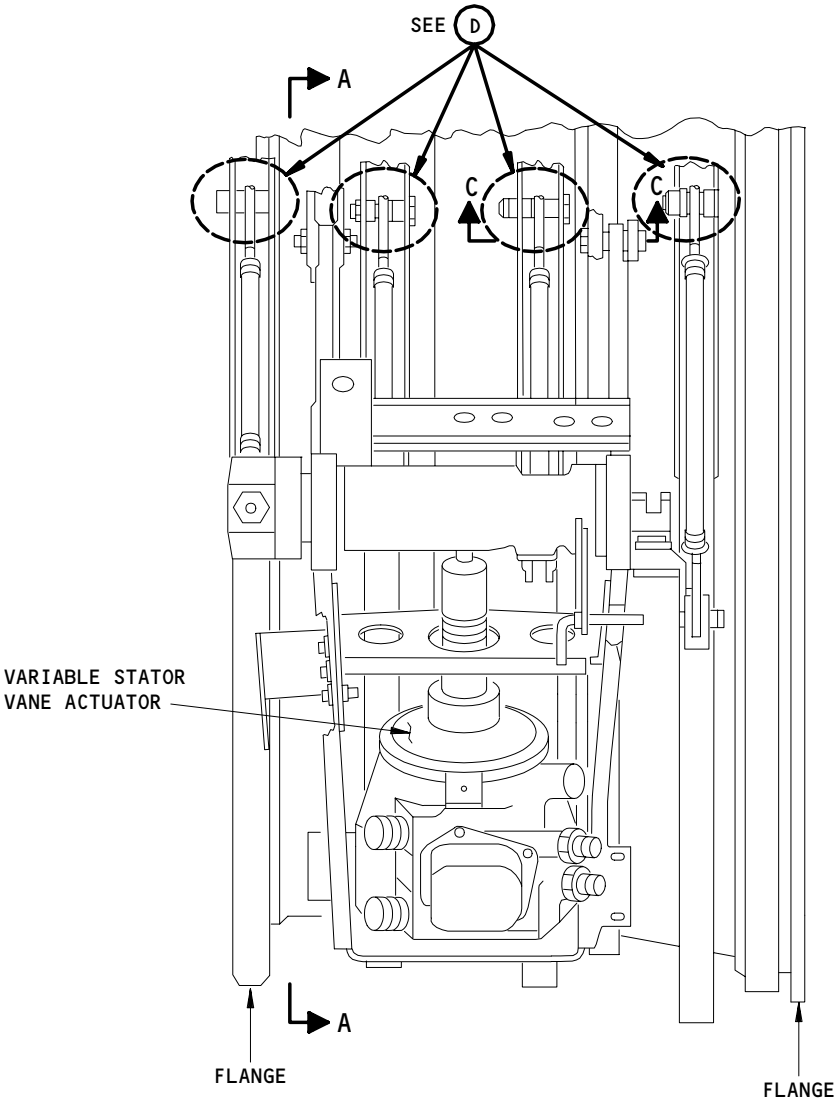
(i) If you can install all of the rig check pins, remove the rig check pins and the PWA 86344 holder from the unison rings and the bellcrank.

(j) If you cannot install all of the rig check pins, adjust the compressor stator vane control system (AMM 75-31-00/501).

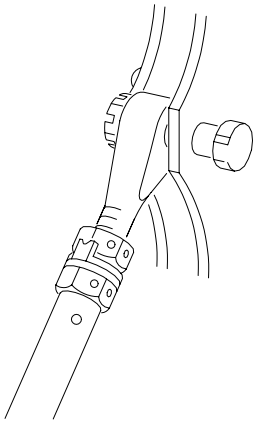
F. Do an Inspection of the Variable Stator Vane Actuating System for Continued In-Service Limits.



Compressor Stator Vane Lever Set and Support
Figure 603 (Sheet 1)

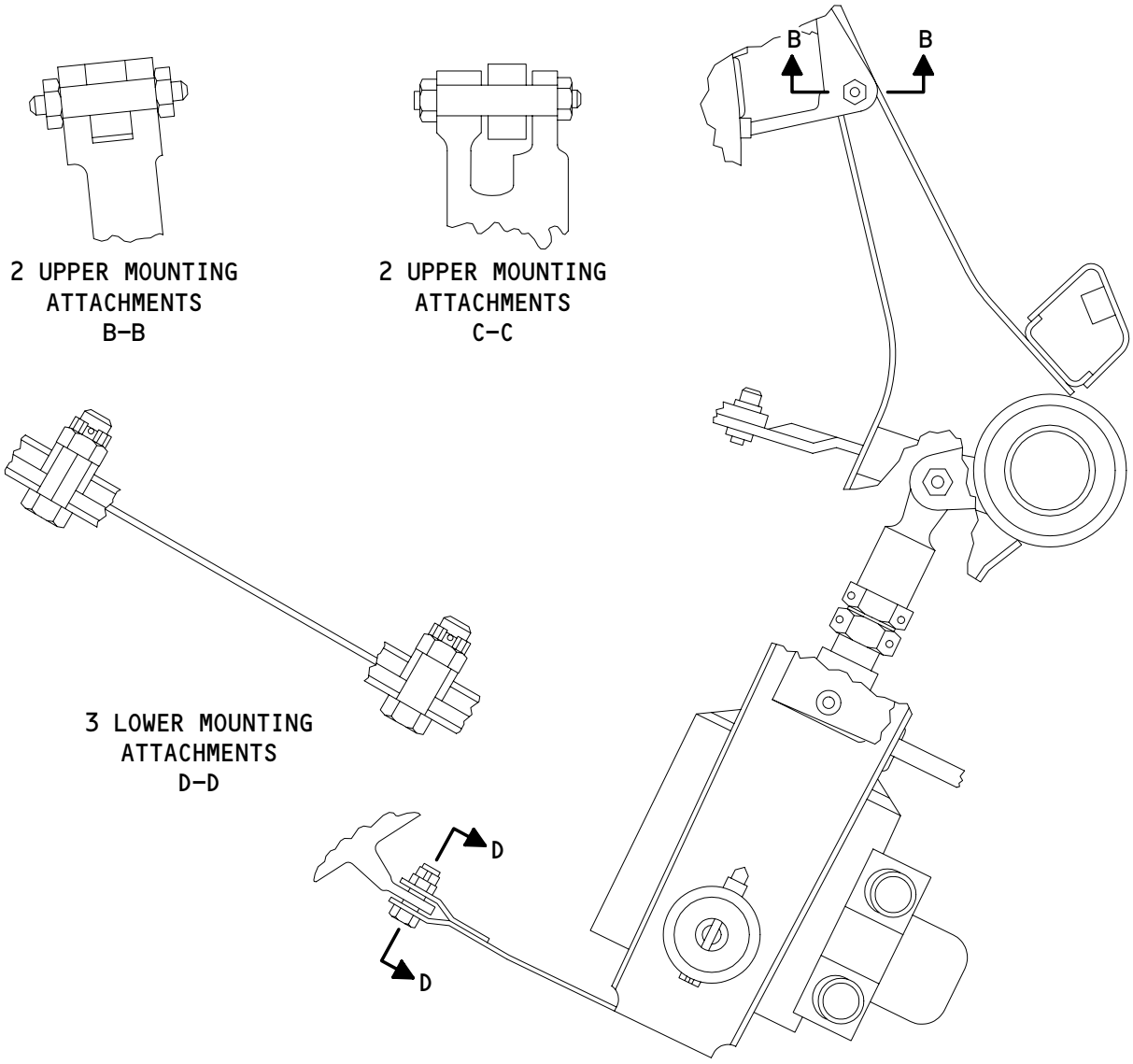


RIGHT SIDE VIEW OF
ACTUATOR AND SUPPORT
C



CLEVIS ATTACHMENT OF LEVER SET
CONNECTING RODS TO UNISON RING
D

Compressor Stator Vane Lever Set and Support
Figure 603 (Sheet 2)



Compressor Stator Vane Lever Set and Support
Figure 603 (Sheet 3)

C12194

S 226-016-N00

(1) Do the inspection steps that follow:

NOTE: The variable vane actuating system can be continued in service for a maximum of 250 hours. This is when the wear on the parts of the system are more than the specified wear/looseness limits.

CONTINUE-IN-SERVICE INSPECTION		
EXAMINE	DAMAGE LIMITS	DISPOSITION
Clevis attachments: Lever to connecting rod to VSV unision ring for IGV, 5th 6th, and 7th stages for looseness.	No wear/looseness permitted	Replace/Repair before 250 hours
Actuator support bracket upper mounting attachments for radial wear/looseness.	Maximum wear/looseness permitted is 0.040 inch (1.016 millimeters).	Replace/Repair before 250 hours
Actuator support bracket lower mounting attachments for radial wear/looseness.	Maximum wear/looseness permitted is 0.050 inch (1.270 millimeters).	Replace/Repair before 250 hours
Lever set assembly for axial wear/looseness	Maximum wear/looseness permitted is 0.040 inch (1.016 millimeters).	Replace/Repair before 250 hours
Lever set assemply for radial wear/looseness	Maximum wear/looseness permitted is 0.030 inch (0.762 millimeters).	Replace/Repair before 250 hours

G. Do an Inspection of the Variable Stator Vane Actuator (SVA) for Position Indication.

S 866-018-N00

(1) Supply electrical power when it is necessary (AMM 24-22-00/201).

S 226-017-N00

(2) Do the inspection steps that follow:

(a) Move the Lever Set (bellcrank) to the vane open position (unision rings move up).

1) Use a standard wrench on the wrench flats.

2) Insert the rig pin.

(b) With the Ground Test Power ON, read the Stator Vane Actuator position (percent) on the flight deck display.

1) Both EEC channels must show between 94 percent and 96 percent for the actuator position.

(c) Remove the lever set (bellcrank) rig pin.

(d) Move the lever set (bellcrank) to the vanes full closed stop (unision rings move down).

(e) With EEC ground test power ON, read the actuator position (percent) on the flight deck display.

1) Both EEC Channels must show between -6 percent and -4 percent.

(f) If either position gives a faulty reading, or if the system is hard to operate, do the steps that follow:

1) Do Visual Check #2 - Stator Vane Unision Ring/Actuator Linkage (FIM 71-07-00/101).

2) Do Engine Check #9 - Variable Stator Vane System Check (FIM 71-08-00/101).

3) Rig the stator vane system (AMM 75-31-00/501).

4) Replace the Stator Vane Actuator (AMM 75-31-02/401).

S 866-019-N00

(3) Remove electrical power if it is not necessary (AMM 24-22-00/201).

H. Do a Check of the Synchronizing Ring.

NOTE: This Synchronizing Ring Pull Test is required only when troubleshooting a high power engine surge.

S 826-028-N00

(1) Use a 2 1/4 inch crowsfoot and wrench on the bellcrank wrench flats and pull down to move the belcrank to the stator vanes full open (actuator rod extended) position.

S 026-029-N00

(2) Remove the cotter pin from the nut and bolt that attaches the adjuster rod to the synchronizing ring clevis at the inlet, 5th, 6th and 7th stages.

S 026-027-N00

(3) Remove the nut, washer, and bolt that attaches the adjuster rod to the synchronizing ring clevis at the inlet, inlet, 5th, 6th and 7th stages.

S 426-026-N00

(4) Position the adjuster end away from the IGV synchronizing ring clevis and install the nut, washer and bolt finger tight.

S 866-025-N00

(5) Attach a pull scale to the IGV bolt shank and apply a downward tangential pull load.
   (a) Measure the force required to start the synchronizing ring to move.
   (b) Measure the force required at mid-travel (vane arms at approximately the horizontal position).
   (c) The pull force required should be no more than 125 pounds (56.8 Kg).
   (d) Repeat the pull test for the 5th, 6th and 7th stages.

S 206-024-N00

(6) If the pull force required is no more than 125 pounds (56.8 Kg.) that stage of the variable stator vane system is satisfactory and the adjuster rod can be re-attached.
   (a) Remove the nut, washer and bolt from the adjuster rod, and then attach the adjuster rod to the synchronizing ring clevis with the nut, washer and bolt.
   (b) Tighten the nut to 15-22 pound-inhes (1.7-2.5 newton-meters) plus the torque necessary to turn the nut on the bolts.
   (c) Install a new cotter pin.

S 206-023-N00

(7) If the pull force required is more than 125 pounds (56.8 Kg) that stage of the variable stator vane system is not satisfactory.
   (a) Loosen the 10 vane arm retaining bolts on vanes that have anti-curling spacers.

      NOTE: The anti-curling spacers are installed to the 2nd and 4th vanes above and below the horizontal split on both sides of the engine (8 locations) and the 12 o'clock and 6 o'clock locations (2 locations).

   (b) Repeat the pull test.

(c) If the measured pull force is more than 100 pounds (45 kg), replace the engine (AMM 71-00-02/401).
(d) If measured pull force is less than 100 pounds (45.4 Kg), a one cycle flight is permitted to return the airplane to a maintenance base if you use the following procedure:
1) Remove the 10 vane arm retention bolts and discard the tab washer.
2) Install the 10 vane arm retention bolts with a flat washer and a new tab waher at eah location.
3) Tighten the vane arm retention bolts finger tight.
4) Bend the tabs of the tab washer to secure the bolts.

I. Put the Airplane Back to Its Usual Condition

S 416-012-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Close the right thrust reverser (AMM 78-31-00/201).

S 416-013-N00
(2) Close the right core cowl panel (AMM 71-11-06/201).

S 416-014-N00
(3) Close the right fan cowl panel (AMM 71-11-04/201).

S 446-015-N00
(4) Do the activation procedure for the thrust reversers (AMM 78-31-00/201).

VARIABLE STATOR VANE ACTUATOR - REMOVAL/INSTALLATION

1. General
   A. This procedure has two tasks. The first task removes the variable stator vane (VSV) actuator. The second task installs the VSV actuator.

   TASK 75-31-02-004-001-N00

2. Remove the Variable Stator Vane Actuator
   A. Equipment
      (1) Container - 5 gallon (19 liter) capacity
      (2) Jackscrew Puller - PWA 85688; Pratt & Whitney, 400 Main Street, East Hartfort, CT 06108
   B. References
      (1) AMM 71-11-04/201, Fan Cowl Panels
      (2) AMM 71-11-06/201, Core Cowl Panels
      (3) AMM 78-31-00/201, Thrust Reverser System
   C. Access
      (1) Location Zones
          411 Left Engine
          421 Right Engine

      (2) Access Panels
          414AR Fan Cowl Panel (Right), Left Engine
          416AR Thrust Reverser (Right), Left Engine
          418AR Core Cowl Panel (Right), Left Engine
          424AR Fan Cowl Panel (Right), Right Engine
          426AR Thrust Reverser (Right), Right Engine
          428AR Core Cowl Panel (Right), Right Engine

   D. Prepare to Remove the VSV Actuator

      S 864-002-N00
      (1) For the left engine, open these circuit breakers on the overhead circuit breaker panel, P11, and attach the DO-NOT-CLOSE tags:
          (a) 11L3, L ENG PERF SOL CHAN A
          (b) 11L4, L ENG PERF SOL CHAN B

      S 864-003-N00
      (2) For the right engine, open these circuit breakers on the overhead circuit breaker panel, P11, and attach the DO-NOT-CLOSE tags:
          (a) 11L30, R ENG PERF SOL CHAN A
          (b) 11L31, R ENG PERF SOL CHAN B

      S 014-004-N00
      (3) Open the right fan cowl panel (AMM 71-11-04/201).

S 044-005-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

(4) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 014-006-N00

(5) Open the right core cowl panel (AMM 71-11-06/201).

S 014-007-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(6) Open the right thrust reverser (AMM 78-31-00/201).

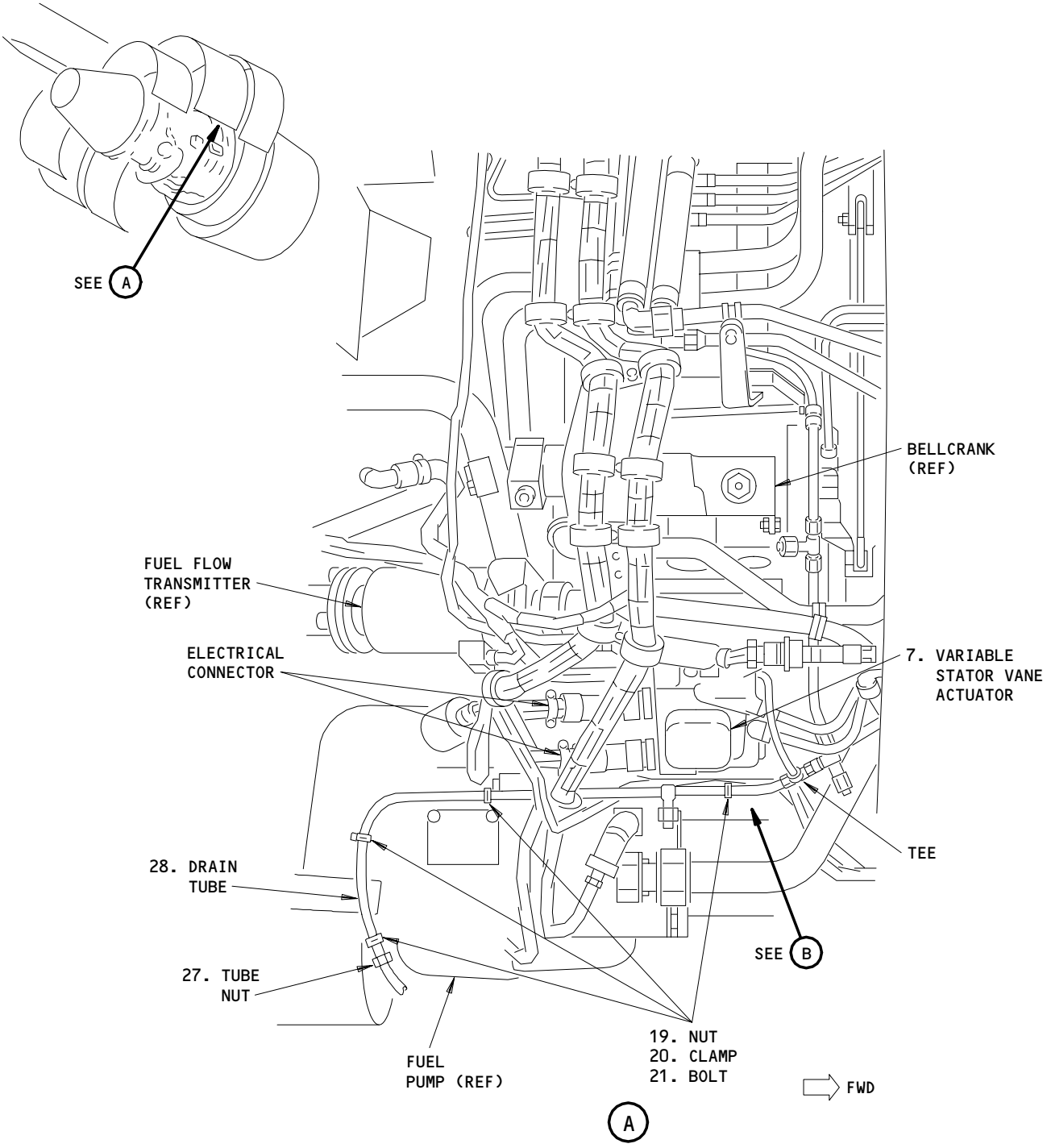
E. Procedure

S 024-040-N00

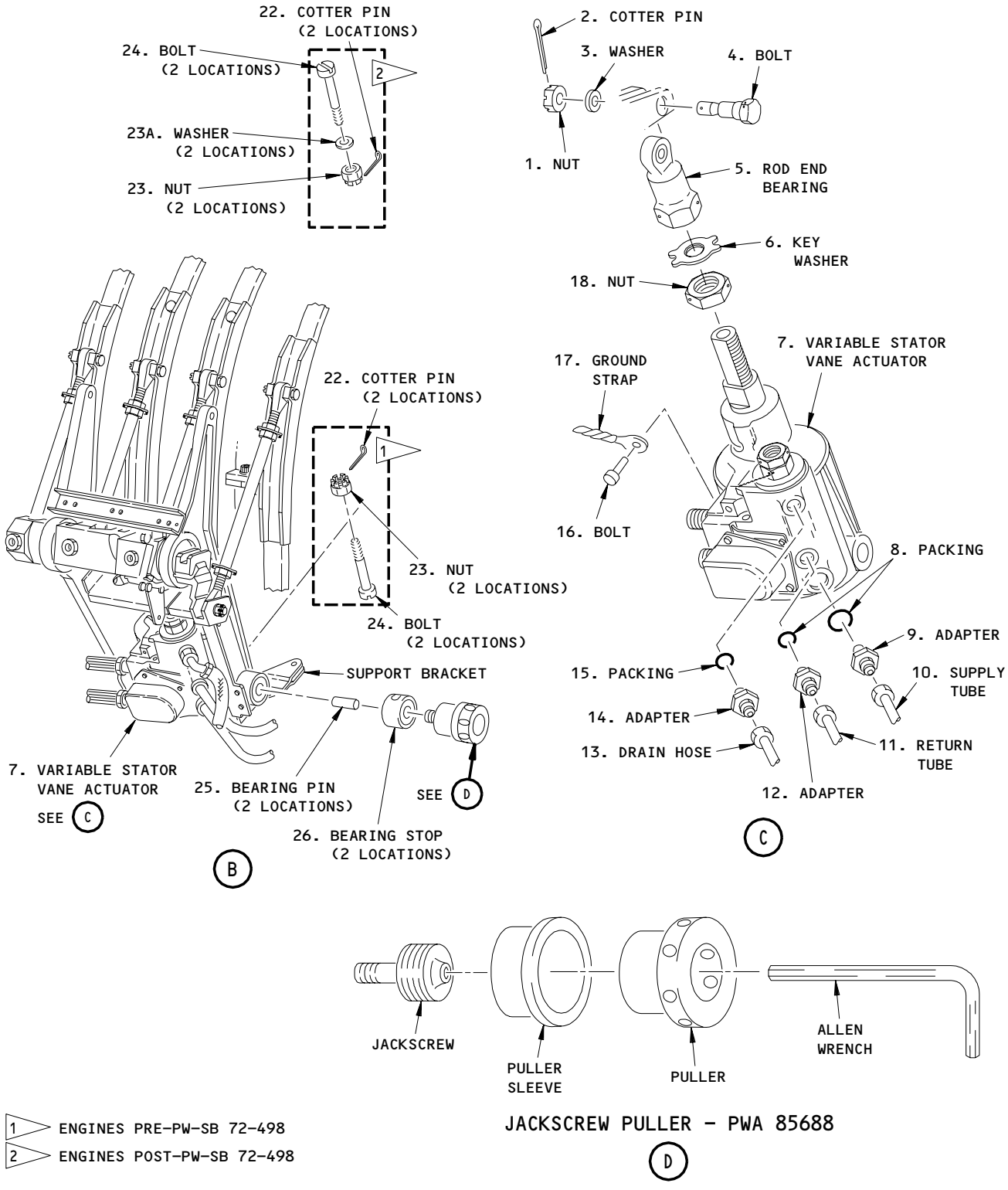
(1) Remove the VSV actuator (Fig. 401):
  (a) Disconnect the electrical connectors from the VSV actuator (7).
    1) Install the protection caps on the electrical connectors.
  (b) Remove the bolt (16) which attaches the ground strap to the VSV actuator (7).
  (c) Disconnect the drain tube (28) with the steps that follow:

    NOTE: It is not necessary to remove the drain tube from the engine. The drain tube is disconnected to make it easier to remove the VSV actuator.

    1) Disconnect the drain tube (28) from the tee.



Variable Stator Vane Actuator Installation
Figure 401 (Sheet 1)



Variable Stator Vane Actuator Installation
Figure 401 (Sheet 2)

2) Disconnect the tube nut (27).
3) Remove the bolts (21) which attach the clamps (20) on the drain tube (28).

(d) Disconnect the supply and return tubes (10, 11) and the drain hose (13) from the VSV actuator (7).

NOTE: Prepare to catch the remaining fuel in a container.

(e) Remove the cotter pin (2), nut (1), washer (3) and bolt (4) which attach the rod end bearing (5) to the bellcrank.

NOTE: To make it easier to get access to the rod end bearing, turn the bellcrank to lower the rod end bearing.

(f) ENGINES PRE-PW-SB 72-498;
Remove the cotter pin (22), nut (23), bolt (24), and bearing stop (26) from the two sides of the support bracket.

(g) ENGINES POST-PW-SB 72-498;
Remove the cotter pin (22), nut (23), bolt (24) and washer (23A), and bearing stop (26) from the two sides of the support bracket.

(h) Use the PWA 85688 jackscrew puller to remove the bearing pins (25) from the two sides of the support bracket.
1) Install the jackscrew into the I.D. of the bearing pin (25).
a) Tighten the jackscrew with your hand.
2) Install the puller sleeve on the jackscrew.
3) Install the puller into the puller sleeve and to the jackscrew.

NOTE: If it is necessary, use an allen wrench to hold the jackscrew in the correct position while you turn the puller.

a) Tighten the puller with your hand.
4) While you hold the jackscrew with an allen wrench, turn the puller with a spanner wrench or a 0.180 inch diameter punch.

5) Turn the puller until you remove the bearing pin (25).

(i) Remove the VSV actuator (7) from the engine.

S 024-041-N00

(2) If it is necessary to replace the VSV actuator, do the steps that follow:

(a) Remove the adapters (9, 12, and 14) from the ports for the supply, return, and drain tubes.

(b) Discard the packings (8, 15).

(c) Remove the rod end bearing (5), key washer (6), and nut (18) from the actuator rod.

(d) Discard the key washer (6).

S 024-042-N00

(3) Install the protection caps on the openings.

TASK 75-31-02-404-018-N00

3. Install the Variable Stator Vane Actuator

A. Equipment

(1) M303, M305, or M307 Bergen Mechanical Crimper
Bergen Cable Technologies Inc
170 Gregg St
P.O. Box 1300
Lodi, NJ 07644-9982

B. Consumable Materials

(1) A00628 Compound, Antiseize - PWA36053-4
(2) D00059 G-N Metal Assembly Paste, Lubricant - PWA587
(3) D00137 Engine Oil - PWA 521
(4) D00504 Petrolatum, White - PMC 9609
(5) G02334 Lockwire - AS3214-02
(6) G02332 Ferrule - P05-292 (Optional)
(7) G02335 Cable - Safety - P05-291 (Optional)
(8) D50124 Anti-seize paste - PWA 36246

C. Parts

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	2	Cotter Pin	75-31-02	05	35
	6	Key Washer			60
	7	Actuator - Variable Stator Vane			120
	8	Packing			20
	8	Packing			25
	15	Packing			20
	22	Cotter Pin			30

D. References
(1) AMM 70-24-05/201, Electrical Harnesses
(2) AMM 71-11-04/201, Fan Cowl Panels
(3) AMM 71-11-06/201, Core Cowl Panels
(4) AMM 75-31-02/501, Variable Stator- Vane Actuator
(5) AMM 78-31-00/201, Thrust Reverser System

E. Access
(1) Location Zones
411 Left Engine
421 Right Engine

(2) Access Panels
414AR Fan Cowl Panel (Right), Left Engine
416AR Thrust Reverser (Right), Left Engine
418AR Core Cowl Panel (Right), Left Engine
424AR Fan Cowl Panel (Right), Right Engine
426AR Thrust Reverser (Right), Right Engine
428AR Core Cowl Panel (Right), Right Engine

F. Prepare to Install the VSV Actuator (Fig. 401)

S 424-043-N00
(1) Remove the protection caps from the VSV actuator (7).

S 424-044-N00
(2) If you install a new VSV actuator, do the steps that follow:
(a) Lubricate the packings (8, 15) with petrolatum.
(b) Install the packings (8, 15) on the adapters (9, 12 and 14).
(c) Lubricate the threads of the adapters (9, 12 and 14) with engine oil.
(d) Install the adapters (9, 12, and 14) into the ports in the VSV actuator.
(e) Tighten the adapter (9) to 150-170 pound-inches (16.9-19.2 newton-meters).
(f) Tighten the adapter (12) to 110-120 pound-inches (12.4-13.6 newton-meters).

(g) Tighten the adapter (14).
(h) Install the nut (18), new key washer (6), and the rod end bearing (5) to the actuator rod.
(i) Do not tighten the nut (18) at this time.
(j) Do not bend the tabs of the key washer (6) at this time.

G. Procedure

S 424-045-N00

(1) Install the VSV actuator:
(a) Install the VSV actuator (7) to the support bracket with the rod end bearing (5) through the hole in the cross-member on top of the support bracket.
(b) Install the bearings in the support bracket.
1) Align the side mount holes on the VSV actuator (7) with the openings in the support bracket bearings.
(c) Apply lubricant or anti-seize compound to the bearing pins (25).
(d) Insert the pins through the support bracket bearings to engage the actuator.
(e) Lubricate the threads of the bolts (24) with engine oil.
(f) ENGINES PRE-PW-SB 72-498;
Install the bearing stops (26) to the support bracket with the bolts (24) and nuts (23).

NOTE: With some tolerance conditions, the clearance between the bolt hole in the bearing stop (26) and the bolt (24) is possibly not sufficient for the correct installation of the bolt. If this occurs, see PW SB 75-38 for the repair procedure.

(g) ENGINES POST-PW-SB 72-498;
Install the bearing stops (26) to the support bracket with the bolts (24), the washers (23A) and nuts (23).

NOTE: With some tolerance conditions, the clearance between the bolt hole in the bearing stop (26) and the bolt (24) is possibly not sufficient for the correct installation of the bolt. If this occurs, see PW SB 75-38 for the repair procedure.

1) Tighten the bolts (24) to 36-40 pound-inches (4.1-4.5 newton-meters).

2) Install the cotter pin (22).

(h) Lubricate the threads of the shoulder bolt (4) with engine oil.

(i) Attach the rod end bearing (5) to the bellcrank lever with the shoulder bolt (4), washer (3), and nut (1).
1) Tighten the nut (1) with your hand.

(j) Lubricate the threads of the bolt (16) with engine oil.

(k) Attach the ground strap (17) to the VSV actuator with the bolt (16).
1) Tighten the bolt (16) to 75-85 pound-inches (8.5-9.6 newton-meters).

(l) Remove the protection caps from the electrical connectors on the VSV actuator (7).

CAUTION: USE THE CORRECT ASSEMBLY PROCEDURE, AND TOOLS, FOR THE HARNESS CONNECTOR INSTALLATION (AMM 70-24-05/201). IF YOU USE THE INCORRECT ASSEMBLY PROCEDURE, OR TOOLS, A DAMAGED OR LOOSE CONNECTOR CAN OCCUR. A LOOSE CONNECTOR PERMITS VIBRATION, WHICH CAUSES THE CONTACTS TO WEAR AND DECREASES THE LIGHTNING PROTECTION.

(m) Connect the electrical connector W4P3 to the lower receptacle, and the electrical connector W5P7 to the top receptacle on the VSV actuator (7) (AMM 70-24-05/201).

(n) Adjust the VSV Actuator (AMM 75-31-02/501).

(o) Connect the drain tube (28) with the steps that follow:
1) Lubricate the threads of the tee with engine oil.
2) Connect the drain tube (28) to the tee.
3) Lubricate the threads of the tube nut (27) with engine oil.
4) Connect the tube nut (27).
5) Tighten the two ends of the drain tube (28).
6) Attach the clamps (20) with the bolts (21) and nuts (19).
7) Tighten the bolts (21).

(p) Attach the drain hose (13) to the top union (14) on the actuator (7).

(q) Connect the supply (10) and return (11) tubes to the VSV actuator (7) with the steps that follow:
1) Remove the protection caps from the tubes.
2) Lubricate the threads of the tube nuts with the anti-seize paste.
3) Connect the servo fuel supply tube (10) to the lower adapter (9) on the VSV actuator.

4) Connect the servo fuel return tube (11) to the center adapter (12) on the VSV actuator.
5) Tighten the tube nuts on the supply tube (10) to 225-250 pound-inches (25.4-28.2 newton-meters).
6) Tighten the tube nut on the return tube (11) to 200-225 pound-inches (22.6-25.4 newton-meters).
7) Safety the tube nuts with lockwire or safety cable and safety cable ferrule.

H. Put the Aircraft Back to Its Usual Condition

S 414-032-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Close the right thrust reverser (AMM 78-31-00/201).

S 414-033-N00
(2) Close the right core cowl panel (AMM 71-11-06/201).

S 414-034-N00
(3) Close the right fan cowl panel (AMM 71-11-04/201).

S 444-035-N00
(4) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

S 864-036-N00
(5) For the left engine, remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:
(a) 11L3, L ENG PERF SOL CHAN A
(b) 11L4, L ENG PERF SOL CHAN B

S 864-037-N00
(6) For the right engine, remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:
(a) 11L30, R ENG PERF SOL CHAN A
(b) 11L31, R ENG PERF SOL CHAN B

VARIABLE STATOR VANE ACTUATOR - ADJUSTMENT/TEST

TASK 75-31-02-825-001-N00

1. Adjustment - Variable Stator Vane Actuator (Mechanical Rigging Procedure)

A. Equipment

(1) ENGINES PRE-PW-SB 72-246;
PWA 85395 Rig Pin (Pin Diameter 0.21760 inches +/- 0.00025 inches)

(2) ENGINES POST-PW-SB 72-246;
PWA 86097 Rig Pin (Pin Diameter 0.19060 inches +/- 0.00025 inches)

(3) PWA 86344 Holder, Rigging

B. Consumable Materials

(1) D00137 Engine Oil - PWA 521

C. Prepare to Do the Mechanical Rigging Procedure

S 015-002-N00

(1) Open the fan cowl panels (AMM 71-11-04/201).

S 045-003-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSERS CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

(2) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 015-004-N00

(3) Open the core cowl panels (AMM 71-11-06/201).

S 015-039-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THESE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(4) Open the thrust reversers (AMM 78-31-00/201).

D. Do the Mechanical Rigging Procedure (Fig. 501)

S 825-046-N00

WARNING: DO NOT PUT YOUR FINGERS IN THE LINE OF MOVEMENT OF THE LINKAGES, UNISON RINGS, OR LEVERS WHEN YOU OPERATE THE STATOR VANE SYSTEM. IF YOU DO NOT OBEY THIS, INJURY TO YOU CAN OCCUR.

CAUTION: IT IS VERY INPORTANT TO DO THIS MECHANICAL RIGGING PROCEDURE WITH PRECISION. BAD RIGGING CAN CAUSE FATIGUE IN THE HPC BLADES TO INCREASE, INTERNAL ENGINE DAMAGE TO A COMPLETE ENGINE FAILURE.

CAUTION: YOU MUST REMOVE ALL RIG PINS BEFORE YOU MOVE THE STATOR VANE SYSTEM. IF YOU DO NOT DO THIS, DAMAGE TO THE ENGINE CAN OCCUR.

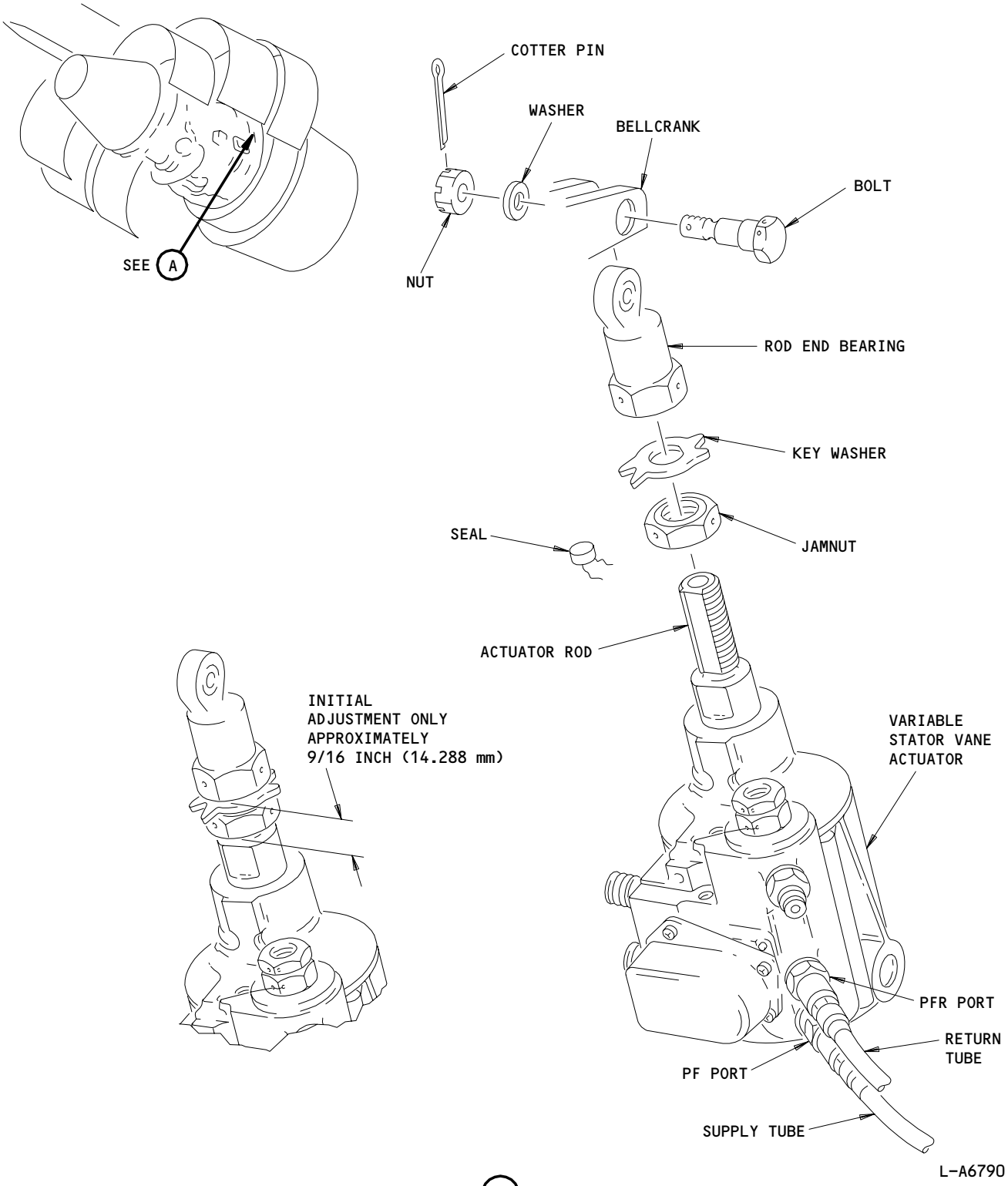
(1) Do an initial adjustment of the rod end bearing with the steps that follow:
   (a) Turn the actuator rod of the stator vane actuator until the flat surface below the hex of the rod end bearing is approximately 9/16 inch (14.2 mm) from the flat surface below the actuator rod threads.

S 825-005-N00

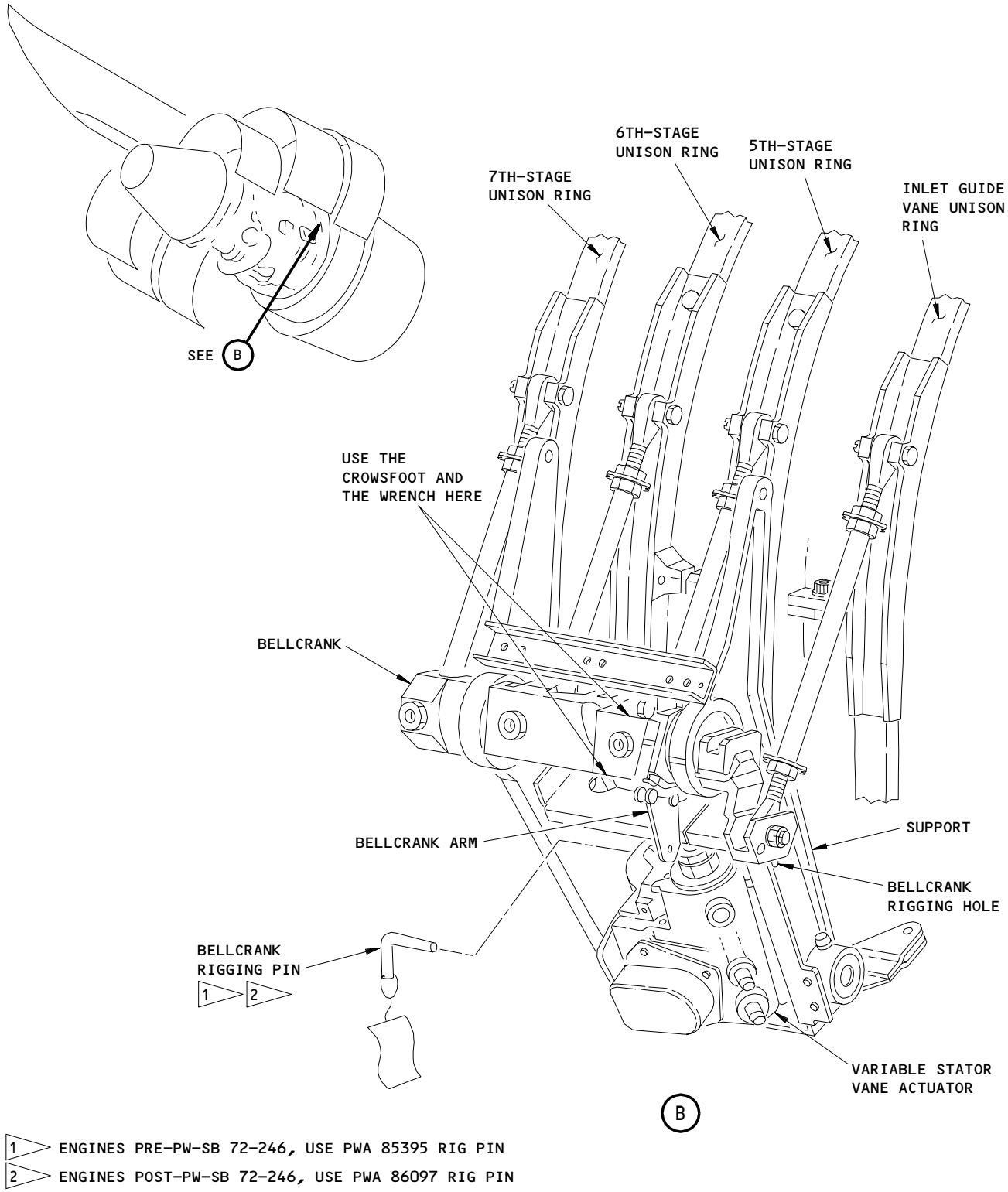
(2) Adjust the rod end bearing with the steps that follow:
   (a) With a crowsfoot and a wrench, do the steps that follow:
      1) Install the crowsfoot and the wrench on the flats of the bellcrank adjacent to the 5th-stage adjuster link.

      CAUTION: MAKE SURE YOU DO NOT PUT TOO MUCH TORQUE ON THE BELLCRANK. TOO MUCH TORQUE CAN BEND THE BELLCRANK BRACKET WHICH CAN CAUSE A BAD RIGGING.

      2) Pull down on the wrench until you feel the internal stop of the variable stator vane actuator.
      3) Push up on the wrench until you are off of the internal stop.
      4) Pull down on the wrench again until the actuator rod is fully extended against the internal stop.
      5) Hold the actuator rod fully extended against the internal stop (stator vanes are open) with 300-400 pound-inches (33.9-45.2 newton-meters) on the crowsfoot.



Variable Stator Vane Actuator - Adjustment
Figure 501 (Sheet 1)



Variable Stator Vane Actuator - Adjustment
Figure 501 (Sheet 2)

6) While you hold the actuator rod fully extended against the internal stop, install the PWA 86344 holder between the jamnut and the top of the actuator housing.
   a) Tighten the detail bolt to 8-10 pound-inches (0.9-1.1 newton-meters).

      NOTE: Do not tighten the detail bolt too much.

   b) Tighten the detail jamnut with your hand.

CAUTION: MAKE SURE YOU KEEP THE ACTUATOR ROD FULLY EXTENDED WHEN YOU INSTALL THE BELLCRANK RIG PIN. IF YOU LET THE ACTUATOR ROD RETRACT, YOU WILL NOT GET AN ACCURATE CHECK. A BAD RIGGING CAN CAUSE A DANGEROUS STABILITY AND EFFECTS ON THE LENGTH OF LIFE.

CAUTION: MAKE SURE THAT THE END OF THE RIG PINS ARE CORRECTLY AND FULLY INSTALLED. IF YOU DO NOT OBEY THIS INSTRUCTION, DAMAGE TO THE ENGINE CAN OCCUR.

CAUTION: MAKE SURE TO USE THE CORRECT BELLCRANK RIG PIN. ON ENGINES PRE-PW-SB 72-246, USE THE LARGER PWA 85395 RIG PIN. ON ENGINES POST-PW-SB 72-246, USE THE SMALLER PWA 86097 RIG PIN. IF YOU DO NOT USE THE CORRECT RIG PIN, THE ENGINE WILL NOT BE RIGGED CORRECTLY.

7) ENGINES PRE-PW-SB 72-246;
   Adjust the rod end bearing until you can install the PWA 85395 rig pin into the bellcrank arm slot and into the bolt holes of the support.

   NOTE: You must remove the PWA 86344 holder when you adjust the rod end bearing. You must then install the PWA 86344 holder again to install the rig pin.

8) ENGINES POST-PW-SB 72-246;
   Adjust the rod end bearing until you can install the PWA 95097 rig pin into the bellcrank arm slot and into the bolt holes of the support.

   NOTE: You must remove the PWA 86344 holder when you adjust the rod end bearing. You must then install the PWA 86344 holder again to install the rig pin.

9) Remove the rig pin and the PWA 86344 holder.

10) Lock the rod end bearing to the actuator rod with the jamnut.
    a) Tighten the jamnut to 460-510 pound-inches (52.0-57.6 newton-meters).

11) Push up on the wrench to retract the actuator rod.
12) Pull down on the wrench again to fully extend the actuator rod.
13) Hold the actuator rod fully extended against the internal stop with 300-400 pound-inches (33.9-45.2 newton-meters) on the crowsfoot.
14) While you hold the actuator rod fully extended against the internal stop, install the PWA 86344 holder between the jamnut and the top of the actuator housing.
    a) Tighten the detail bolt to 8-10 pound-inches (0.9-1.1 newton-meters).

       NOTE: Do not tighten the detail bolt too much.

    b) Tighten the detail jamnut with your hand.
15) Install the bellcrank rig pin again with the actuator rod fully extended.
16) If you cannot install the bellcrank rig pin, do the adjustment for the rod-end bearing again with the steps from above.
17) If you can install the bellcrank rig pin, do the steps that follow:
    a) Remove the rig pin and PWA 86344 holder.
    b) Lock the jamnut and the rod-end bearing with the key washer.
       1 Bend one set of tabs on the key washer to the rod end bearing.
       2 Bend the other set of tabs on the jamnut.
18) Install the lockwire and the seal.

S 425-040-N00

(3) Tighten the nut for the rod end bearing to a minumum of 15 pound-inches (1.7 newton-meters) plus the torque which is necessary to turn the nut on the bolt.
    (a) Continue to tighten the nut until the slot in the nut aligns with the hole in the bolt.
        1) Make sure the torque which is necessary to tighten the nut is not more than 22 pound-inches (2.5 newton-meters) plus the torque which is necessary to turn the nut on the bellcrank clevis bolt.

(b) Install the cotter pin in the nut.
1) Bend the cotter pin.

E. Put the Aircraft Back to Its Usual Condition.

S 215-041-N00

CAUTION: MAKE SURE TO REMOVE ALL OF THE RIG PINS AFTER THE CHECK. IF YOU DO NOT REMOVE THE RIG PINS, DAMAGE TO THE ENGINE CAN OCCUR.

(1) Do the inspection of the stator vane actuator (SVA) position indication (AMM 75-31-00/601).

S 415-031-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Close the thrust reversers (AMM 78-31-00/201).

S 415-032-N00

(3) Close the core cowl panels (AMM 71-11-06/201).

S 415-033-N00

(4) Close the fan cowl panels (AMM 71-11-04/201).

S 445-035-N00

(5) Do the activation procedure for the thrust reversers (AMM 78-31-00/201).

S 715-034-N00

(6) Do a test of the variable stator vane actuator as shown in the Power Plant Test Reference Table (AMM 71-00-00/501).

TASK 75-31-02-825-042-N00

2. Adjustment - Variable Stator Vane Actuator (Hydraulic Rigging Procedure)

A. Equipment

(1) PWA 29451 Adapter
(2) PWA 49030 Hydraulic Cart (Pneumatic) (Optional to CTE 5100)

(3) CTE 5100 Hydraulic Cart (Pneumatic) (Optional to PWA 49030)
(4) ENGINES PRE-PW-SB 72-246;
PWA 85395 Rig Pin (Pin Diameter 0.21760 inches +/- 0.00025 inches)
(5) ENGINES POST-PW-SB 72-246;
PWA 86097 Rig Pin (Pin Diameter 0.19060 inches +/- 0.00025 inches)
(6) PWA 86317 Electrical Switch Box (Recommended)
(7) M303, M305, or M307 Bergen Mechanical Crimper
Bergen Cable Technologies Inc
170 Gregg St
P.O. Box 1300
Lodi, NJ 07644-9982

B. Consumable Materials
(1) D00137 Engine Oil - PWA 521
(2) G00597 Calibration Fluid
(3) D50124 Anti-seize paste - PWA 36246
(4) G02334 Lockwire - AS3214-02
(5) G02332 Ferrule - P05-292 (Optional)
(6) G02335 Cable - Safety - P05-291 (Optional)

C. References
(1) AMM 70-24-05/201, Electrical Harnesses
(2) AMM 71-00-00/501, Power Plant
(3) AMM 71-11-04/201, Fan Cowl Panels
(4) AMM 71-11-06/201, Core Cowl Panels
(5) AMM 75-31-00/601, Compressor Stator Vane Control System
(6) AMM 78-31-00/201, Thrust Reverser System

D. Prepare to Do the Hydraulic Rigging Procedure

S 015-041-N00
(1) Open the fan cowl panels (AMM 71-11-04/201).

S 045-042-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSERS CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

(2) Do this procedure: Thrust reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

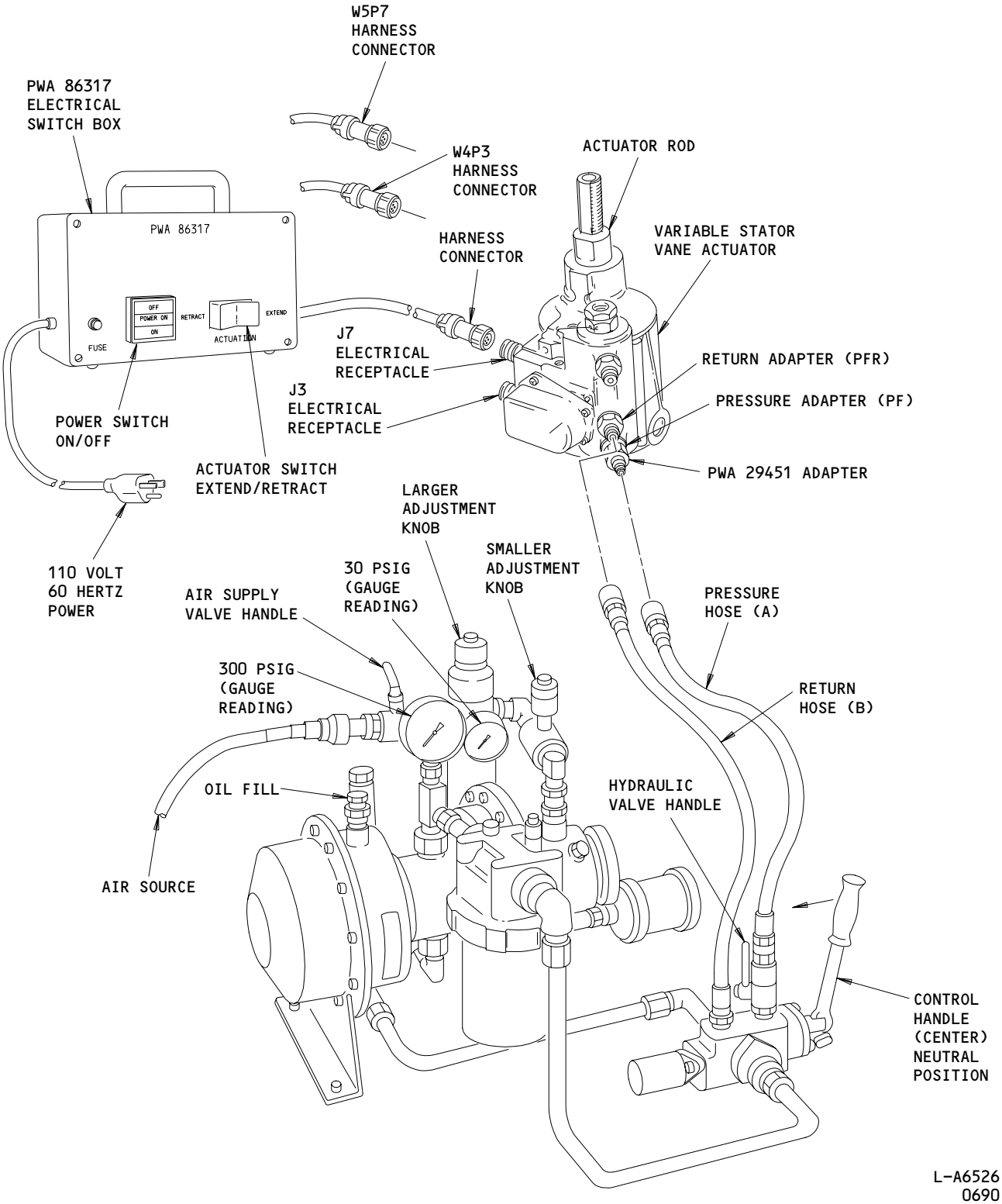
S 015-043-N00
(3) Open the core cowl panels (AMM 71-11-06/201).

S 015-044-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THESE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(4) Open the thrust reversers (AMM 78-31-00/501).

E. Do the Hydraulic Rigging Procedure (Fig. 501, 502)



Hydraulic Rigging Procedure
Figure 502

S 025-047-N00

WARNING: DO NOT PUT YOUR FINGERS IN THE LINE OF MOVEMENT OF THE LINKAGES, UNISON RINGS, OR LEVERS WHEN YOU OPERATE THE STATOR VANE SYSTEM. IF YOU DO NOT OBEY THIS, INJURY TO YOU CAN OCCUR.

CAUTION: IT IS VERY IMPORTANT TO DO THIS MECHANICAL RIGGING PROCEDURE WITH PRECISION. BAD RIGGING CAN CAUSE FATIGUE IN THE HPC BLADES TO INCREASE, INTERNAL ENGINE DAMAGE TO A COMPLETE ENGINE FAILURE.

CAUTION: YOU MUST REMOVE ALL RIG PINS BEFORE YOU MOVE THE STATOR VANE SYSTEM. IF YOU DO NOT REMOVE THE RIG PINS, YOU CAN CAUSE DAMAGE TO THE ENGINE.

(1) If the supply and return tubes are not disconnected, do the steps that follow:
   (a) Disconnect the supply tube at the two ends.

   WARNING: DO NOT LET THE ENGINE FUEL STAY ON YOUR SKIN FOR A LONG PERIOD OF TIME. THE ENGINE FUEL IS POISONOUS AND CAN BE ABSORBED THROUGH YOUR SKIN.

   (b) Disconnect the return tube at the two ends.
   (c) Loosen the clamp bolts.
   (d) Move the supply and return tubes to a position away from the adapters on the variable stator-vane actuator.
   (e) Install the protection covers.

S 485-008-N00

(2) Connect the Hydraulic Cart with the steps that follow:
   (a) Install the PWA 29451 Adapter to the adapter on the variable stator-vane actuator in the PF port.
   (b) Tighten the PWA 29451 Adapter to 225-250 pound-inches (25.4-28.2 newton-meters).

   NOTE: Make sure you hold the adapter in the PF port while you tighten the PWA 29451 Adapter.

   (c) Install the hydraulic pressure hose A to the PWA 29451 Adapter.

   NOTE: If it is necessary, use a standard 45 degree or 90 degree adapter or elbow on the end of the hose.

   (d) Install the hydraulic return hose B to the adapter in the PFR port.

(e) Tighten the nuts on hoses A and B to 200-225 pound-inches (22.6-25.4 newton-meters).

NOTE: Make sure you hold the adapters while you tighten the nuts.

(f) Remove the hose which is attached to the top of the pump reservoir.

(g) Examine the level of the fluid in the pump reservoir.

1) If it is necessary, fill the pump reservoir to the top with the calibration fluid.

S 485-009-N00

(3) Connect the PWA 86317 Electrical Switch Box with the steps that follow:

NOTE: Although the PWA 86317 Electrical Switch Box is recommended, you can do a check of the variable stator-vane actuator without the electrical switch box when the switch box is not available.

(a) If it is not done, disconnect the W4P3 and the W5P7 harness connectors from the J7 and the J3 electrical receptacles for the variable stator vane actuator.

1) Install the protection covers to the harness connectors.

(b) Connect the electrical lead from the electrical switch box to the top receptacle, J7, on the variable stator vane actuator.

S 825-010-N00

(4) If this is not done, do the initial adjustment for the rod end bearing with the steps that follow:

(a) Turn the actuator rod until the flat surface below the hex of the rod end bearing is approximately 9/16 inch (14.3 mm) from the flat surface below the actuator rod threads.

NOTE: You can turn the actuator rod for this adjustment only with no hydraulic pressure to the PF port.

S 985-042-N00

(5) Operate the hydraulic cart to fully extend the actuator rod (stator vanes are open) with the steps that follow:

(a) Before you connect the air source to the hydraulic cart, make sure you do the steps that follow:

1) Put the control handle to the neutral (center) position.

2) Turn the hydraulic valve handle to the closed position (perpendicular to the flow).

3) Turn the handle for the air supply valve to the closed position (perpendicular to the flow).

4) Turn the smaller adjustment knob clockwise to stop.

a) Do not tighten too much.

(b) Connect the air source to the air inlet.
(c) Turn the handle for the air supply valve to the open position (parallel to the flow).
(d) Lift and turn the larger adjustment knob clockwise to raise the air pressure to 25-30 psig.

NOTE: The pump ratio is 1 to 10 (30 psig air is the same as 300 psig hydraulic).

(e) Turn the hydraulic valve handle to the open position (parallel with the flow).
(f) Slowly turn the smaller adjustment knob counterclockwise until the air motor turns.

NOTE: The smaller adjustment knob controls the speed of the variable stator vane actuator and the time it takes the air pressure to come back after operation. Adjust the system as necessary.

With the control valve in the neutral position, the hydraulic pressure on the gage is 0 psig.

(g) Put the control handle on the hydraulic cart to the advance position (points to the hoses).

NOTE: The hydraulic pressure to the PF port on the variable stator-vane actuator is 250-300 psig.

(h) Push the power switch on the electrical switch box to the on position.
(i) Push the actuator switch to the extend position.

NOTE: The actuator rod is fully extended at this time (stator vanes are open).

S 825-012-N00

(6) Adjust the rod end bearing with the steps that follow:

NOTE: During the adjustment of the rod end bearing only, you can temporarily decrease the hydraulic pressure to 0 psig. You can turn the actuator rod for the last small adjustment.

CAUTION: MAKE SURE YOU KEEP THE ACTUATOR ROD FULLY EXTENDED WHEN YOU INSTALL THE BELLCRANK RIG PIN. IF YOU LET THE ACTUATOR ROD RETRACT, YOU WILL NOT GET AN ACCURATE CHECK. A BAD RIGGING CAN CAUSE A DANGEROUS STABILITY AND EFFECTS ON THE LENGTH OF LIFE.

MAKE SURE THAT THE END OF THE RIG PINS ARE CORRECTLY AND FULLY INSTALLED.

CAUTION: MAKE SURE TO USE THE CORRECT BELLCRANK RIG PIN. ON ENGINES PRE-PW-SB 72-246, USE THE LARGER PWA 85395 RIG PIN. ON ENGINES POST-PW-SB 72-246, USE THE SMALLER PWA 86097 RIG PIN.

(a) ENGINES PRE-PW-SB 72-246;
Adjust the rod end bearing until you can install the PWA 85395 rig pin into the bellcrank arm slot and into the bolt holes of the support with the hydraulic pressure on.
(b) ENGINES POST-PW-SB 72-246;
Adjust the rod end bearing until you can install the PWA 86097 rig pin into the bellcrank arm slot and into the bolt holes of the support with the hydraulic pressure on.
(c) Lock the rod end bearing to the actuator rod with the jamnut.
1) Tighten the jamnut to 460-510 pound-inches (51.9-57.6 newton-meters).

CAUTION: REMOVE ALL OF THE RIG PINS FROM THE UNISON RINGS AND THE BELLCRANK BEFORE YOU CONTINUE WITH THE PROCEDURE. IF YOU DO NOT DO THIS, YOU CAN CAUSE DAMAGE TO THE ENGINE.

(d) Remove the bellcrank rig pin.
(e) If an electrical switch box is used, push the actuator switch to retract and extend the actuator rod through its full movement.
1) Do this step a minimum of three times.
2) Stop the actuator rod in the fully extended position.
(f) If an electrical switch box is not used, operate the system with the steps that follow:
1) Turn the handle of the air supply valve to the closed position (perpendicular to the flow).
2) Install a crowsfoot and a wrench on the flats of the bellcrank.
3) Push up on the wrench to move the system to the closed position.
4) Remove the wrench and the crowsfoot.
5) Operate the hydraulic cart to supply 250-300 psig hydraulic pressure to the PF port.

6) Fully extend the actuator rod to the full open position.
a) The actuator rod is now extended against the internal stop.
7) Do these steps one more time.
(g) With the actuator rod fully extended (stator vanes are open), install the bellcrank rig pin in the bellcrank arm slot and in the two holes of the support.
(h) If you cannot install the bellcrank rig pin, do the steps to adjust the rod end bearing again.
(i) If you can install the bellcrank rig pin, lock the jamnut and the rod end bearing with the key washer.
1) Bend one set of the tabs on the key washer to the jamnut.
2) Bend the other set of the tabs to the rod end bearing.
(j) Install the lockwire and the seal.
(k) Tighten the nut on the bellcrank clevis bolt to a minimum of 15 pound-inches (1.7 newton-meters) plus the torque which is necessary to turn the nut on the bellcrank clevis bolt.
1) Continue to tighten the nut until the slot in the nut aligns with the hole in the bellcrank clevis bolt.
a) You must not use a torque more than 22 pound-inches (2.5 newton-meters) plus the torque which is necessary to turn the nut on the bellcrank clevis bolt.
(l) Install the cotter pin to the nut.
(m) Bend the cotter pin.

S 085-045-N00

CAUTION: REMOVE ALL OF THE RIG PINS FROM THE UNISON RINGS AND THE BELLCRANK BEFORE YOU CONTINUE WITH THE PROCEDURE. IF YOU DO NOT DO THIS, YOU CAN CAUSE DAMAGE TO THE ENGINE.

(7) Remove the equipment:
(a) Remove the bellcrank rig pin.
(b) Turn the handle for the air supply valve to the closed position (perpendicular to the flow).
(c) Disconnect the air source.
(d) Move the control handle to the neutral (center) position.
(e) Disconnect the hoses A and B from the variable stator vane actuator.

NOTE: Make sure you hold the adapters on the variable stator vane actuator while you disconnect the hoses and the PWA 29451 adapter.

(f) Remove the PWA 29451 adapter from the PF port.
(g) Install the protection covers to the hoses.
(h) Push the power switch on the electrical switch box to the off position.
(i) Disconnect the electrical connector from the variable stator-vane actuator.

S 425-049-N00

CAUTION: USE THE CORRECT ASSEMBLY PROCEDURE, AND TOOLS, FOR THE HARNESS CONNECTOR INSTALLATION (AMM 70-24-05/201). IF YOU USE THE INCORRECT ASSEMBLY PROCEDURE, OR TOOLS, A DAMAGED OR LOOSE CONNECTOR CAN OCCUR. A LOOSE CONNECTOR PERMITS VIBRATION, WHICH CAUSES THE CONTACTS TO WEAR AND DECREASES THE LIGHTNING PROTECTION.

(8) Connect the W4P3 and the W5P7 harness connectors to the receptacles J7 and J3 (AMM 70-24-05/201).

S 425-045-N00
(9) Connect the supply tube assembly.
(a) Remove the protection covers from the supply tube.
(b) Lubricate the threads of the adapter at each end with the anti-seize paste.
(c) Install the tube nut on the larger adapter of the variable stator vane actuator.
1) Tighten the tube nut with your hand only.
(d) Install the tube nut on the hydraulic manifold tee.
1) Tighten the tube nut with your hand only.
(e) Lubricate the threads of the clamp bolt with the engine oil.
(f) Tighten the clamp bolt to 36-40 pound-inches (4.1-4.5 newton-meters).
(g) Tighten the tube nuts to 225-250 pound-inches (25.4-28.2 newton-meters).
(h) Safety the tube nuts with lockwire or safety cable and safety cable ferrule.

S 425-046-N00

(10) Connect the return tube assembly.
  (a) Remove the protection covers from the return tube.
  (b) Lubricate the threads of the adapter at each end with anti-seize paste.
  (c) Install the tube nut to the smaller adapter on the variable stator vane actuator.
    1) Tighten the tube nut with your hand only.
  (d) Install the tube nut on the tee of the inlet return manifold.
    1) Tighten the tube nut with your hand only.
  (e) Lubricate the threads of the clamp bolt with engine oil.
  (f) Tighten the clamp bolt to 36-40 pound-inches (4.1-4.5 newton-meters).
  (g) Tighten the tube nuts to 225-250 pound-inches (25.4-28.2 newton-meters).
    1) Safety the tube nuts with lockwire or safety cable and safety cable ferrule.

F. Put the Aircraft Back to Its Usual Condition

S 215-047-N00

CAUTION: MAKE SURE TO REMOVE ALL OF THE RIG PINS AFTER THE CHECK. IF YOU DO NOT REMOVE THE RIG PINS, DAMAGE TO THE ENGINE CAN OCCUR.

(1) Do an inspection of the stator vane actuator (SVA) position indication (AMM 75-31-00/601).

S 415-025-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Close the thrust reversers (AMM 78-31-00/201).

S 415-026-N00

(3) Close the core cowl panels (AMM 71-11-06/201).

S 415-027-N00

(4) Close the fan cowl panels (AMM 71-11-04/201).

S 445-028-N00

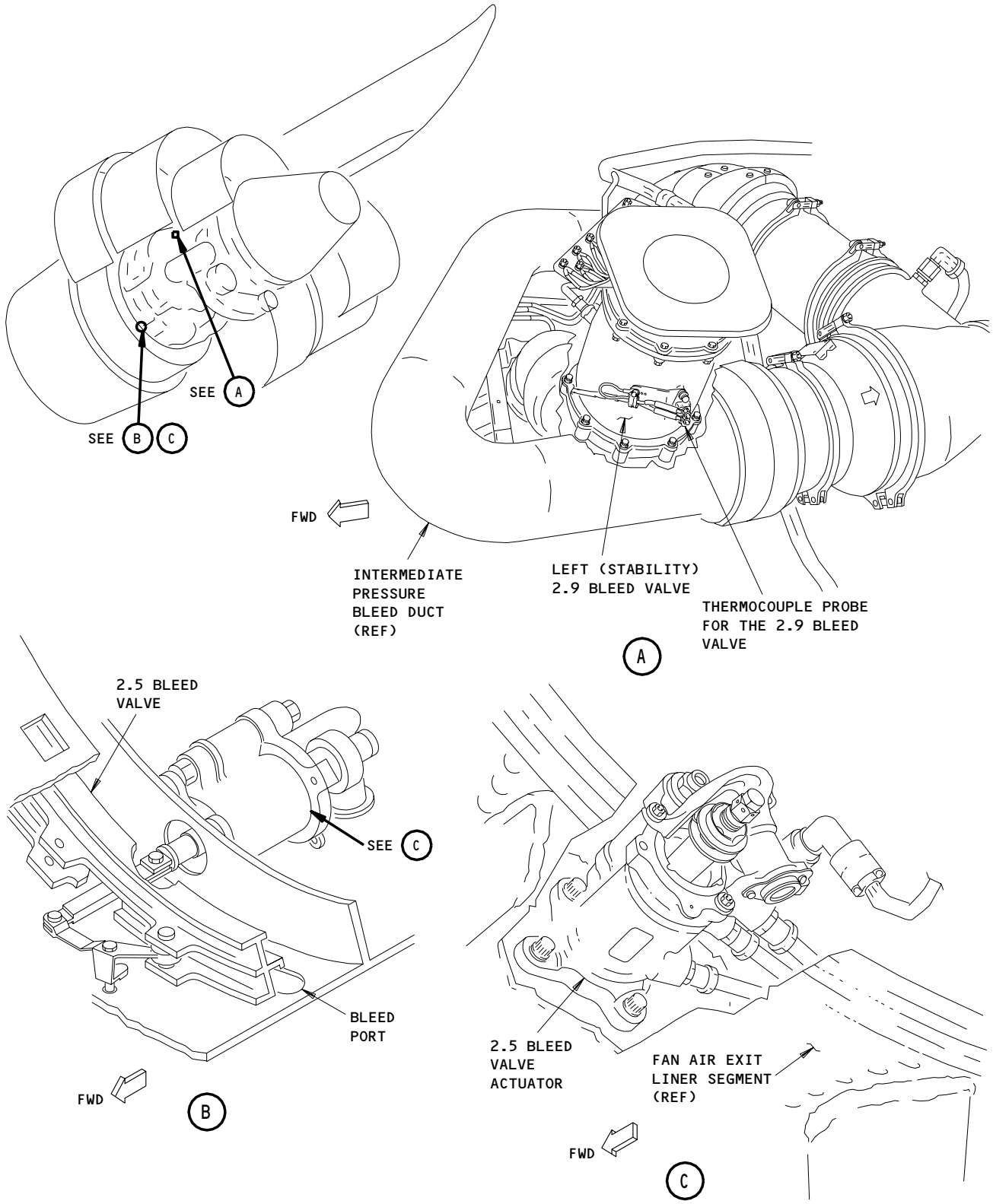
(5) Do the activation procedure for the thrust reversers (AMM 78-31-00/201).

S 715-029-N00

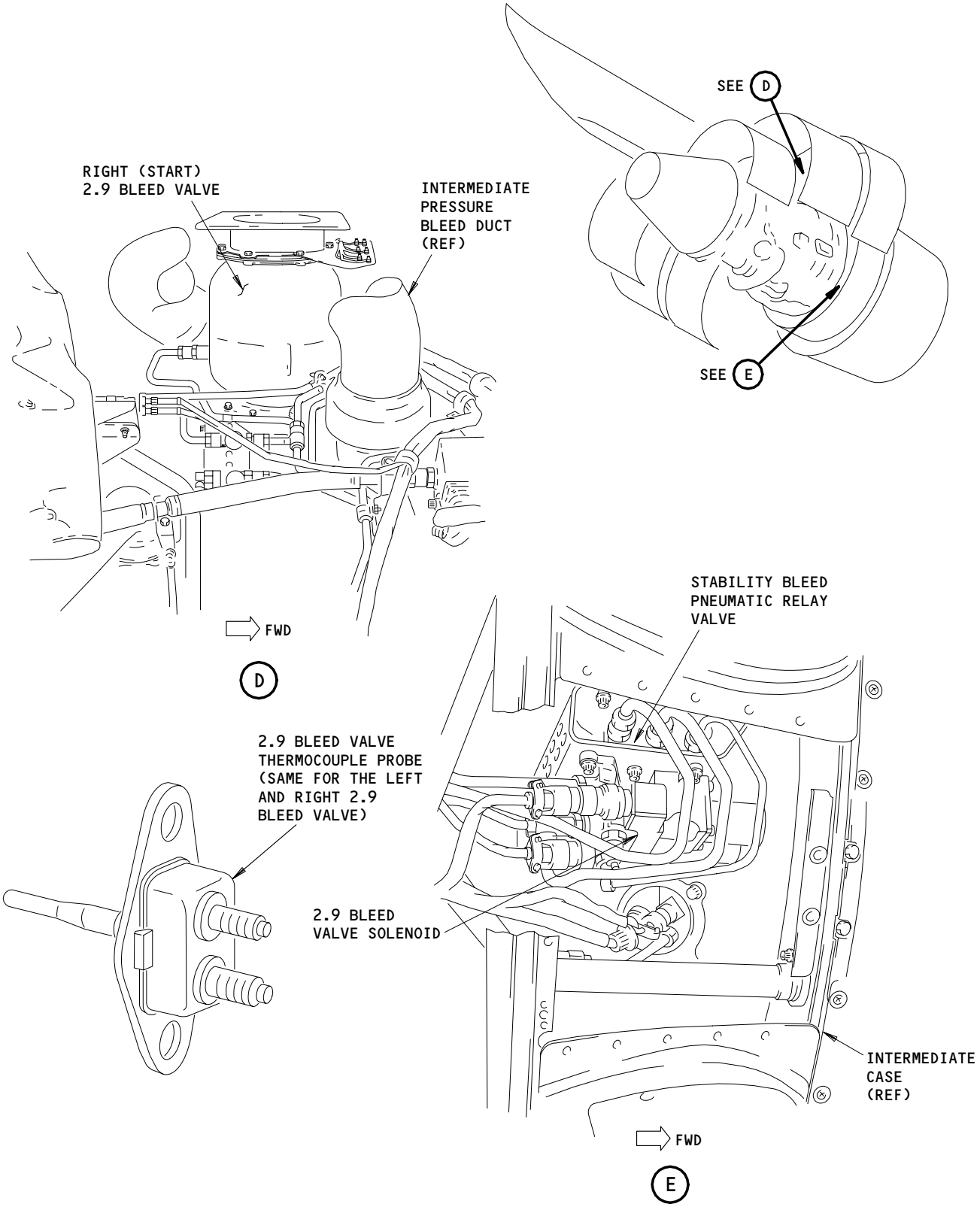
(6) Do a test of the variable stator vane actuator as shown in the Power Plant Test Reference Table (AMM 71-00-00/501).

COMPRESSOR BLEED CONTROL SYSTEM - DESCRIPTION AND OPERATION

1. General
   A. Air is bled from the high pressure compressor (HPC) during an engine start, transient thrust operation, and reverse thrust operation to make the compressor stability better.
   B. The compressor bleed control system includes the 2.5 and 2.9 bleed subsystems. These systems bleed the 4th- and 9th-stage air into the fan airstream.
   C. The 2.5 bleed system includes the 2.5 bleed valve and the actuator for the 2.5 bleed valve.
   D. The 2.9 bleed system includes the 2.9 bleed valves, solenoids for the 2.9 bleed valves, stability bleed pneumatic relay valve and two thermocouple probes on the 2.9 bleed valves.
2. Component Details (Fig. 1)
   A. 2.5 Bleed Valve
      (1) The 2.5 bleed valve is installed in the fan exit case.
      (2) The 2.5 bleed valve is a 360-degree, translating-ring type valve which is installed by the cam and roller linkage of the 2.5 bleed valve actuator.
      (3) The 2.5 bleed valve controls the 4th-stage compressor airflow through the bleed ports into the fan airstream. Also, when it is open, the 2.5 bleed valve does not permit air with dirt in it to the HPC.
      (4) When it is fully open, the 2.5 bleed valve permits borescope access to the 4th-stage compressor blades through the bleed port at the 8 o'clock position.
   B. 2.5 Bleed Valve Actuator
      (1) The actuator for the 2.5 bleed valve is installed on the intermediate case at the 7 o'clock position.
      (2) The actuator is hydraulically operated with fuel pressure from the fuel control. The EEC controls the fuel pressure through a pilot valve installed by a dual-coil torque motor.
      (3) The dual rotational variable transformers (RVT) in the actuator supplies a feedback signal to the EEC to show the actuator piston position.
   C. 2.9 Bleed Valves
      (1) The two 2.9 bleed valves are installed on the HPC rear case. One 2.9 bleed valve, at the 10 o'clock position, is used for start/stability operations. The other 2.9 bleed valve, at the 1 o'clock position, is used only for start operations.
      (2) The 2.9 bleed valves are spring-loaded, pneumatically operated, poppet type valves. The 2.9 bleed valves are spring-loaded open, and closed pneumatically by compressor bleed (15th-stage air).
   D. 2.9 Bleed Valve Solenoid
      (1) The solenoid for the 2.9 bleed valve is installed on the intermediate case at the 5 o'clock position.
      (2) There are two different solenoids which have the same solenoid valve housing. They are dual-coiled solenoids, electrically operated by the EEC.



Compressor Bleed Control System
Figure 1 (Sheet 1)



Compressor Bleed Control System
Figure 1 (Sheet 2)

(3) Each solenoid controls the supply of 15th-stage air pressure to the 2.9 bleed valves.

E. Stability Bleed Pneumatic Relay Valve

(1) The pneumatic relay valve for stability bleed is installed on the intermediate case at the 5 o'clock position above the solenoid for the 2.9 bleed valve.

(2) There are three threaded ports for inlet, outlet, and servo pressure, and one vent port with a screen.

(3) The pneumatic relay valve helps control the pneumatic pressure to the left (stability) 2.9 bleed valve to make sure it opens quickly.

F. 2.9 Bleed Valve Thermocouple Probe

(1) The thermocouple probes of the 2.9 bleed valve are installed on the left and right 2.9 bleed valves.

(2) The thermocouple probe is a thermoelectric device that measures the temperature of the air in each of the 2.9 bleed valves.

(3) The temperatures are changed by the thermocouple probes with a voltage. The voltage is sent through the EEC wire harnesses to the EEC. With the thermocouple probes, the EEC monitors the airflow in each of the 2.9 bleed valves to find if they are open or closed. The EEC will send data to the PIMU if there is a failure of the thermocouple probe or an incorrect position of the 2.9 bleed valve.

3. Operation

A. Functional Description

(1) 2.5 Bleed System

(a) The 2.5 bleed system is controlled by the EEC as a function of thrust lever angle, low rotor speed (N1), high rotor speed (N2), engine inlet total temperature (T2), mach number, and altitude.

(b) During an engine start, the EEC controls fuel pressure to the actuator for the 2.5 bleed valve. The actuator will then move the 2.5 bleed valve to the fully open position. This permits the low pressure compressor (4th-stage) air to bleed into the fan airflow.

(c) At engine idle, the 2.5 bleed valve stays fully open. While engine power is increased to 70% N2, the 2.5 bleed valve starts to close. At 85% N2, the 2.5 bleed valve is in the fully closed position.

(d) During quick engine decelerations, or if there is a possible surge, the 2.5 bleed valve will go to the fully open position.

(e) During reverse thrust operation, the 2.5 bleed valve will go to the fifty percent flow position.

(2) 2.9 Bleed System

(a) The 2.9 bleed system is controlled by the EEC as a function of high rotor speed (N2) and engine total temperature (T2).

(b) During an engine start, the EEC supplies 28 volts dc to energize the solenoid for the left 2.9 bleed valve. This stops the 15th-stage air pressure to the 2.9 bleed valves, which causes the two 2.9 bleed valves to open. The 9th-stage compressor air is then bled into the fan airflow.

(c) Immediately before minimum idle speed and at steady-state conditions, electrical power is removed from the left solenoid and the right solenoid is energized. This causes the two 2.9 bleed valves to close.

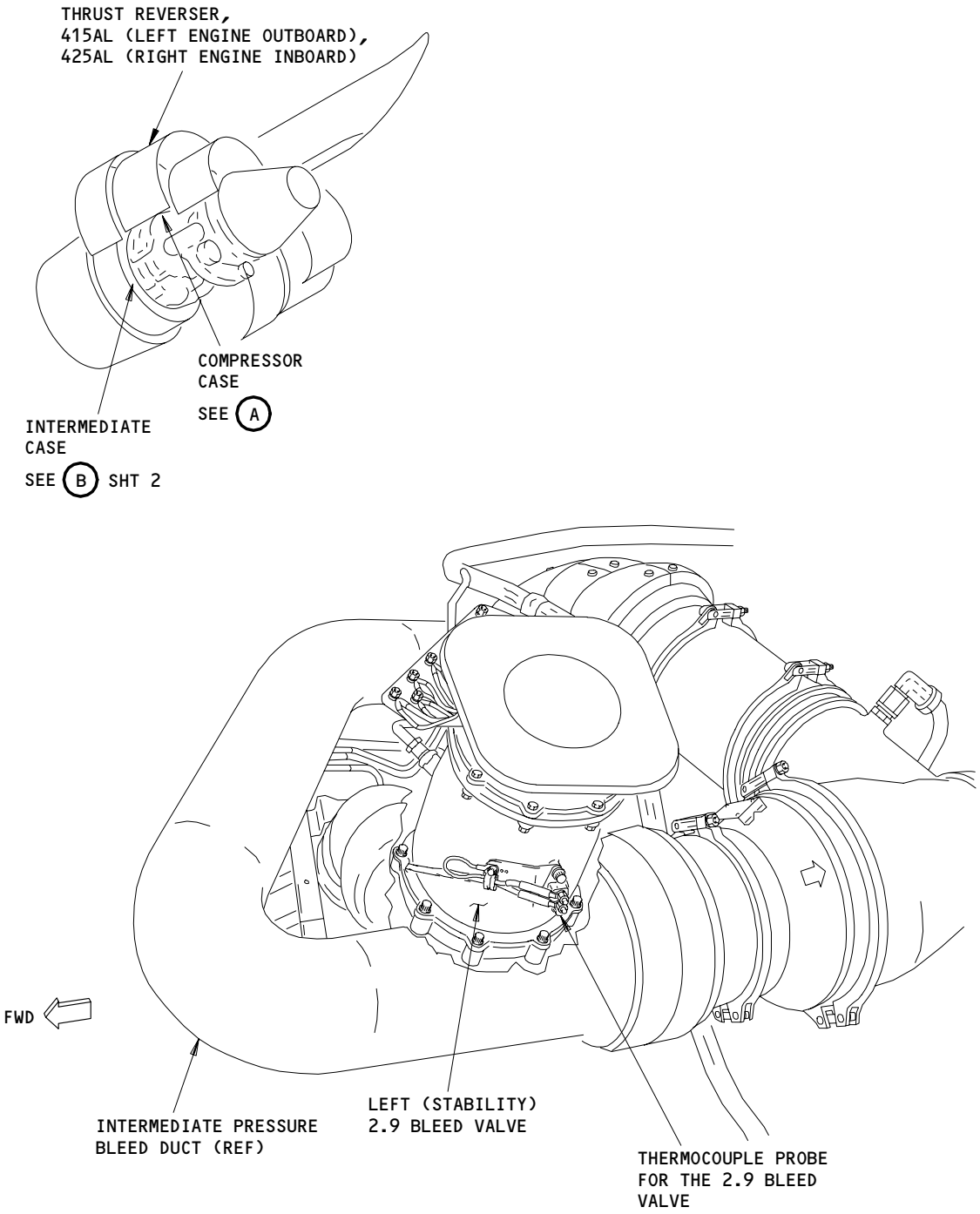
(d) With the engine start not included, the left solenoid stays without electrical power and the right (or start) 2.9 bleed valve stays closed.

(e) If the engine is decelerated to less than 81% N2, or if an impending engine surge is detected, electrical power is removed from the right solenoid and the left (or stability) 2.9 bleed valve is opened for a maximum of 2 seconds.

COMPRESSOR BLEED CONTROL SYSTEM

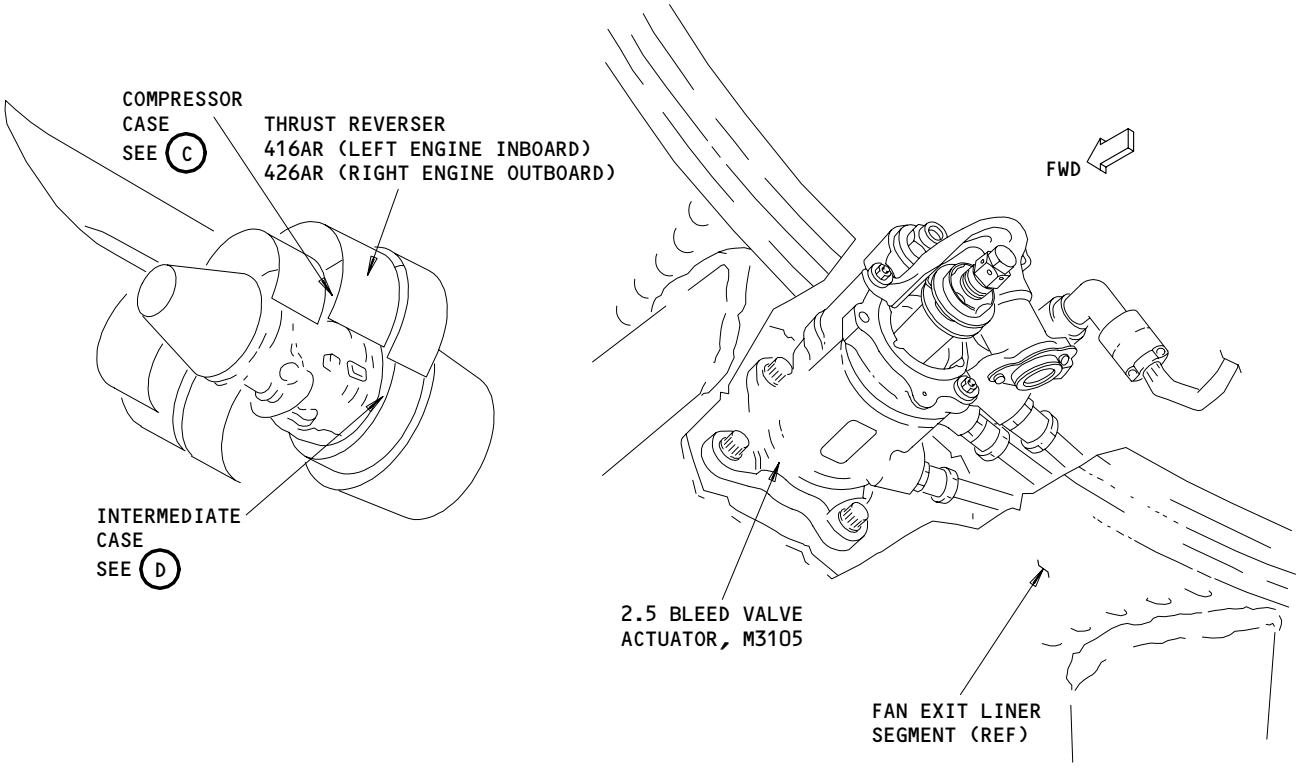
COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	AMM REFERENCE
ACTUATOR - 2.5 BLEED VALVE, M3105	2	2	415AL,425AL THRUST REVERSER	75-32-01
CONTROL - (FIM 73-21-00/101) ELECTRONIC ENGINE, M7198				
SOLENOID - 2.9 BLEED VALVE, V356	2	2	416AR,426AR THRUST REVERSER	75-32-04
VALVE - LEFT (STABILITY) 2.9 BLEED	1	2	415AL,425AL THRUST REVERSER	75-32-03
VALVE - RIGHT (START) 2.9 BLEED	2	2	416AR,426AR THRUST REVERSER	75-32-03
VALVE - STABILITY BLEED PNEUMATIC RELAY	2	2	416AR,426AR THRUST REVERSER	75-32-04

Compressor Bleed Control System - Component Index
Figure 101



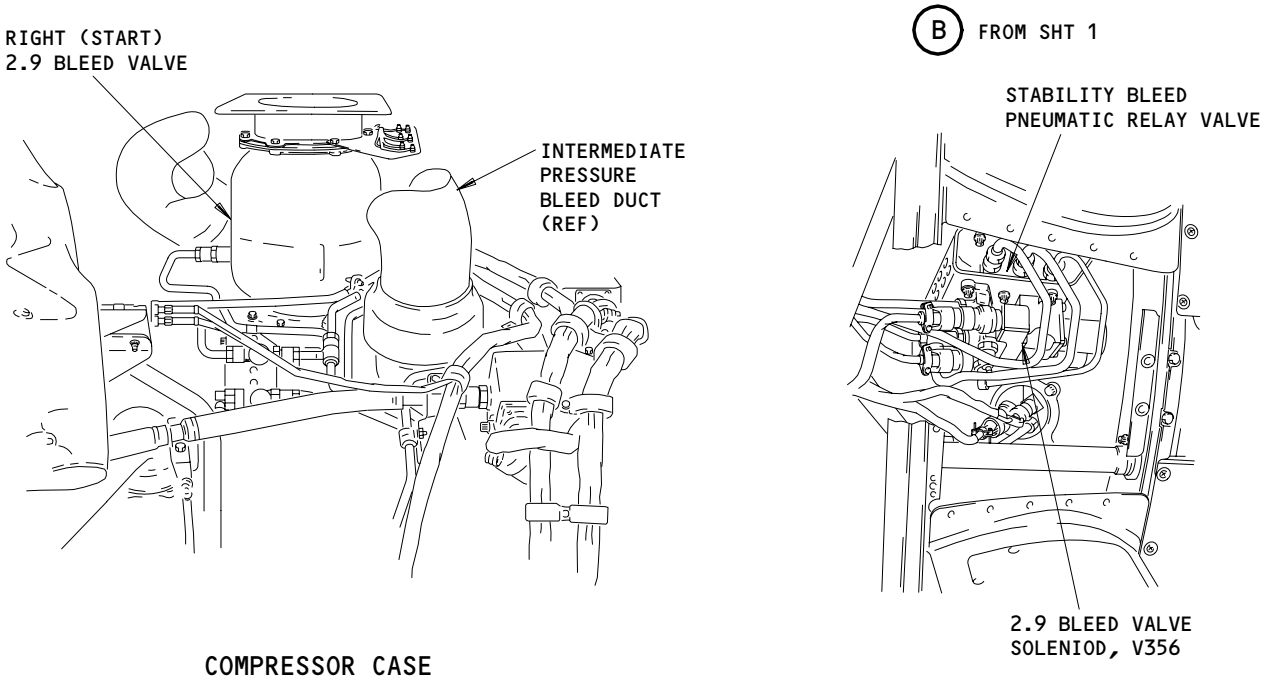
COMPRESSOR CASE
A

Compressor Bleed Control System - Component Location
Figure 102 (Sheet 1)



INTERMEDIATE CASE

B FROM SHT 1



COMPRESSOR CASE

C

INTERMEDIATE CASE

D

Compressor Bleed Control System – Component Location
Figure 102 (Sheet 2)

EFFECTIVITY

ALL

299462

COMPRESSOR BLEED CONTROL SYSTEM - INSPECTION/CHECK

1. General
   A. This procedure gives the instructions to examine the components of the compressor bleed control system for damage and correct installation.
   B. You can get access to the components of the compressor bleed control system through the thrust reversers.

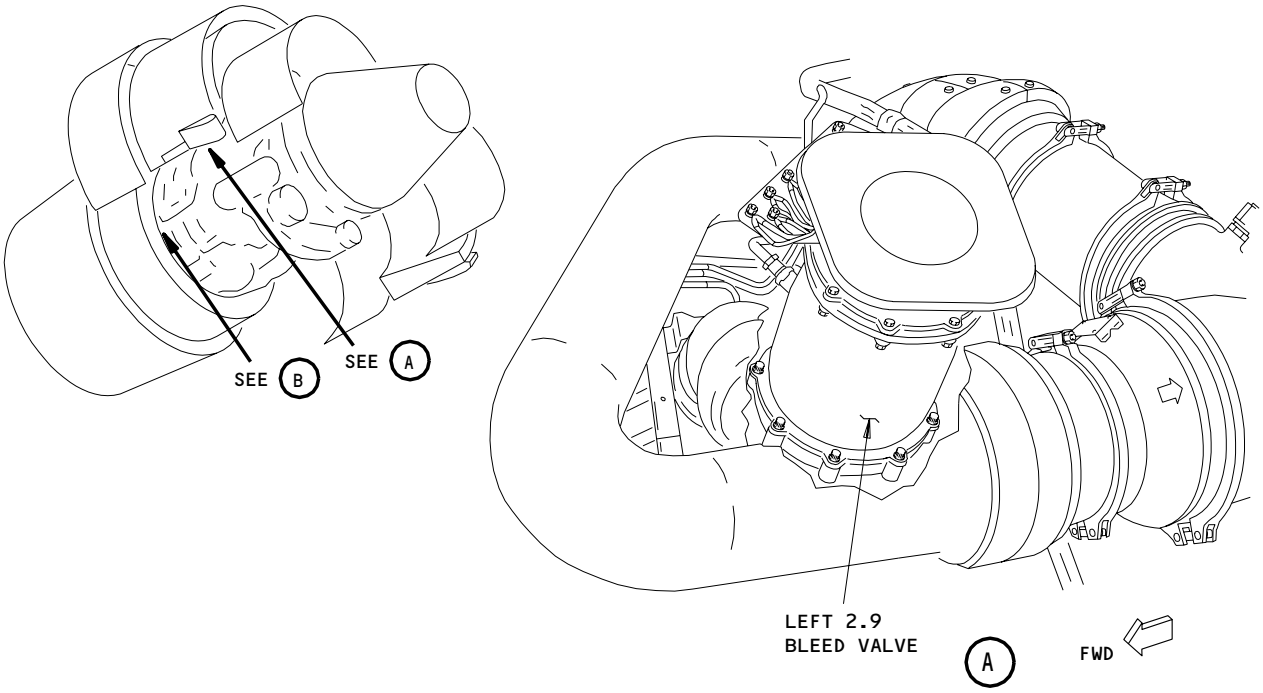
TASK 75-32-00-206-001-N00

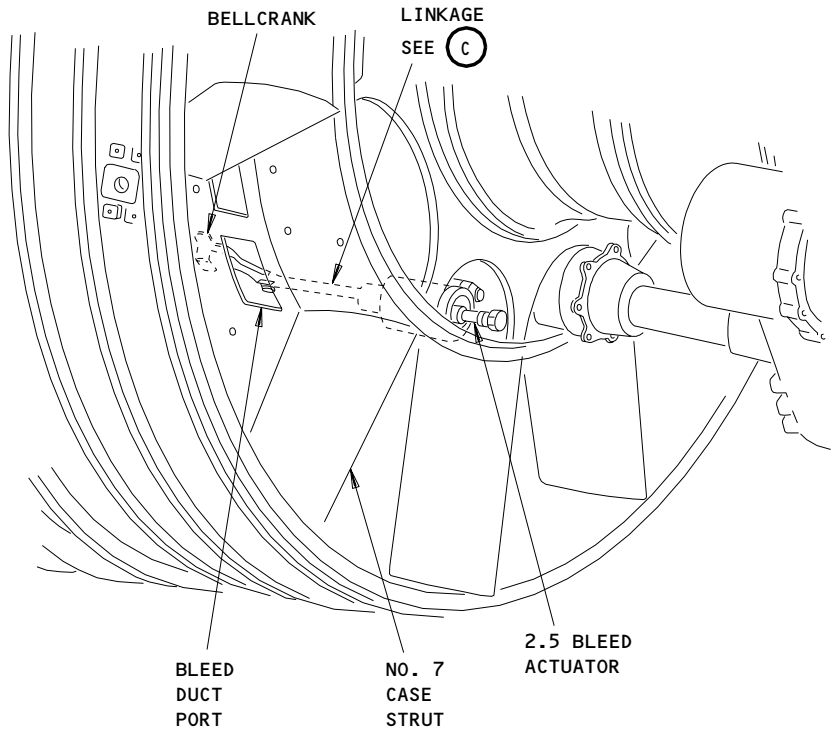
2. Do the Inspection of the Compressor Bleed Control System
   A. References
      (1) AMM 71-11-04/201, Fan Cowl Panels
      (2) AMM 71-11-06/201, Core Cowl Panels
      (3) AMM 72-34-03/401, Fan Exit Liner Segment
      (4) AMM 75-32-01/401, 2.5 Bleed Valve Actuator
      (5) AMM 75-32-03/401, 2.9 Bleed Valve
      (6) AMM 75-32-04/401, 2.9 Bleed Valve Solenoid
      (7) AMM 75-32-05/401, Stability Bleed Pneumatic Relay Valve
      (8) AMM 78-31-00/201, Thrust Reverser System
   B. Access
      (1) Location Zones
          411 Left Engine
          421 Right Engine

      (2) Access Panels
          413AL Fan Cowl Panel (Left), Left Engine
          414AR Fan Cowl Panel (Right), Left Engine
          415AL Thrust Reverser (Left), Left Engine
          416AR Thrust Reverser (Right), Left Engine
          417AL Core Cowl Panel (Left), Left Engine
          418AR Core Cowl Panel (Right), Left Engine
          423AL Fan Cowl Panel (Left), Right Engine
          424AR Fan Cowl Panel (Right), Right Engine
          425AL Thrust Reverser (Left), Right Engine
          426AR Thrust Reverser (Right), Right Engine
          427AL Core Cowl Panel (Left), Right Engine
          428AR Core Cowl Panel (Right), Right Engine

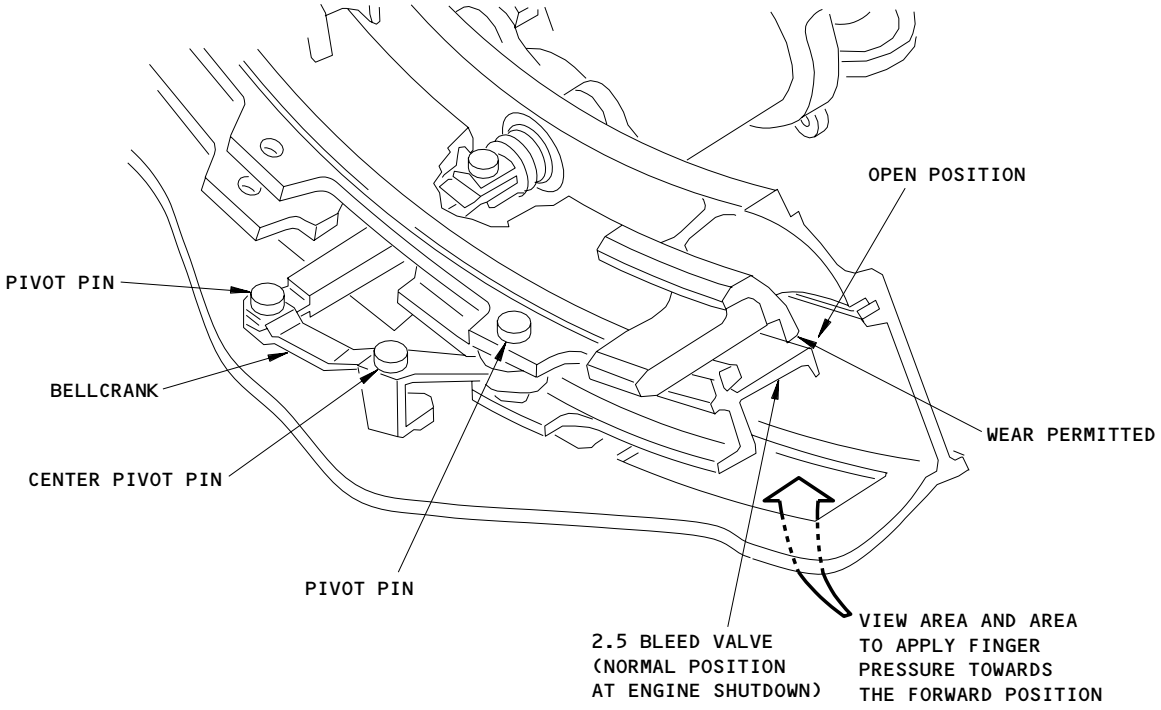
   C. Prepare for the Inspection of the Compressor Bleed Control System

      S 016-002-N00
      (1) Open the fan cowl panels (AMM 71-11-04/201).





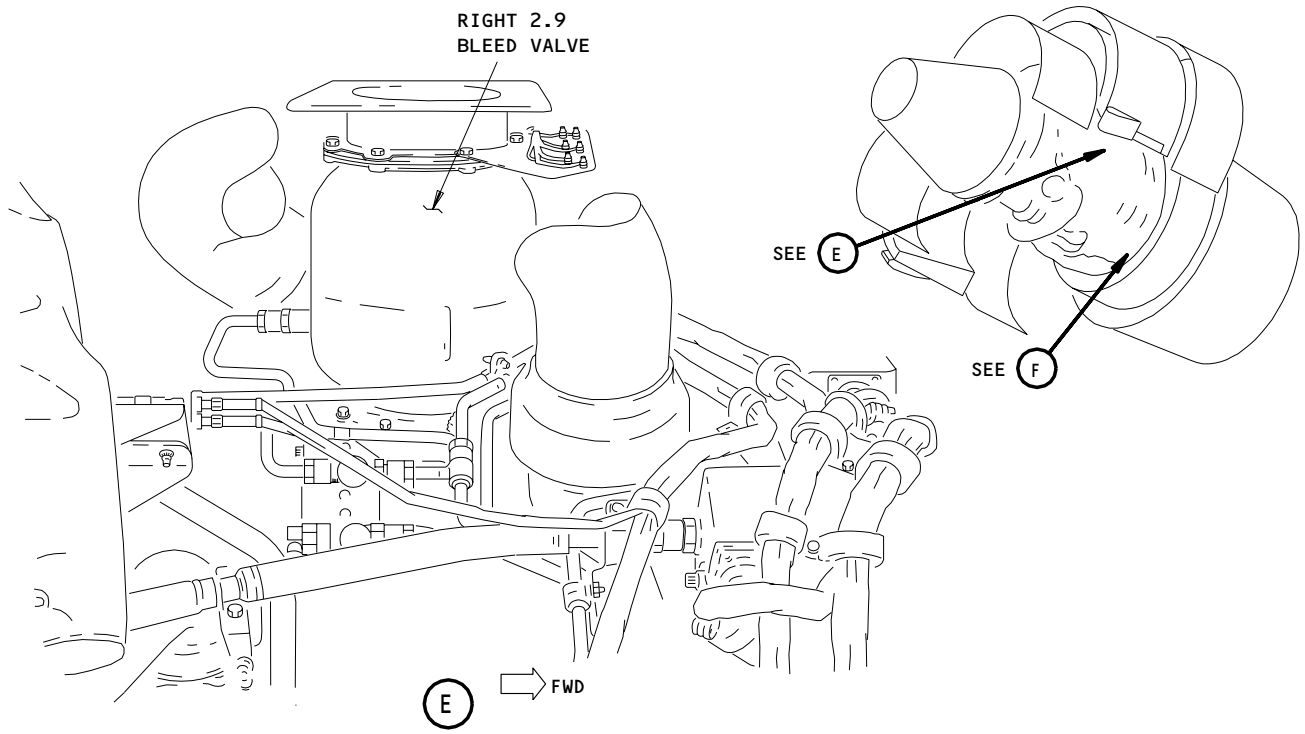
Compressor Bleed Control System Inspection
Figure 601 (Sheet 1)

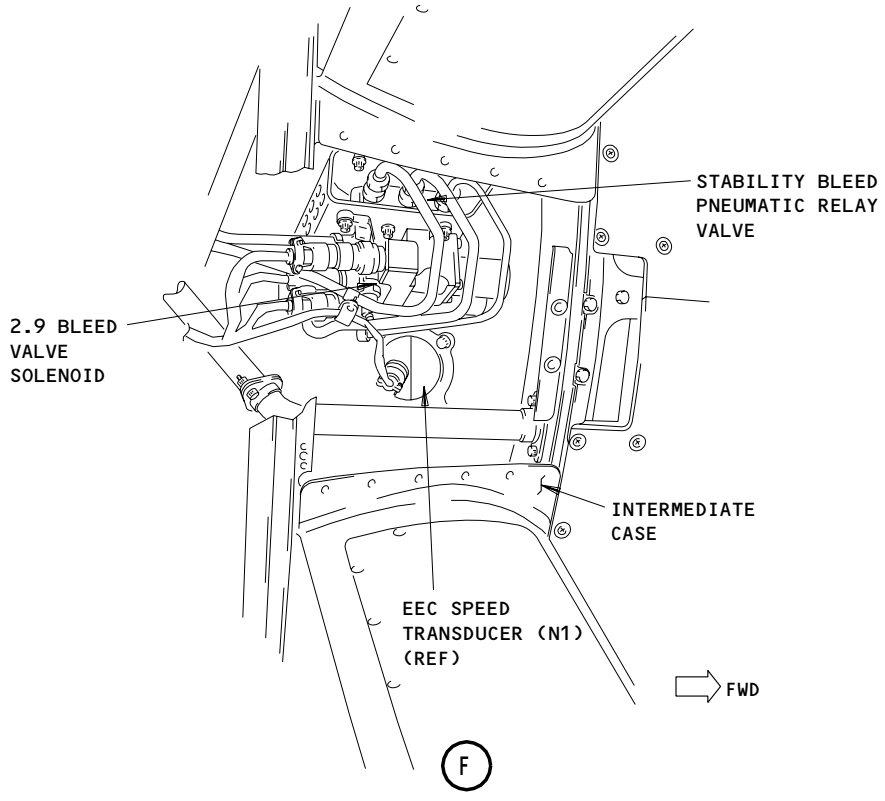


(C)

L-B5370 (0897)

Compressor Bleed Control System Inspection
Figure 601 (Sheet 2)





Compressor Bleed Control System Inspection
Figure 601 (Sheet 3)

G85609

S 046-003-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

(2) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 016-004-N00

(3) Open the core cowl panels (AMM 71-11-06/201).

S 016-005-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(4) Open the thrust reversers (AMM 78-31-00/201).

D. Procedure

S 216-013-N00

(1) Do the inspection of the bleed control system (Fig. 601):
   (a) Remove the No. 5 segment of the fan exit liner (AMM 72-34-03/401) to get access to the actuator for the 2.5 bleed valve.
   (b) Examine the 2.5 bleed valve actuator for leakage.
      1) If you find leakage, replace the 2.5 bleed valve actuator (AMM 75-32-01/401).
   (c) Visually examine the linkage assembly of the 2.5 bleed valve through the ports on the bleed exit duct found on each side of the No. 7 case strut.
      1) Use a fluorescent white light and mirror to examine the linkage for correct installation of the connecting pins and the condition of the linkage assembly.
      2) If the part has worn too much or has some damage which can cause the bleed control system to operate incorrectly, you must replace the part.

(d) Visually examine the bellcrank-to-bracket pivot pins for wear or damage (Reference PW SB A75-51) (see Table 601).

NOTE: Make sure the 2.5 bleed valve is in the fully open position.

1) Inspect for missing pivot pins (2 locations). A missing pivot pin in either of the two locations is not permitted. A missing pivot pin would cause the 2.5 bleed to stop functioning, resulting in engine operational problems. A missing pivot pin requires immediate engine removal for repair. Continue in service with a missing pivot pin is not permitted.
2) Inspect for a fractured or partly missing center pivot pin. Experience shows that if this pin fractures only a portion of the pin will be missing. Some of the pin will remain and permit the 2.5 bleed to function. An engine with this condition can continue in service for up to 350 hours. If the pin is completely missing or it is obivious the bellcrank is no longer attached to the bellcrank bracket, the engine should be removed immediately for repair.

Inspection Of 2.5 Bleed Pivot Pins
TABLE 601

EXAMINE	RESULTS	DISPOSITION
Broken pins	0.250 inch (6.350 mm) maximum amount of pin head movement permitted	Continue-in-service limitation of 350 hours. See Alert PW SB PW4ENG A75-51.

(e) Any amount of wear on the bleed valve or bleed duct is permitted.

NOTE: If there is any sign of wear on the bleed valve or bleed duct, the wear is permitted provided the bleed valve operates normally and there are no 2.5 bleed maintenance messages.

(f) Visually examine the 2.5 bleed system seals.

NOTE: The 2.5 bleed system seals are orange in color, and are bonded to the aft surface of the 2.5 bleed-valve ring. The seals can be examined through the 2.5 bleed ports.

1) Use a flashlight to examine as much of the 2.5 bleed system seals as you can see through the 2.5 bleed ports (see Table 602).

NOTE: Color of the 2.5 bleed system seals are orange. You will not be able to see all the surfaces of the seals, but you should examine all the areas that you can see.

2) Cut off any parts of the seals that are loose or hang out of a bleed valve slot.

NOTE: The 2.5 bleed system is still serviceable after you remove any amount of seal material.

3) If you removed some of the seal material, do the steps that follow:
   a) At each subsequent "A" Check, examine the forward edge of the fan-exit liner segments for damage until the missing seals are replaced.
   b) If you find damage on the fan-exit liner segments, inform your local Pratt & Whitney representative.

Inspection Of 2.5 Bleed System Seals
TABLE 602

EXAMINE	RESULTS	DISPOSITION
Loss of attachment or loss of seal material	Any amount of missing seal material or disbonded seal material	Bleed system is serviceable with any amount of missing seal material. Bleed system is serviceable after disbonded seal material is removed.

CAUTION: CLOSE THE SCREEN PORTS COMPLETELY WITH TAPE BEFORE YOU DO MAINTENANCE IN AN AREA WHERE YOU FIND PIECES OR SECTIONS OF A SCREEN ARE MISSING. PARTS CAN FALL INTO THE ENGINE WHEN YOU DO NOT CLOSE THE SCREEN PORTS.

(g) Visually examine the 2.5 bleed-valve screens (see Table 603).

NOTE: The 2.5 bleed-valve screens are installed in the eight 2.5 bleed ports that are above the horizontal centerline of the engine.

1) Examine the bleed-valve screens for damage.
   a) If necessary, remove loose or broken pieces from the bleed-valve screens.

Inspection Of 2.5 Bleed Screen
TABLE 603

EXAMINE	RESULTS	DISPOSITION
Screen distortion	Any amount permitted	Bleed screen is serviceable.
Missing screen material	Any amount permitted	Full screens can be missing. Remove loose or about to be loose, or broken off pieces. Tape over any port before you do any maintenance where there is missing screen material.

(h) Visually examine the 2.9 bleed valves for cracks and if it is attached correctly.
   1) If a 2.9 bleed valve is not attached correctly, tighten or replace the mounting bolt(s) as necessary.
   2) If there are cracks, replace the applicable 2.9 bleed valve (AMM 75-32-03/401).

(i) Remove the No. 3 segment for the fan exit liner (AMM 72-34-03/401) to get access to the solenoid for the 2.9 bleed valve.

(j) Visually examine the solenoid for the 2.9 bleed valve.
   1) Examine the solenoid for the correct installation.
      a) If the solenoid is not attached correctly, tighten or replace the mounting bolt(s) as necessary.
   2) Examine the solenoid for cracks.
      a) Replace the solenoid if there are cracks (AMM 75-32-04/401).

(k) Visually examine the pneumatic relay valve for the stability bleed.
1) Examine the pneumatic relay valve for the correct installation.
a) If the pneumatic relay valve is not attached correctly, replace or tighten the mounting bolt(s).
2) Examine the pneumatic relay valve for cracks.
3) Replace the pneumatic relay valve if there are cracks (AMM 75-32-05/401).
(l) Install the No. 3 segment of the fan exit liner (AMM 72-34-03/401).
(m) Install the No. 5 segment of the fan exit liner (AMM 72-34-03/401).

E. Return the Aircraft to Its Usual Condition

S 416-008-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Close the thrust reversers (AMM 78-31-00/201).

S 416-009-N00
(2) Close the core cowl panels (AMM 71-11-06/201).

S 416-010-N00
(3) Close the fan cowl panels (AMM 71-11-04/201).

S 446-011-N00
(4) Do the activation procedure for the thrust reversers (AMM 78-31-00/201).

2.5 BLEED VALVE ACTUATOR - MAINTENANCE PRACTICES

1. General
   A. Use this procedure for the service or operation of the PWA 49030 or the CTE 5100 Hydraulic Pump. The CTE 5100 Pump replaces the PWA 49030 pump.
   B. Either Hydraulic Pump is available with an air driven pneumatic motor or and electric motor. All pumps must be serviced with clean filtered Calibrating Fluid (P03-003).
   C. These pumps are used for many applications and for other engine models. Make sure that you have the necessary adapters, elbows, and fittings for your application. The adjustment procedure specifies the correct adapters to connect the hoses to the actuator.
   D. This procedure has the tasks necessary to operate the pneumatic motor or electric motor driven pumps.

TASK 75-32-01-802-001-N00

2. Pump Operation - Pneumatic Motor Driven (Fig. 201)
   A. Check the hoses as follows:

S 212-002-N00
(1) Make sure the return hose is connected to the return adapter of the actuator.

S 212-004-N00
(2) Make sure the pressure hose A or B is connected to the pressure adapter of the actuator.

S 412-005-N00
(3) Install a No. 6 plug to the end of the hose that is not being used.

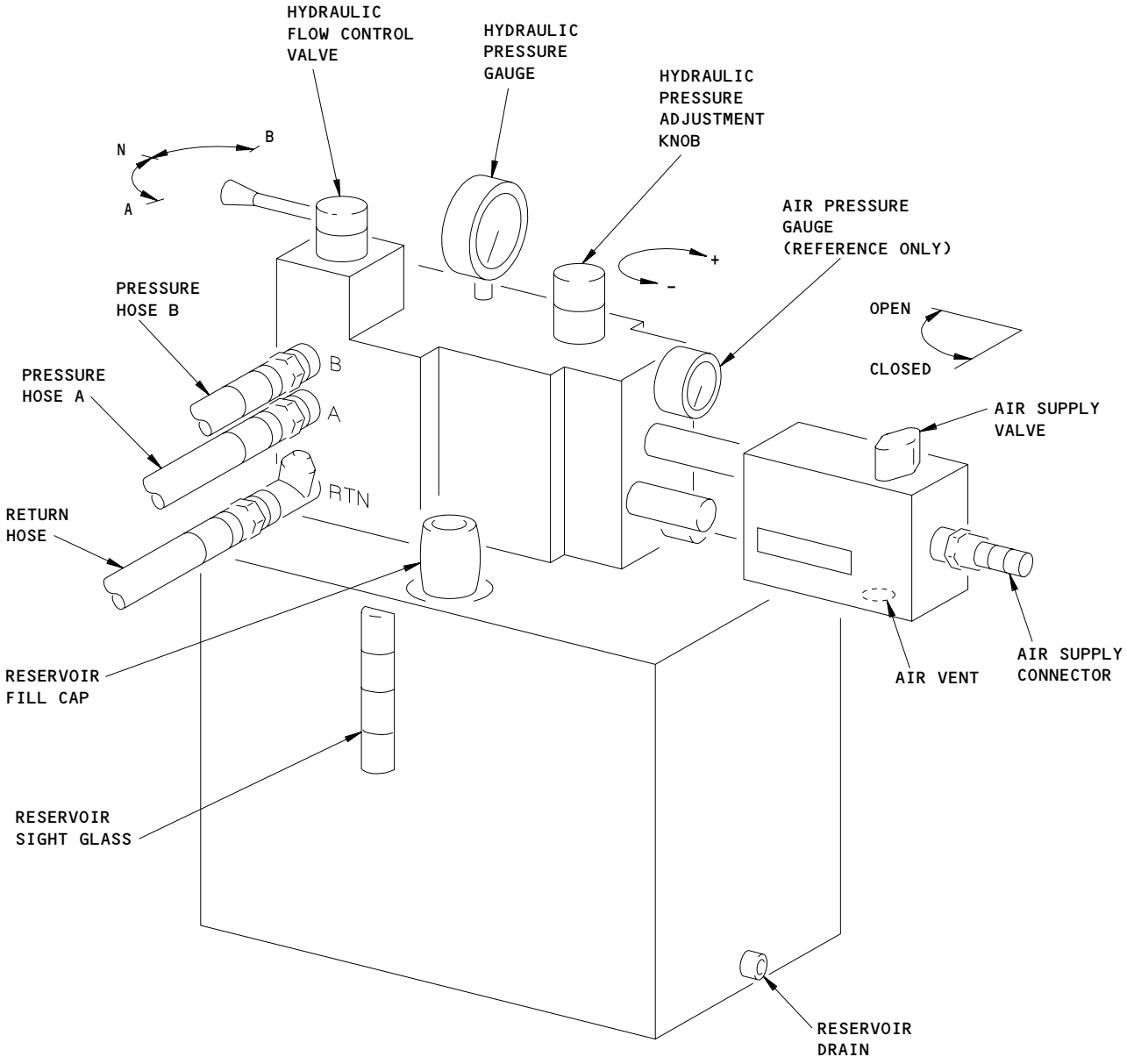
S 412-006-N00
(4) Tighten the plug with a wrench.

NOTE: Do not use aluminum or plastic dust covers. Make sure you use fittings that will seal the hose when you put pressure to the hose.

   B. Service the pump reservoir as follows:

S 212-007-N00
(1) Examine the sightglass on the side of the pump reservoir.

S 612-008-N00
(2) If you can not see the fluid level, service the pump as follows:
   (a) Remove the fill cap.
   (b) Add clean filtered Calibrating Fluid (P03-003) until full.



L-B5317 (0697) PW V

Hydraulic Pump (Pnuematic Motor Driven)
Figure 201

(c) Install the fill cap.

C. Before you connect an air supply to the pump, do a check of the controls and valves as follows:

S 862-010-N00

(1) Turn the Air Supply Valve to CLOSED (perpendicular to flow).

S 862-011-N00

(2) Lift and turn the Hydraulic Pressure Adjustment Knob counterclockwise towards OFF (MINUS) to stop.

S 862-012-N00

(3) Move the Hydraulic Flow Control Valve to NEUTRAL (middle position).

D. Supply air to hydraulic pump.

S 862-046-N00

(1) Connect an air supply hose to the pump air supply connector.

E. Operate the pump to supply hydraulic pressure to the applicable actuator as follows:

S 862-045-N00

WARNING: MAKE SURE ALL PERSONS AND TOOLS ARE AWAY FROM THE MECHANICAL PARTS OF THE SYSTEM THAT YOU ARE ADJUSTING. WHEN YOU START THE PUMP, THE ACTUATOR CAN MOVE. IF YOU DO NOT DO THIS, YOU CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

(1) Turn the Air Supply Valve to OPEN (parallel to flow).

NOTE: The air flow out of the air vent will stop when the valve is full open. Do not install a plug to the vent hole.

S 862-014-N00

(2) Lift and turn the Hydraulic Pressure Adjustment Knob towards ON (PLUS) only until the correct pressure is on the larger hydraulic pressure gage.

S 782-015-N00

(3) See the adjustment procedure for the correct pressure.

S 862-016-N00

(4) Move the Hydraulic Flow Control Valve to pressurize the hose that is connected to the actuator.

S 862-017-N00
(5) Lift and turn the Hydraulic Pressure Adjustment Knob as necessary to keep the correct pressure during the adjustment.

F. Extend and retract the actuator.

S 862-047-N00
(1) Use the applicable Electrical Control Box to extend and retract the actuator.

NOTE: You do not use the pump valves to extend or retract the actuator.

G. After the adjustment, disconnect and remove the equipment as follows:

S 862-018-N00
(1) Move the Hydraulic Flow Control Valve to NEUTRAL (middle position).

S 862-019-N00
(2) Lift and turn the Hydraulic Pressure Adjustment Knob counterclockwise towards OFF (MINUS) to stop.

S 862-020-N00
(3) Turn the Air Supply Valve to CLOSED (perpendicular to flow).

S 022-021-N00
(4) Disconnect the air supply.

S 862-022-N00
(5) Move the Hydraulic Flow Control Valve from A to B a few times to bleed any pressure in the hoses.

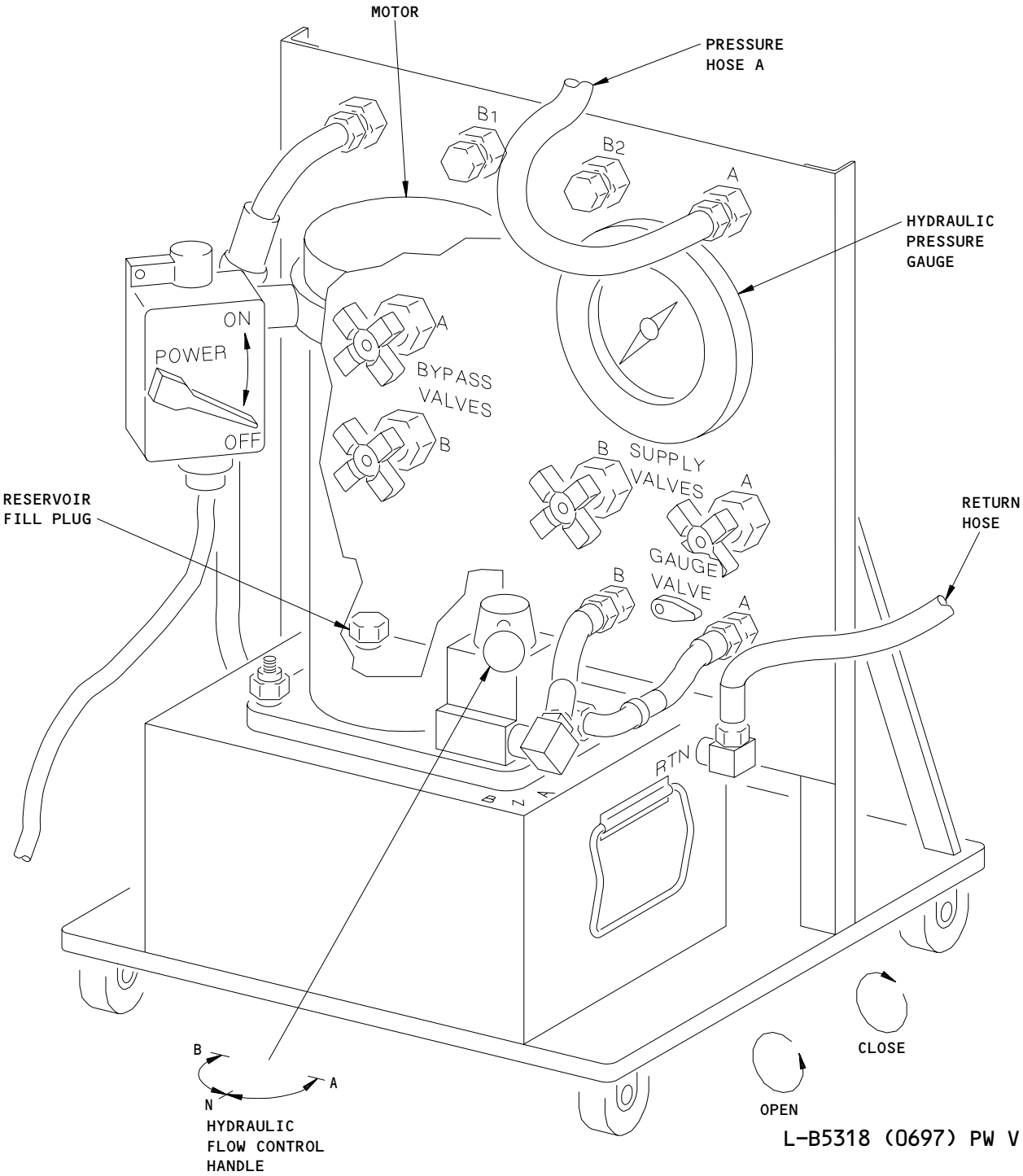
S 902-023-N00
(6) Disconnect the hoses from the actuator and install protection covers to the ends.

TASK 75-32-01-802-003-N00

3. Pump Operation - Electric Motor Driven (Fig. 202)

A. Check the hoses as follows:

S 212-024-N00
(1) Make sure the return hose is connected to the return adapter of the actuator.



Hydraulic Pump (Pnuematic Motor Driven)
Figure 202

S 212-025-N00
(2) Make sure the pressure hose A is connected to the pressure adapter of the actuator.

S 412-026-N00
(3) Install a No. 6 cap to the B1 and B2 pressure port adapters (not used) on the pump.

S 862-027-N00
(4) Tighten the caps with a wrench.

NOTE: Do not use aluminum or plastic dust covers. Make sure you use fittings that will seal the adapters if pressurized.

B. Service the pump reservoir as follows:

S 012-028-N00
(1) Remove the reservoir fill plug.

S 612-029-N00
(2) If you cannot see the fluid level, service the pump as follows:
(a) Add clean filtered Calibrating Fluid (P03-003) until full.
(b) Install the fill cap.

C. Before you connect the pump to the power supply, set the controls and valves as follows:

S 862-030-N00
(1) Turn the Power Supply Switch to OFF.

S 862-031-N00
(2) Turn the Supply Valve B and Bypass Valve B clockwise to CLOSED to stop.

S 862-032-N00
(3) Turn the Supply Valve A and Bypass Valve A to OPEN (counterclockwise approxiamtely 10 turns).

S 862-033-N00
(4) Turn the Guage Valve to the A position.

S 862-034-N00
(5) Move the Hydraulic Flow Control Valve to the Neutral (middle) position.

D. Supply electrical power to hydraulic pump.

S 862-048-N00

(1) Connect the power cord to the power supply.

E. Operate the pump to supply hydraulic pressure to the applicable actuator as follows:

S 862-049-N00

WARNING: MAKE SURE ALL PERSONS AND TOOLS ARE AWAY FROM THE MECHANICAL PARTS OF THE SYSTEM THAT YOU ARE ADJUSTING. WHEN YOU START THE PUMP, THE ACTUATOR CAN MOVE. IF YOU DO NOT DO THIS, YOU CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

(1) Turn the Power Switch to ON.

S 862-036-N00

(2) Move the Hydraulic Flow Control Handle to the A position.

S 862-037-N00

(3) Slowly close the Bypass Valve A (clockwise) only until the correct pressure is on the hydraulic pressure guage.
(a) See the adjustment procedure for the correct pressure.

F. Extend and retract the actuator.

S 862-050-N00

(1) Use the applicable Electrical Control Box to extend and retract the actuator per the adjustment task.

NOTE: You do not use the pump valves to extend or retract the actuator.

G. After the adjustment, disconnect and remove the equipment as follows:

S 862-038-N00

(1) Open the Bypass Valve A (counterclockwise) until the pressure on the hydraulic gauge is 0.

S 862-039-N00

(2) Move the Hydraulic Flow Control Valve to NEUTRAL (middle position).

S 862-040-N00

(3) Close the Supply Valve A (to clockwise stop).

S 862-041-N00

(4) Turn the Power Supply Switch to OFF.

S 022-044-N00
(5) Disconnect the power cord from the power supply.

S 022-043-N00
(6) Disconnect the hoses from the actuator and install protection covers to the ends.

2.5 BLEED VALVE ACTUATOR - REMOVAL/INSTALLATION

1. General
   A. This procedure gives the instructions for the removal and installation of the 2.5 bleed-valve actuator.
   B. The 2.5 bleed-valve actuator is installed on the aft face of the intermediate case at the 7 o'clock position.
   C. You can get access to the 2.5 bleed-valve actuator through the left thrust reverser.

TASK 75-32-01-024-001-N00

2. Remove the 2.5 Bleed Valve Actuator
   A. Equipment
      (1) Container - for fuel
   B. References
      (1) AMM 71-11-04/201, Fan Cowl Panels
      (2) AMM 71-11-06/201, Core Cowl Panels
      (3) AMM 72-34-03/401, Fan Exit Liner Segments
      (4) AMM 78-31-00/201, Thrust Reverser System
   C. Access
      (1) Location Zones
          411 Left Engine
          421 Right Engine

      (2) Access Panels
          413AL Fan Cowl Panel (Left), Left Engine
          415AL Thrust Reverser (Left), Left Engine
          417AL Core Cowl Panel (Left), Left Engine
          423AL Fan Cowl Panel (Left), Right Engine
          425AL Thrust Reverser (Left), Right Engine
          427AL Core Cowl Panel (Left), Right Engine

   D. Prepare to Remove the 2.5 Bleed-Valve Actuator

      S 864-002-N00
      (1) For the left engine, open these circuit breakers on the overhead circuit breaker panel, P11, and attach the DO-NOT-CLOSE tags:
          (a) 11L3, L ENG PERF SOL CHAN A
          (b) 11L4, L ENG PERF SOL CHAN B

      S 864-003-N00
      (2) For the right engine, open these circuit breakers on the overhead circuit breaker panel, P11, and attach the DO-NOT-CLOSE tags:
          (a) 11L30, R ENG PERF SOL CHAN A

(b) 11L31, R ENG PERF SOL CHAN B

S 014-004-N00

(3) Open the left fan cowl panel (AMM 71-11-04/201).

S 044-005-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(4) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 014-006-N00

(5) Open the left core cowl panel (AMM 71-11-06/201).

S 014-007-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(6) Open the left thrust reverser (AMM 78-31-00/201).

E. Procedure (Fig. 401)

S 014-054-N00

(1) Remove the fan exit liner segment at the 6:30 o'clock position (AMM 72-34-03/401).

S 024-046-N00

(2) Remove the 2.5 bleed-valve actuator.

(a) Disconnect the EEC electrical connector.

1) Install protection caps on the EEC electrical connector and the receptacle on the 2.5 bleed-valve actuator.

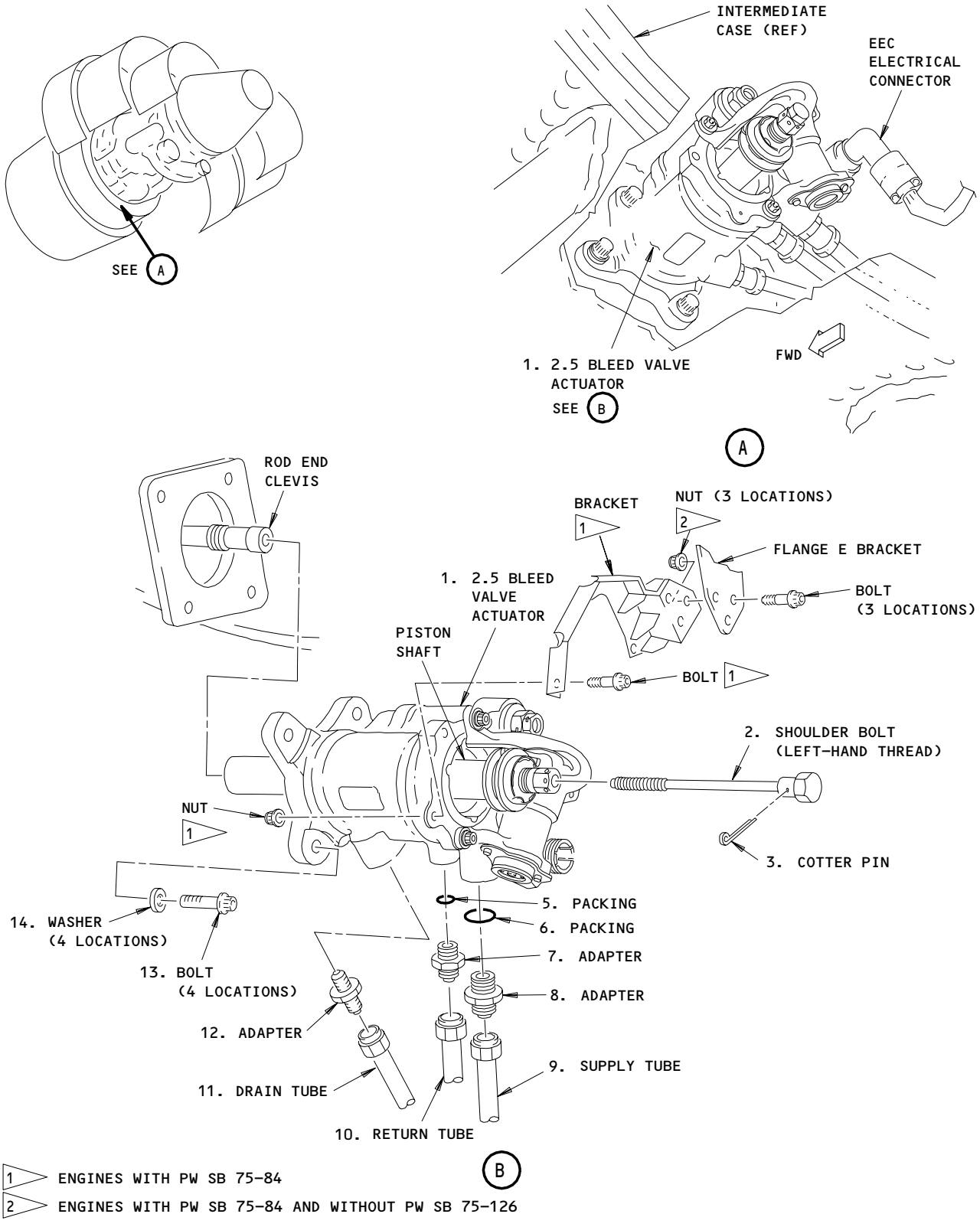
WARNING: MAKE SURE ALL THE SOURCES OF HEAT OR FLAME ARE REMOVED OR EXTINGUISHED BEFORE YOU DISCONNECT THE PRESSURE, RETURN, AND DRAIN LINES.

WARNING: DO NOT GET FUEL IN YOUR EYES OR ON YOUR SKIN. THE FUEL CAN CAUSE INJURY TO YOU.

(b) Disconnect the drain tube (11), the return tube (10) and the supply tube (9) from the 2.5 bleed-valve actuator (1).

1) Collect the remaining fuel with the container.

NOTE: Approximately 1/2 pint (1/4 liter) of fuel will drain from the 2.5 bleed-valve actuator.



2.5 Bleed Valve Actuator Installation
Figure 401

(c) ENGINES POST-PW-SB 75-84;
Remove the support bracket for the 2.5 bleed-valve actuator with the steps that follow:
1) ENGINES PRE-PW-SB 75-126;
Remove the three bolts and nuts which attach the support bracket to the bracket on the Flange E.
2) ENGINES POST-PW-SB 75-126;
Remove the three bolts which attach the support bracket to the bracket on the Flange E.
3) Remove the two bolts which attach the support bracket to the 2.5 bleed-valve actuator.
4) Remove the support bracket from the engine.
(d) Remove the cotter pin (3) from the shoulder bolt (2).

CAUTION: BE CAREFUL WHEN YOU REMOVE THE SHOULDER BOLT. THE SHOULDER BOLT HAS LEFT-HAND THREADS. DAMAGE TO THE SHOULDER BOLT OR THE 2.5 BLEED-VALVE ACTUATOR CAN OCCUR IF YOU TURN THE BOLT IN THE INCORRECT DIRECTION.

(e) Hold the piston shaft hex-head of the 2.5 bleed-valve actuator (1) and remove the shoulder bolt (2).
(f) Remove the bolts (14) which attach the 2.5 bleed-valve actuator (1) to the intermediate case bulkhead.

CAUTION: MAKE SURE THE CRIMPED LOCKING CUP AND RETAINING NUT DO NOT LOOSEN FROM THE PISTON SHAFT WHEN YOU TURN THE PISTON SHAFT HEX-HEAD. IF THE RETAINING NUT CHANGES POSITION OR LOOSENS, THE INTERNAL ADJUSTMENT OF THE 2.5 BLEED-VALVE ACTUATOR CAN BE CHANGED WHICH CAN CAUSE DAMAGE TO THE 2.5 BLEED-VALVE OR THE ENGINE.

(g) Turn the hex head of the piston shaft counterclockwise to disengage the internal threads from the rod end clevis.
(h) Remove the 2.5 bleed-valve actuator (1), forward end first, down through the liner segment section.

S 024-047-N00
(3) If it is necessary to replace the 2.5 bleed-valve actuator (1), do the steps that follow:
(a) Remove the adapters (7, 8) from the supply and return ports.
1) Discard the packings (5, 6).

S 024-056-N00

(4) Install protection caps to the openings in the 2.5 bleed-valve actuator (1) and to all open line-ends.

TASK 75-32-01-424-019-N00

3. Install the 2.5 Bleed Valve Actuator

A. Equipment

(1) PWA 85928 Adapter - Torque, Pratt & Whitney, East Hartford, Conn.

(2) M303, M305, or M307 Bergen Mechanical Crimper
Bergen Cable Technologies Inc
170 Gregg St
P.O. Box 1300
Lodi, NJ 07644-9982

B. Consumable Materials

(1) Engine Oil - Aircraft Turbine Engine, Synthetic Base, 475°F Minimum, (P03-001)

(2) Lockwire - 0.032 inch (0.813 mm) Diameter (P05-289)

(3) Ferrule, Safety Cable - F30B50, 0.032 in. (0.813 mm) (P05-292) (Optional)

(4) G02335 Cable - Safety - P05-291 (Optional)

(5) Paste - Antiseize, Molykote P-37 (P06-054)

C. Parts

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	1	Actuator - 2.5 Bleed Valve	75-32-01	05	55
	3	Pin - Cotter			35
	5	Packing (O-ring)			10
	6	Packing (O-ring)			20

D. References

(1) AMM 70-00-00/201, Standard Practices - Engine

(2) AMM 70-24-05/201, Electrical Harnesses

(3) AMM 71-11-04/201, Fan Cowl Panels

(4) AMM 71-11-06/201, Core Cowl Panels

(5) AMM 72-34-03/401, Fan Exit Liner Segments

(6) AMM 75-32-01/501, 2.5 Bleed Valve Actuator

(7) AMM 78-31-00/201, Thrust Reverser System

E. Access

(1) Location Zones

411 Left Engine

421 Right Engine

(2) Access Panels

413AL	Fan Cowl Panel (Left), Left Engine
415AL	Thrust Reverser (Left), Left Engine
417AL	Core Cowl Panel (Left), Left Engine
423AL	Fan Cowl Panel (Left), Right Engine
425AL	Thrust Reverser (Left), Right Engine
427AL	Core Cowl Panel (Left), Right Engine

F. Prepare to Install the 2.5 Bleed-Valve Actuator (Fig. 401)

S 024-048-N00

(1) Remove the protection caps from the openings in the 2.5 bleed-valve actuator (1) and all open line-ends.

S 424-050-N00

(2) If it is necessary to install a new 2.5 bleed-valve actuator, do the steps that follow:
   (a) Lubricate the new packings (5, 6) with engine oil.
   (b) Install the new packings (5, 6) on the adapters (7, 8).
   (c) Install the adapter (7) in the supply port of the 2.5 bleed-valve actuator (1).
      1) Tighten the adapter (7) to 110-120 pound-inches (12.4-13.6 newton-meters).
   (d) Install the adapter (8) in the return port of the 2.5 bleed-valve actuator (1).
      1) Tighten the adapter (8) to 150-170 pound-inches (16.9-19.2 newton-meters).

G. Procedure

S 424-057-N00

(1) Install the 2.5 bleed-valve actuator.
   (a) Lubricate the outer threads of the rod end clevis as follows:
      1) ENGINES PRE-PW-SB 75-154;
         Lubricate the external (OD) threads of the rod end clevis with engine oil (P03-001).

2) ENGINES POST-PW-SB 75-154;
Lubricate the external threads of the rod end clevis with Antiseize paste (P06-054).
a) Apply the paste to the entire area of the external threads and to a maximum of 0.250 inch (6.350 mm) more than both ends of the threads.

(b) Lubricate the threads of the attaching bolts (13) of the 2.5 bleed-valve actuator (1) with engine oil.

CAUTION: DO NOT TURN THE ROD END CLEVIS. IF YOU TURN THE ROD END CLEVIS, YOU CAN CAUSE DAMAGE TO THE 2.5 BLEED-VALVE LINKAGE.

(c) Move the piston shaft of the 2.5 bleed-valve actuator (1) in its position on the lubricated rod end clevis.
(d) Turn the hex head of the piston shaft clockwise until the 2.5 bleed-valve actuator (1) is in position against the intermediate case.
(e) Secure the 2.5 bleed-valve actuator (1) to the intermediate case with the bolts (13) and washers (14).

CAUTION: YOU MUST ADJUST THE TORQUE WRENCH INDICATION FOR THE EFFECT OF THE TORQUE ADAPTER ON THE APPLIED TORQUE (AMM 70-50-00/201). IF TOO MUCH TORQUE IS APPLIED TO THE BOLT, DAMAGE TO THE THREADS OF THE BOLT CAN OCCUR.

(f) Use the PWA 85928 torque adapter to tighten the bolts (13) to 180-200 pound-inches (20.4-22.6 newton-meters).
(g) Install the support bracket for the 2.5 bleed-valve actuator with the steps that follow:
1) Lubricate the threads of the attaching bolts of the support bracket, with engine oil.
2) Install the support bracket to the 2.5 bleed-valve actuator with the two bolts.
a) Tighten the bolts with your hand.
3) Align the three bolt holes in the support bracket with the three bolt holes in the bracket on the Flange E.
4) ENGINES PRE-PW-SB 75-126;
Attach the support bracket to the bracket on the Flange E with the three bolts and nuts.
a) Tighten the nuts with your hand.
5) ENGINES POST-PW-SB 75-126;
Attach the support bracket to the bracket on the Flange E with the three bolts.
a) Tighten the bolts with your hand.
6) Tighten the bolts which attach the support bracket to the 2.5 bleed-valve actuator to 65-85 pound-inches (7.3-9.6 newton-meters).
a) Safety the bolts with lockwire or safety cable and safety cable ferrule.

7) Tighten the bolts which attach the support bracket to the bracket on the Flange E to 85-95 pound-inches (9.6-10.7 newton-meters).

(h) Lubricate the threads of the tube nut of the drain tube (11) with engine oil.

(i) Connect the drain tube (11) to the 2.5 bleed-valve actuator (1).

1) Hold the adapter and tighten the tube nut to 270-300 pound-inches (30.5-33.9 newton-meters).

(j) Remove the protection caps from the EEC electrical connector and the receptacle on the 2.5 bleed-valve actuator.

CAUTION: USE THE CORRECT ASSEMBLY PROCEDURE, AND TOOLS, FOR THE HARNESS CONNECTOR INSTALLATION (AMM 70-24-05/201). IF YOU USE THE INCORRECT ASSEMBLY PROCEDURE, OR TOOLS, A DAMAGED OR LOOSE CONNECTOR CAN OCCUR. A LOOSE CONNECTOR PERMITS VIBRATION, WHICH CAUSES THE CONTACTS TO WEAR AND DECREASES THE LIGHTNING PROTECTION.

(k) Install the W3P15 electrical connector to the 2.5 bleed-valve actuator (AMM 70-24-05/201).

S 824-028-N00

(2) Adjust the 2.5 bleed-valve actuator (AMM 75-32-01/501).

S 414-055-N00

(3) Install the fan exit liner segment at the 6:30 o'clock position (AMM 72-34-03/401).

H. Return the Aircraft to Its Usual Condition

S 414-030-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT COULD OCCUR.

(1) Close the left thrust reverser (AMM 78-31-00/201).

S 414-031-N00

(2) Close the left core cowl panel (AMM 71-11-06/201).

S 414-032-N00

(3) Close the left fan cowl panel (AMM 71-11-04/201).

S 444-033-N00

(4) Do the activation procedure for the thrust reversers (AMM 78-31-00/201).

S 864-034-N00

(5) For the left engine, remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:
   (a) 11L3, L ENG PERF SOL CHAN A
   (b) 11L4, L ENG PERF SOL CHAN B

S 864-035-N00

(6) For the right engine, remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:
   (a) 11L30, R ENG PERF SOL CHAN A
   (b) 11L31, R ENG PERF SOL CHAN B

2.5 BLEED VALVE ACTUATOR - ADJUSTMENT/TEST

1. General
   A. This procedure contains two seperate tasks, hydraulic and mechanical, used for the adjustment of the 2.5 bleed valve actuator (referred to as the actuator) to the necessary limits.
   B. Do either procedure when the actuator is replaced. Also, do either procedure when the actuator is disconnected from the support.
   C. The actuator is installed on the aft face of the intermediate case at the 7 o'clock position.
   D. You can get access to the actuator through the left thrust reverser.

TASK 75-32-01-825-001-N00

2. Adjustment - 2.5 Bleed Valve Actuator, (Hydraulic Method)
   A. Equipment
      (1) M303, M305, or M307 Bergen Mechanical Crimper
          Bergen Cable Technologies Inc
          170 Gregg St
          P.O. Box 1300
          Lodi, NJ 07644-9982
      (2) PWA29451 Adapter - Hydraulic Pump
          77445 United Technologies Corp, Pratt and Whitney
          400 Main St, East Hartford, CT 06108
      (3) PWA85842 Box - Control, Electrical
          Pratt and Whitney (See United Technologies)
      (4) TG69 Pliers - Electrical Connector
          06324 Glenair Inc.
          1211 Air Way, Glendale, CA 91201-2497
      (5) CTE5100 Pump - Portable Hydraulic
          Pratt and Whitney (see United Technologies)
      (6) Wrench (or alternative tool):

          - TG70 Wrench - Strap, Electrical Connector (recommended)
            06324 Glenair Inc.
            1211 Air Way, Glendale, CA 91201-2497

          - BTBS609 Wrench - Strap, Electrical Connector (alternative)
            11851 Daniels Mfg Corp.
            526 Thorp Rd.
            PO Box 593872, Orlando, FL 32859-3872
   B. Consumable Materials
      (1) D00137 Engine Oil - PWA 521, (P03-001)
      (2) G02147 Cheesecloth - Unsized GA-100-11
      (3) A00482 Sealant, Silicon Rubber - PWA 36003
      (4) B00148 Solvent - Methyl Ethyl Ketone (MEK), TT-M-261
      (5) D00247 Compound, Antigalling - PWA 586-3
      (6) G02334 Lockwire - AS3214-02
      (7) G02332 Ferrule - P05-292 (Optional)
      (8) G02335 Cable - Safety - P05-291 (Optional)
   C. References
      (1) AMM 70-24-05/201, Electrical Harnesses

(2) AMM 70-41-03/201, Cotter Pins
(3) AMM 71-00-00/501, Power Plant - General
(4) AMM 71-11-04/201, Fan Cowl Panels
(5) AMM 71-11-06/201, Core Cowl Panels
(6) AMM 78-31-00/201, Thrust Reverser System

D. Access

(1) Location Zones

411 Left Engine
421 Right Engine

(2) Access Panels

413AL Fan Cowl Panel (Left), Left Engine
414AR Fan Cowl Panel (Right), Left Engine
423AL Fan Cowl Panel (Left), Right Engine
424AR Fan Cowl Panel (Right), Right Engine

E. Prepare to Adjust the 2.5 Bleed Valve Actuator (Fig. 501)

S 865-002-N00

(1) For the left engine, open these circuit breakers on the overhead circuit breaker panel P11 and attach DO-NOT-CLOSE tags:
(a) 11L3, L ENG PERF SOL CHAN A
(b) 11L4, L ENG PERF SOL CHAN B

S 865-003-N00

(2) For the right engine, open these circuit breakers on the overhead circuit breaker panel P11 and attach DO-NOT-CLOSE tags:
(a) 11L30, R ENG PERF SOL CHAN A
(b) 11L31, R ENG PERF SOL CHAN B

S 015-004-N00

(3) Open the left fan cowl panel (AMM 71-11-04/201).

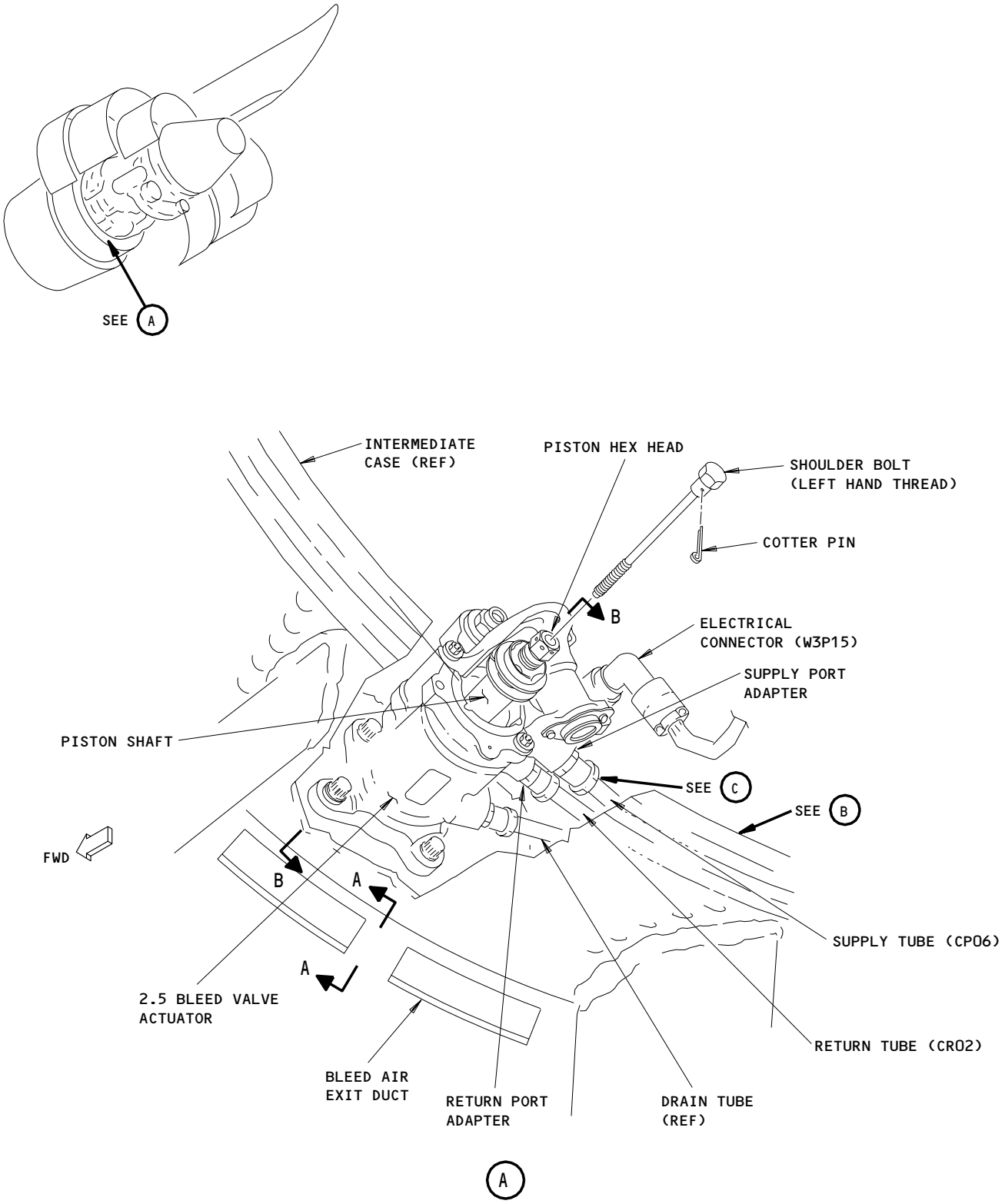
S 045-005-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

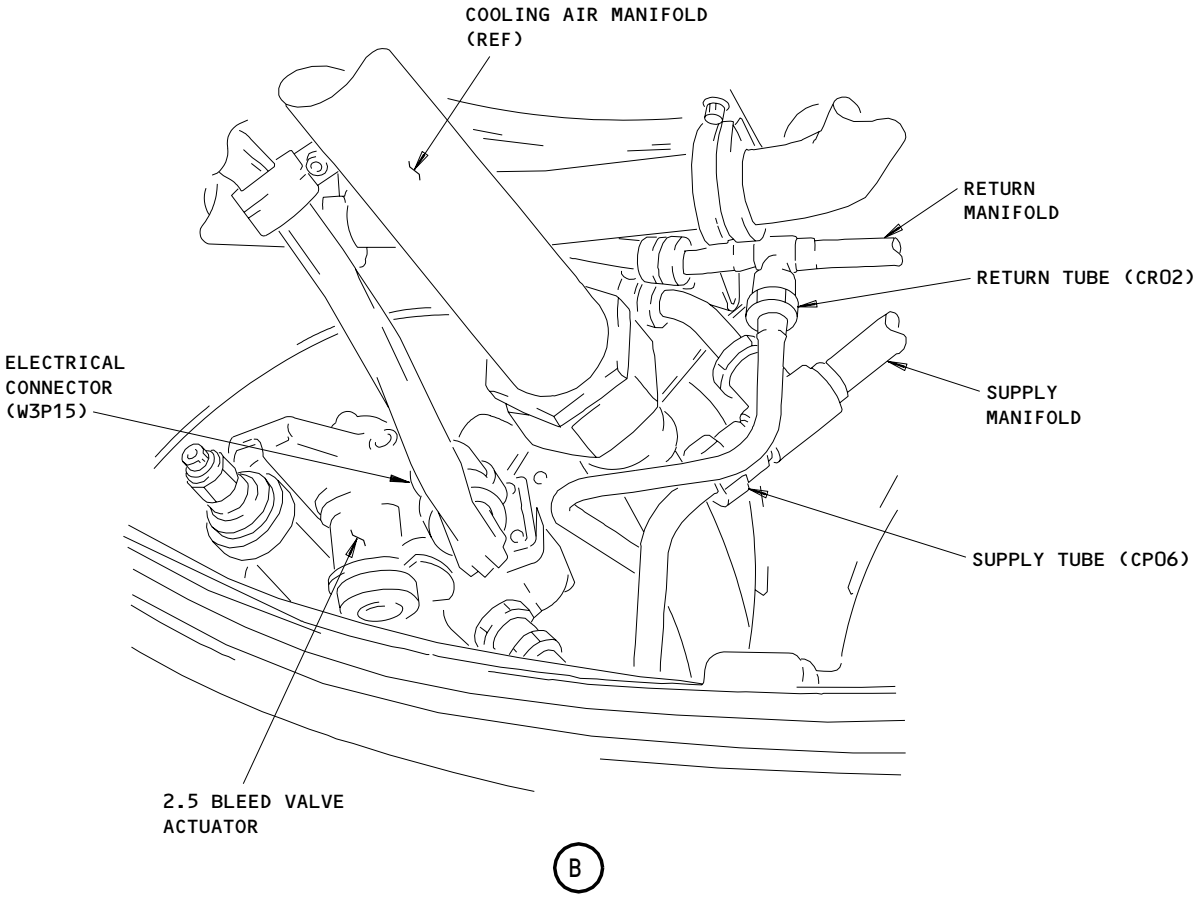
(4) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 015-006-N00

(5) Open the left core cowl panel (AMM 71-11-06/201).

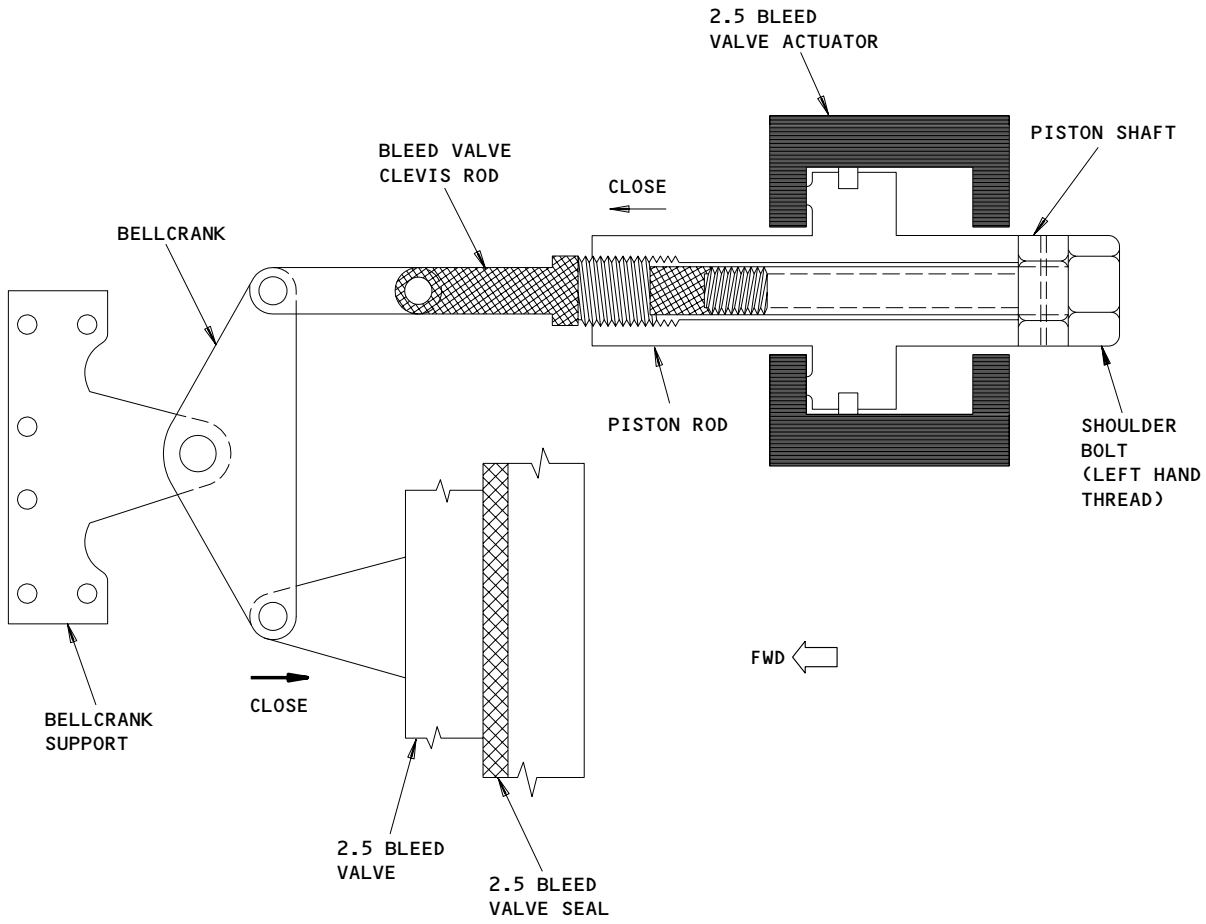


2.5 Bleed Valve Actuator Adjustment
Figure 501 (Sheet 1)



A-A

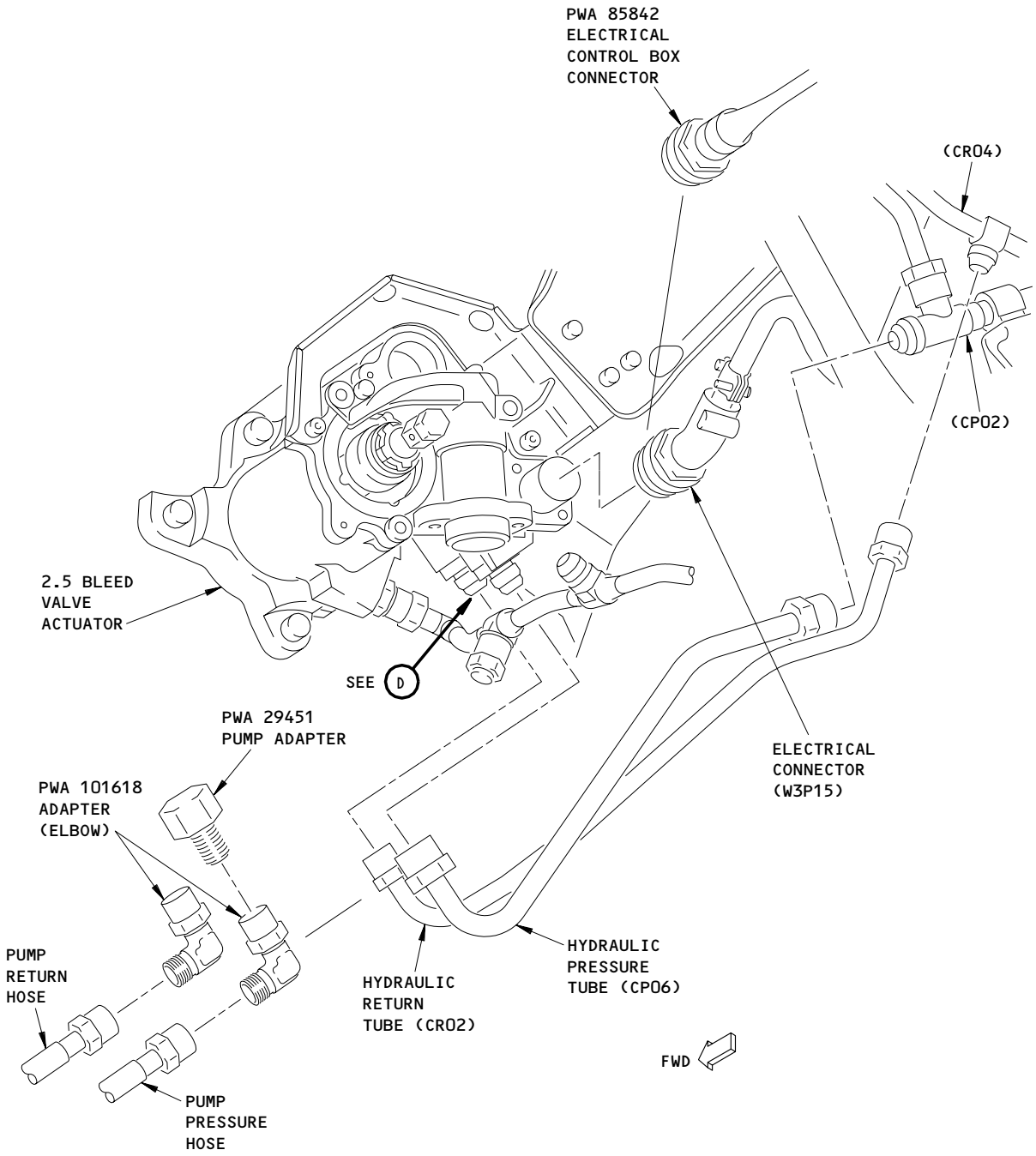
2.5 Bleed Valve Actuator Adjustment
Figure 501 (Sheet 2)



B-B

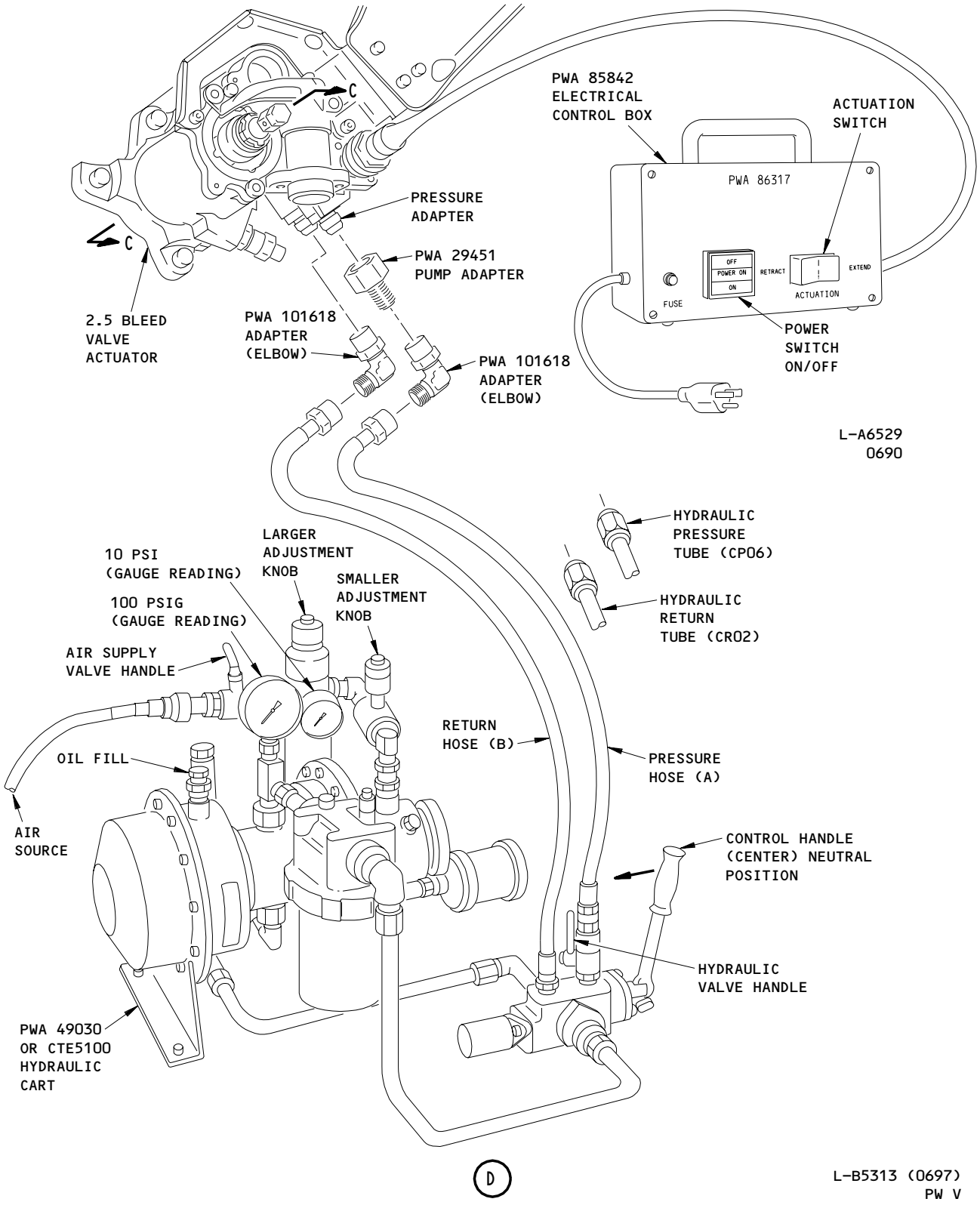
L-A6481

2.5 Bleed Valve Actuator Adjustment
Figure 501 (Sheet 3)

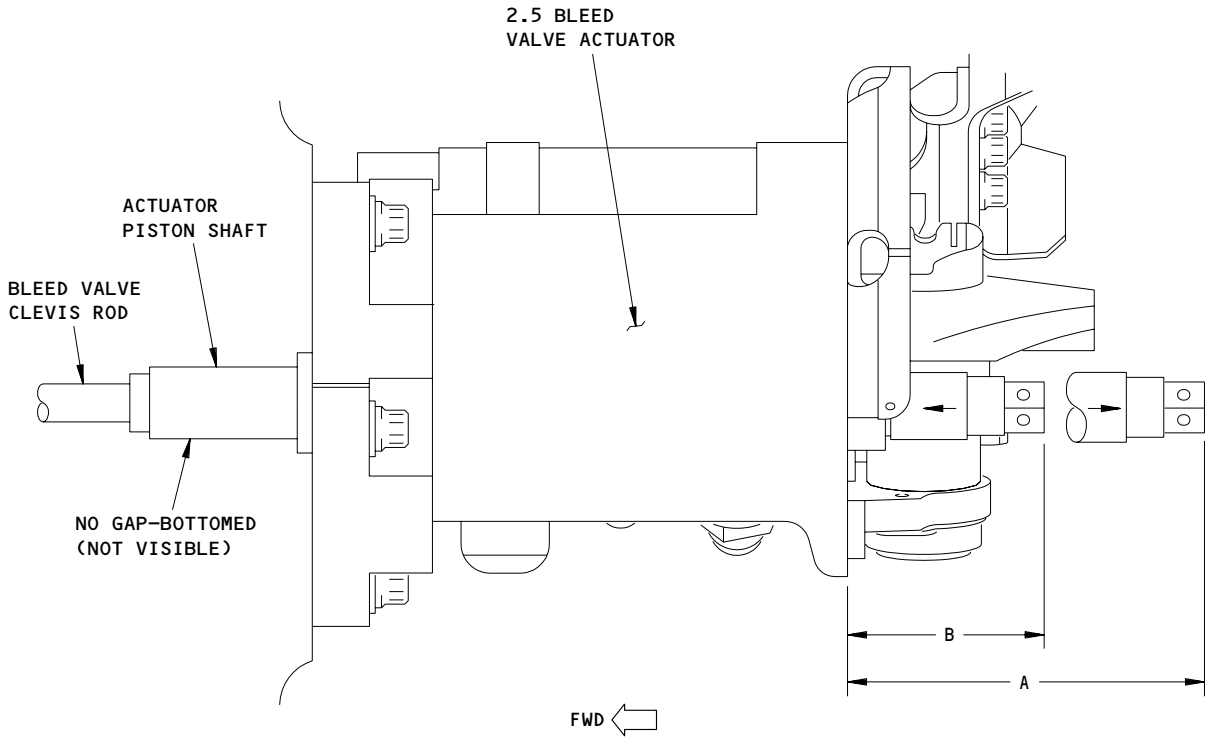


C

2.5 Bleed Valve Actuator Adjustment
Figure 501 (Sheet 4)



2.5 Bleed Valve Actuator Adjustment
Figure 501 (Sheet 5)

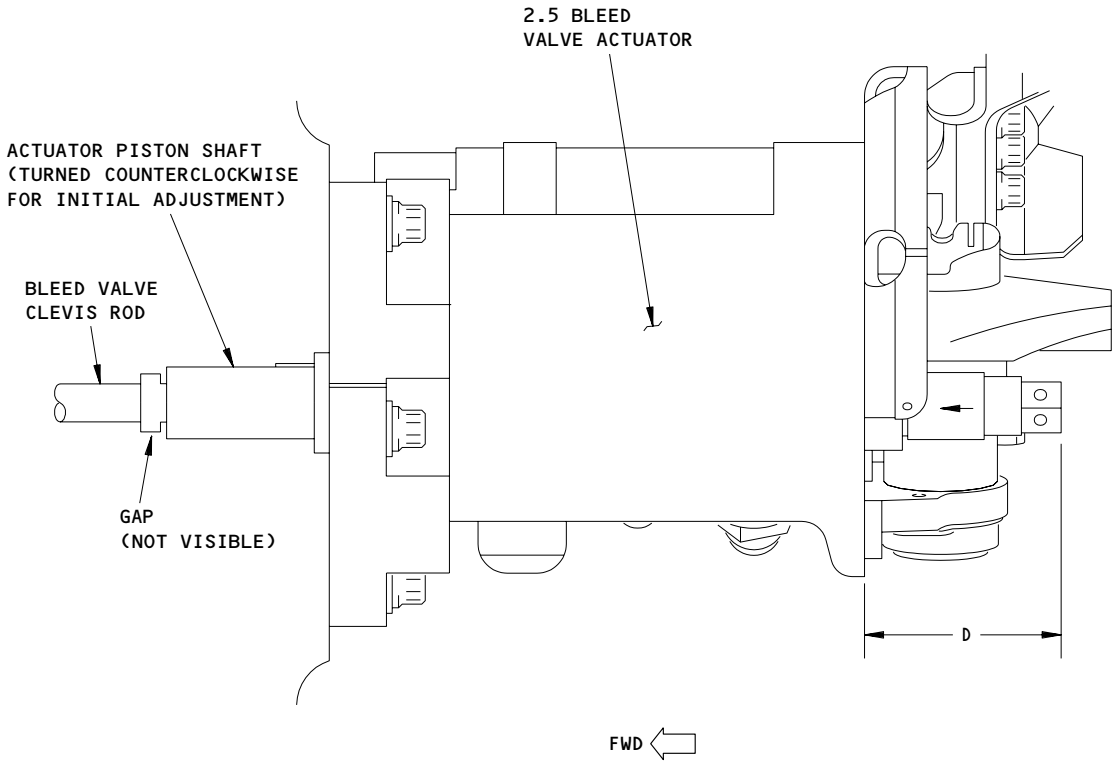


PISTON REARWARD.....DIMENSION A _____
PISTON FORWARD.....DIMENSION B _____
SUBTRACT – _____
PISTON TRAVEL.....DIMENSION C _____

PISTON TRAVEL CHECK
C–C

L–B5314 (0697)

2.5 Bleed Valve Actuator Adjustment
Figure 501 (Sheet 6)

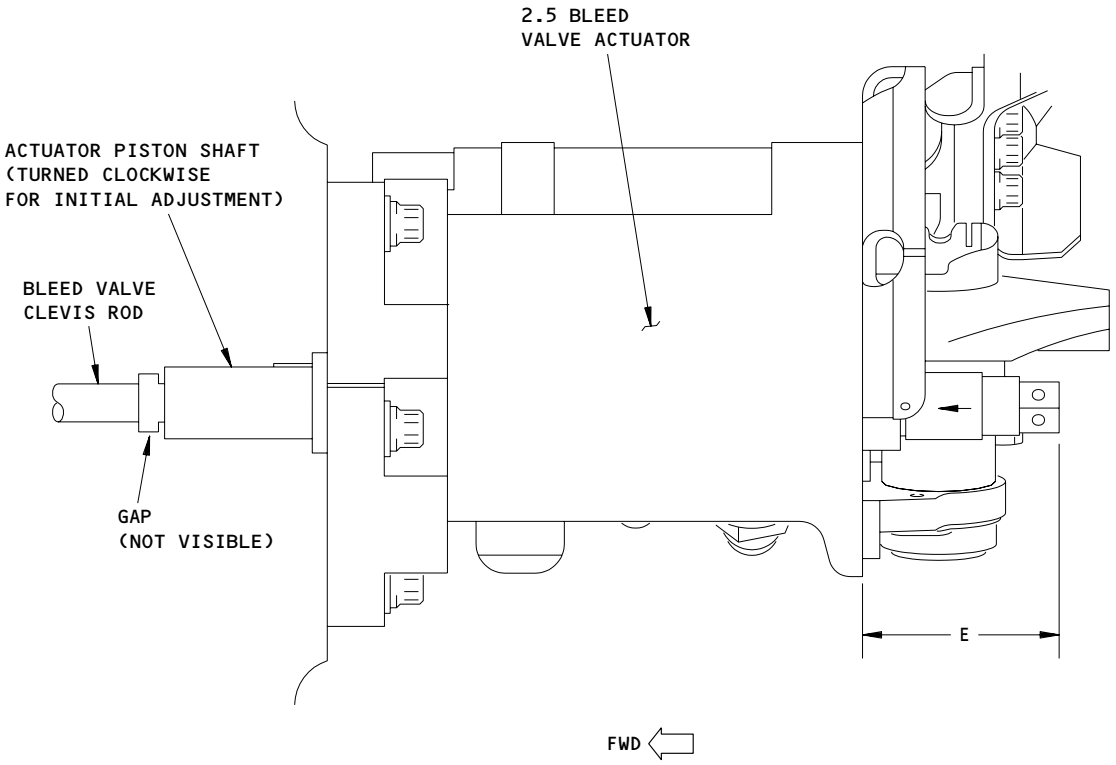


NUMBER OF TURNS COUNTERCLOCKWISE FROM BOTTOMED _____
PISTON FORWARD
(AFTER INITIAL ADJUSTMENT)..... DIMENSION D _____
DIMENSION B _____
SUBTRACT – _____
INITIAL DIFFERENCE _____

INITIAL COMPRESSION ADJUSTMENT
C–C

L–B5315 (0697)

2.5 Bleed Valve Actuator Adjustment
Figure 501 (Sheet 7)



NUMBER OF TURNS CLOCKWISE FROM INITIAL ADJUSTMENT _____
PISTON FORWARD
(AFTER FINAL ADJUSTMENT)..... DIMENSION E _____
DIMENSION B _____
SUBTRACT – _____
FINAL DIFFERENCE _____

(NOTE: IF DIMENSION B IS MORE THAN DIMENSION E, SUBTRACT
DIMENSION E FROM DIMENSION B TO DETERMINE THE DIFFERENCE.)

FINAL COMPRESSION ADJUSTMENT
C-C

L-B5316 (0697)

2.5 Bleed Valve Actuator Adjustment
Figure 501 (Sheet 8)

S 015-007-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS INJURY TO PERSONS OR DAMAGE TO EQUIPMENT COULD OCCUR.

(6) Open the left thrust reverser (AMM 78-31-00/201).

S 015-044-N00

(7) Remove the fan exit liner segment (inner) which covers the actuator.

S 025-045-N00

(8) Use the TG-69 Glenair Soft Jawed Pliers or the TG-70 Glenair Strap wrench to disconnect the electrical connector (W3P15) from the actuator (Fig. 501).

S 915-046-N00

(9) Put a fluid drain collector/container under the actuator.

S 025-047-N00

(10) Remove pressure from the hydraulic tubes as follows:
  (a) Remove lockwire or safety cable from the tube nuts at both ends of each tube (CP06) and (CR02).
  (b) While you hold the tee with a wrench, disconnect the hydraulic pressure tube (CP06) at the (CP02) tee to remove any pressure.
  (c) While you hold the tee with a wrench, disconnect the hydraulic return tube (CR02) at the (CR04) tee to remove any pressure.

S 025-048-N00

(11) Remove the bleed valve actuator hydraulic pressure tube (CP06) and return tube (CR02) as follows:
  (a) Hold the adapters with a wrench and disconnect the tube nuts from the actuator.

    NOTE: It is not necessary to disconnect the drain manifold (DR11) from the actuator.

S 845-058-N00

(12) Connect the hoses from the PWA 49030 or CTE 5100 Hydraulic Pump as follows:

  NOTE: If you do not know which Pump hoses to use, see the instructions for hydraulic pump service and operation (AMM 75-32-01/201).

  (a) Install the PWA 29451 Pump Adapter to the actuator rear adapter.
  (b) While you hold the rear adapter with a wrench, tighten the Pump adapter.

(c) Connect the two elbows to the two pump hoses (pressure and return).
(d) Tighten the hoses to the elbows.
(e) Connect the return hose elbow to the forward adapter.
(f) While you hold the forward adapter with a wrench, tighten the elbow.
(g) Connect the pressure hose elbow to the Pump Adapter.
(h) While you hold the Pump adapter with a wrench, tighten the elbow.

S 845-050-N00
(13) With the power OFF, connect the PWA 85842 Electrical Control Box Connector to the actuator receptacle.

S 025-051-N00
(14) Remove the shoulder bolt from the actuator piston shaft as follows:
(a) Remove and discard the cotter pin installed to the piston shaft and bolt.

CAUTION: TURN THE SHOULDER BOLT CLOCKWISE TO LOOSEN. THE SHOULDER BOLT HAS LEFT HAND THREADS. DAMAGE CAN OCCUR TO THE SHOULDER BOLT OR THE ACTUATOR IF THE SHOULDER BOLT IS TURNED IN THE INCORRECT DIRECTION. ALSO, HOLD THE HEXAGONAL HEAD OF THE ACTUATOR PISTON SHAFT WHEN YOU LOOSEN THE SHOULDER BOLT.

CAUTION: MAKE SURE THE CRIMPED LOCKING CUP AND RETAINING NUT DO NOT LOOSEN FROM THE PISTON SHAFT WHEN THE SHOULDER BOLT IS REMOVED. IF THE RETAINING NUT CHANGES OR LOOSENS, THE INTERNAL ADJUSTMENT OF THE ACTUATOR CAN BE AFFECTED AND ACTUATOR OR ENGINE DAMAGE CAN OCCUR.

(b) Hold the piston shaft hex with a wrench and remove the shoulder bolt (left hand thread).

S 825-052-N00
(15) Turn the piston shaft hex clockwise (from rear) only until the shaft stops.
(a) Do not use too much force. This will tighten the piston shaft against the bleed valve clevis rod until bottomed.

F. Procedure

S 735-053-N00
(1) Check operation of equipment as follows:

WARNING: MAKE SURE ALL PERSONS AND TOOLS ARE AWAY FROM THE MECHANICAL PARTS OF THE BLEED SYSTEM. WHEN YOU START THE PUMP, THE ACTUATOR CAN MOVE. IF YOU DO NOT DO THIS, YOU CAN CAUSE INJURY TO PERSONS AND DAMAGE TO THE ACTUATOR OR THE ENGINE CAN OCCUR.

(a) Service the pump with the Calibrating Fluid (P03-003) and connect to a power source.

NOTE: If you do not know how to service and operate the hydraulic pump, see the instructions for hydraulic pump service and operation (AMM 75-32-01/201).

(b) Supply 100 psig to the actuator aft pressure adapter.
(c) Set the POWER switch on the PWA 85842 Electrical Control Box to the ON position.
(d) Use the Electrical Control Box to cycle the bleed valve back and forth between open and closed positions to make sure the 2.5 bleed valve assembly moves freely.
(e) After cycling the bleed valve, leave the bleed valve in the closed (actuator piston shaft forward) position.
(f) All actuation of the bleed system to the valve open or valve closed positions should now be done using the PWA 85842 Electrical Control Box OPEN/CLOSE switch.
(g) Keep 100 psig pressure to the actuator during all measurements.

S 735-054-N00

(2) Check the travel of the piston as follows:

NOTE: All measurements must be made with 100 psig at the actuator, use a depth micrometer and measure from the piston shaft to the same location on the housing.

(a) Measure the length of piston travel as follows (Fig. 501, View C-C, Piston Travel Check):
1) Establish a stationary reference point on the actuator housing to be used for all piston travel measurements which follow.

2) Make sure the bleed valve is in the closed (actuator piston shaft forward) position.
3) Measure the distance from the piston shaft end to the reference point on the actuator housing.
4) Record as Dimension B.
5) Actuate the bleed system to the valve open (actuator piston shaft rearward) position.
6) Measure the distance from the piston shaft end to the reference point on the actuator housing.
7) Record as Dimension A.
8) Determine piston travel by subtracting Dimension B from Dimension A.
9) Record the result as Dimension C.
10) Piston travel should be 2.280 - 2.320 inches (87.91 - 58.93 mm).

(b) If the piston travel is not within limits, repeat the measurement.

(c) If the piston travel is still not within limits, check to make sure the piston shaft is fully against the bleed valve clevis rod as follows:
1) Remove pressure to the actuator.
2) Turn the piston shaft hex clockwise (from rear) only until the shaft stops.
3) Do not use too much force.
4) This will tighten the piston shaft against the bleed valve clevis rod until bottomed.

(d) Supply 100 psig to the actuator and do the piston travel check again.
1) If the piston travel is still not within the limits, replace the actuator.

S 735-055-N00

(3) Set the bleed valve compression as follows:
(a) Make the initial bleed valve compression adjustment as follows (Fig. 501, View C-C, Initial Compression Adjustment):
1) Remove the pressure from the actuator (0 psig).
2) Turn the piston shaft one turn counterclockwise.
3) Supply 100 psig pressure to the actuator again.
4) Actuate the bleed system to the valve closed (actuator piston shaft forward) position.
5) Measure the adjusted dimension between the piston shaft end and the established reference point on the actuator housing.
6) Record the result as Dimension D.

7) Dimension D should be 0.015 inch (0.381 mm) minimum greater than Dimension B.

(b) If Dimension D is not within the limits, do as follows:
1) Actuate the bleed system to the valve open (actuator piston shaft rearward) position.
2) Remove pressure to the actuator.
3) Turn the piston one more full turn counterclockwise.
4) Supply 100 psig pressure to the actuator again.
5) Actuate the bleed system again to the valve closed (actuator piston shaft forward) position.
6) Measure the adjusted dimension again between the piston shaft end and the established housing reference point.
7) The adjusted Dimension D should be 0.015 inch (0.381 mm) minimum greater than Dimension B.
8) If Dimension D is still not within the limits, do this step again only enough times until Dimension D is within the limits.

(c) Make the final compression adjustment as follows (Fig. 501, View C-C, Final Compression Adjustment):
1) Actuate the bleed system to the valve open (actuator piston shaft rearward) position.
2) Remove pressure to the actuator.
3) Turn the piston shaft 1/4 turn (90 degrees) clockwise.
4) Supply 100 psig pressure to the actuator again.
5) Actuate the bleed system again to the valve closed (actuator piston shaft forward) position.
6) Measure the dimension between the end of the piston shaft to the established reference point on the actuator housing.
7) Record this measurement as Dimension E.
8) Compare Dimension E with Dimension B.
9) Dimension E should be within 0.005 inch (0.127 mm) of Dimension B.

(d) If Dimension E is not within 0.005 inch (0.127 mm) of Dimension B, do as follows:
1) Actuate the bleed system to the valve open (actuator piston shaft rearward) position.
2) Remove pressure to the actuator.
3) Turn the piston another 1/4 turn (90 degree) clockwise.
4) Supply 100 psig pressure to the actuator again.
5) Actuate the bleed system again to the valve closed (actuator piston shaft forward) position.
6) Measure Dimension E again.
7) Dimension E should be within 0.005 inch (0.127 mm) of Dimension B.
8) If Dimension E is still not within the limits, do this step again only enough times wntil Dimension E is within the limits.

(e) Cycle the bleed valve between the open and closed positions to verify that the 2.5 bleed valve assembly can be moved freely.
(f) Remove pressure to the actuator.
(g) Remove power from the pump.

(h) Set the POWER switch on PWA 85842 Electrical Control Box to the OFF position.

S 415-056-N00

(4) Install the shoulder bolt.

(a) Install the (LEFT-HAND THREAD) shoulder bolt to the piston shaft as follows:

1) Apply Engine Oil (P03-001) to the threads on the shoulder bolt.

CAUTION: TO PREVENT LOSS OF ADJUSTMENT OR DAMAGE TO THE SHOULDER BOLT, MAKE SURE YOU HOLD THE ACTUATOR PISTON SHAFT HEX NUT WHEN YOU TORQUE THE SHOULDER BOLT.

2) Hold the piston shaft hex with a wrench and tighten the shoulder bolt (LEFT-HAND THREAD).

3) Tighten the shoulder bolt (LEFT-HAND THREAD) to 50 - 70 pound-inches (5.649 - 7.909 newton-meters).

4) Remove any contamination (oil, fuel, grease, or dirt) from the end of the piston shaft where you must install the cotter pin and sealant.

5) Install a new cotter pin to the piston shaft and shoulder bolt.

NOTE: You can turn the shoulder bolt 30 degrees maximum in either direction to install the cotter pin. This adjustment for the cotter pin will keep the torque on the shoulder bolt satisfactory.

6) Apply Silicone Rubber Sealant (P09-014) to both ends of the cotter pin.

S 845-057-N00

(5) Remove the adjustment equipment as follows:

(a) Disconnect Electrical Control Box connector from the actuator receptacle.

CAUTION: CONNECT THE ENGINE ELECTRICAL CONNECTOR AS SOON AS POSSIBLE. IF YOU DO NOT, CONTAMINATION OF THE CONNECTION CAN OCCUR.

CAUTION: USE THE CORRECT ASSEMBLY PROCEDURE AND TOOLS FOR THE HARNESS CONNECTOR INSTALLATION. IF YOU DO NOT, A DAMAGED OR LOOSE CONNECTOR CAN AFFECT ENGINE OPERATION, LIGHTNING PROTECTION, AND CAUSE AN IN FLIGHT SHUTDOWN.

(b) Connect the self-locking electrical connector (W3P15) to the actuator receptacle as follows:

1) Examine, align, and install the connector.

2) Use the Glenair TG-69 Soft Jawed Pliers or the Gleniar TG-70 Strap Wrench and tighten the connector against the receptacle.
3) While you tighten, push the connector in and from side to side.
4) Make sure you can feel the ratchet feature.
5) Tighten the connector until the pliers or strap wrench slip on the connector ring.

(c) While you hold the adapters with a wrench, disconnect the two hose elbows from the actuator.
(d) While you hold the adapter with a wrench, remove the PWA 29451 Pump Adapter from the aft actuator adapter.
(e) Install the hydraulic pressure tube (CP06) and the hydraulic return tube (CR02) as follows:
1) Apply Antigalling Compound (P06-021) to the nut threads and the backs of the ferrules on both tubes.
2) Connect the hydraulic return tube (CR02) to the forward adapter on the actuator and the (CR04) tee.
3) While you hold the adapter and tee with a wrench, tighten the tube nuts at each end of the tube (CR02) to 200 - 225 pound-inches (22.597 - 25.422 newton-meters).
4) Connect the hydraulic pressure tube (CP06) to the aft adapter on the actuator and to the (CP02) tee.
5) While you hold the adapter and tee with a wrench, tighten the tube nuts at each end of the tube (CP06) to 225 - 250 pound-inches (25.422 - 28.246 newton-meters).
6) Attach lockwire (P05-289) or safety cable (P05-291) and safety cable ferrule (P05-292) to nuts on both ends of each tube (CP06, CR02).

S 425-043-N00

(6) Install the fan exit liner segment (inner).

TASK 75-32-01-825-059-N00

3. Adjustment - 2.5 Bleed Valve Actuator, (Mechanical Method)

A. Equipment

(1) M303, M305, or M307 Bergen Mechanical Crimper
Bergen Cable Technologies Inc
170 Gregg St
P.O. Box 1300
Lodi, NJ 07644-9982

B. Consumable Materials
(1) D00137 Engine Oil - PWA 521, (P03-001)
(2) G02147 Cheesecloth - Unsized GA-100-11
(3) A00482 Sealant, Silicon Rubber - PWA 36003
(4) B00148 Solvent - Methyl Ethyl Ketone (MEK), TT-M-261
(5) D00247 Compound, Antigalling - PWA 586-3
(6) G02334 Lockwire - AS3214-02
(7) G02332 Ferrule - P05-292 (Optional)
(8) G02335 Cable - Safety - P05-291 (Optional)

C. References
(1) AMM 70-24-05/201, Electrical Harnesses
(2) AMM 70-41-03/201, Cotter Pins
(3) AMM 71-00-00/501, Power Plant - General
(4) AMM 71-11-04/201, Fan Cowl Panels
(5) AMM 71-11-06/201, Core Cowl Panels
(6) AMM 78-31-00/201, Thrust Reverser System

D. Access
(1) Location Zones
411 Left Engine
421 Right Engine

(2) Access Panels
413AL Fan Cowl Panel (Left), Left Engine
414AR Fan Cowl Panel (Right), Left Engine
423AL Fan Cowl Panel (Left), Right Engine
424AR Fan Cowl Panel (Right), Right Engine

E. Prepare to Adjust the 2.5 Bleed Valve Actuator (Fig. 501)

S 865-060-N00
(1) For the left engine, open these circuit breakers on the overhead circuit breaker panel P11 and attach DO-NOT-CLOSE tags:
(a) 11L3, L ENG PERF SOL CHAN A
(b) 11L4, L ENG PERF SOL CHAN B

S 865-061-N00
(2) For the right engine, open these circuit breakers on the overhead circuit breaker panel P11 and attach DO-NOT-CLOSE tags:
(a) 11L30, R ENG PERF SOL CHAN A
(b) 11L31, R ENG PERF SOL CHAN B

S 015-062-N00
(3) Open the left fan cowl panel (AMM 71-11-04/201).

S 045-063-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(4) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 015-064-N00

(5) Open the left core cowl panel (AMM 71-11-06/201).

S 015-065-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS INJURY TO PERSONS OR DAMAGE TO EQUIPMENT COULD OCCUR.

(6) Open the left thrust reverser (AMM 78-31-00/201).

F. Procedure

S 825-066-N00

(1) Adjust the actuator for the 2.5 bleed valve:

CAUTION: TURN THE SHOULDER BOLT CLOCKWISE TO LOOSEN. THE SHOULDER BOLT HAS LEFT HAND THREADS. DAMAGE CAN OCCUR TO THE SHOULDER BOLT OR THE ACTUATOR IF THE SHOULDER BOLT IS TURNED IN THE INCORRECT DIRECTION. ALSO, HOLD THE HEXAGONAL HEAD OF THE ACTUATOR PISTON SHAFT WHEN YOU LOOSEN THE SHOULDER BOLT.

CAUTION: MAKE SURE THE CRIMPED LOCKING CUP AND RETAINING NUT DO NOT LOOSEN FROM THE PISTON SHAFT WHEN THE SHOULDER BOLT IS REMOVED. IF THIS OCCURS, DAMAGE TO THE 2.5 BLEED VALVE ACTUATOR OR THE ENGINE CAN OCCUR.

(a) If necessary, remove the cotter pin and the shoulder bolt from the actuator piston shaft.

CAUTION: MAKE SURE THE CRIMPED LOCKING CUP AND THE RETAINING NUT DO NOT LOOSEN FROM THE PISTON SHAFT WHEN THE PISTON HEX HEAD IS TURNED. IF THE RETAINING NUT CHANGES OR LOOSENS, THE INTERNAL ADJUSTMENT OF THE 2.5 BLEED VALVE ACTUATOR CAN CHANGE AND DAMAGE TO THE ACTUATOR OR THE ENGINE CAN OCCUR.

CAUTION: DO NOT USE TOO MUCH FORCE WHEN YOU TURN THE PISTON SHAFT. TOO MUCH FORCE CAN CAUSE INTERNAL DAMAGE TO THE ACTUATOR.

(b) Use a speed handle wrench to turn the piston shaft clockwise until the shaft does not turn.

NOTE: When the piston shaft is turned clockwise, the shaft will extend forward.

(c) Turn the piston shaft counterclockwise four turns.
(d) Lubricate the threads of the shoulder bolt with engine oil.

CAUTION: TURN THE SHOULDER BOLT COUNTERCLOCKWISE TO INSTALL. THE SHOULDER BOLT HAS LEFT HAND THREADS. DAMAGE CAN OCCUR TO THE SHOULDER BOLT OR THE ACTUATOR IF THE SHOULDER BOLT IS TURNED IN THE INCORRECT DIRECTION. ALSO, HOLD THE HEXAGONAL HEAD OF THE ACTUATOR PISTON SHAFT WHEN YOU TIGHTEN THE SHOULDER BOLT.

(e) Install the shoulder bolt to the piston shaft.

NOTE: Hold the hexagonal head of the piston shaft during the installation of the shoulder bolt.

(f) Tighten the shoulder bolt to 50-70 pound-inches (5.6-7.9 newton-meters).

NOTE: The shoulder bolt can be turned up to 30 degrees more to install the cotter pin. After the added turn, the torque can be larger than the limits above.

1) Install the cotter pin.

WARNING: DO NOT GET THE METHYL ETHYL KETONE (MEK) IN YOUR MOUTH, OR EYES, OR ON YOUR SKIN. DO NOT BREATHE THE FUMES FROM THE MEK. PUT ON A PROTECTIVE SPLASH GOGGLE AND GLOVES WHEN YOU USE THE MEK. KEEP THE MEK AWAY FROM SPARKS, FLAME, AND HEAT. MEK IS A POISONOUS AND FLAMMABLE SOLVENT WHICH CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(g) Clean the two ends of the cotter pin on the shoulder bolt with a clean cheesecloth made moist with the solvent.
1) Let the shoulder bolt and the cotter pin dry.

CAUTION: MAKE SURE THERE IS NO SOLVENT ON THE SHOULDER BOLT BEFORE YOU APPLY THE SEALANT. YOU CAN RUB THE SOLVENT DRY OR YOU CAN DRY THE SOLVENT WITH AIR AT AMBIENT TEMPERATURE. IF YOU DO NOT DO THIS, THE SOLVENT CAN CAUSE DAMAGE TO THE SEALANT.

(h) Apply the sealant to the two ends of the cotter pin.
1) Let the sealant become dry.

S 415-067-N00

(2) If removed, install the supply and return tubes with the steps that follow:
(a) Lubricate the threads of the tube nut on the return tube with engine oil.
(b) Install the return tube between the tee on the return manifold and the adapter on the 2.5 bleed valve actuator.
1) Tighten the tube nuts on the return tube to 270-300 pound-inches (30.5-33.9 newton-meters).
2) Safety the tube nuts with lockwire or safety cable and safety cable ferrule.
(c) Lubricate the threads of the tube nuts on the supply tube with antigalling compound.
(d) Install the supply tube between the tee on the supply manifold and the adapter on the 2.5 bleed valve actuator.
1) Tighten the tube nut at the supply manifold to 340-375 pound-inches (38.4-42.4 newton-meters).
2) Tighten the tube nut at the 2.5 bleed valve actuator to 225-250 pound-inches (25.4-28.2 newton-meters).
3) Safety the tube nuts with lockwire or safety cable and safety cable ferrule.
(e) Lubricate the threads of the bolt, which attaches the supply and return tubes together, with engine oil.
(f) Install the clamp, bolt, and nut to attach the supply and return tubes.
1) Tighten the bolt to 36-40 pound-inches (4.1-4.5 newton-meters).

G. Return the Aircraft to Its Usual Condition

S 415-030-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT COULD OCCUR.

(1) Close the left thrust reverser (AMM 78-31-00/201).

S 415-031-N00

(2) Close the left core cowl panel (AMM 71-11-06/201).

S 445-032-N00
(3) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

S 415-033-N00
(4) Close the left fan cowl panel (AMM 71-11-04/201).

S 865-034-N00
(5) For the left engine, remove the DO-NOT-CLOSE tags and close these circuit breakers on the overhead circuit breaker panel P11:
(a) 11L3, L ENG PERF SOL CHAN A
(b) 11L4, L ENG PERF SOL CHAN B

S 865-035-N00
(6) For the right engine, remove the DO-NOT-CLOSE tags and close these circuit breakers on the overhead circuit breaker panel P11:
(a) 11L30, R ENG PERF SOL CHAN A
(b) 11L31, R ENG PERF SOL CHAN B

S 715-036-N00
(7) Do the test of the 2.5 bleed valve actuator that is shown in the Power Plant Reference Table (AMM 71-00-00/501).

2.9 BLEED VALVE - REMOVAL/INSTALLATION

1. General
   A. This procedure gives the instructions to remove and install the left and right 2.9 bleed valves. The differences in the removal and installation instructions between the two 2.9 bleed valves are given in the procedure.
   B. The two 2.9 bleed valves are installed on the aft case of the High Pressure Compressor (HPC) at the 1 o'clock and 10 o'clock positions.
   C. You can get access to the 2.9 bleed valve through the applicable thrust reverser.

TASK 75-32-03-024-001-N00

2. Remove the 2.9 Bleed Valve
   A. References
      (1) AMM 24-22-00/201, Electrical Power - Control
      (2) AMM 71-11-04/201, Fan Cowl Panels
      (3) AMM 71-11-06/201, Core Cowl Panels
      (4) AMM 75-32-06/401, 2.9 Bleed Valve Thermocouple Probe
      (5) AMM 78-31-00/201, Thrust Reverser System
   B. Access
      (1) Location Zones
          411 Left Engine
          421 Right Engine

      (2) Access Panels
          415AL Fan Reverser (Left), Left Engine
          416AR Fan Reverser (Right), Left Engine
          425AL Fan Reverser (Left), Right Engine
          426AR Fan Reverser (Right), Right Engine

   C. Prepare to Remove the 2.9 Bleed Valve (Fig. 401)

      S 864-002-N00
      (1) Remove electrical power (AMM 24-22-00/201).

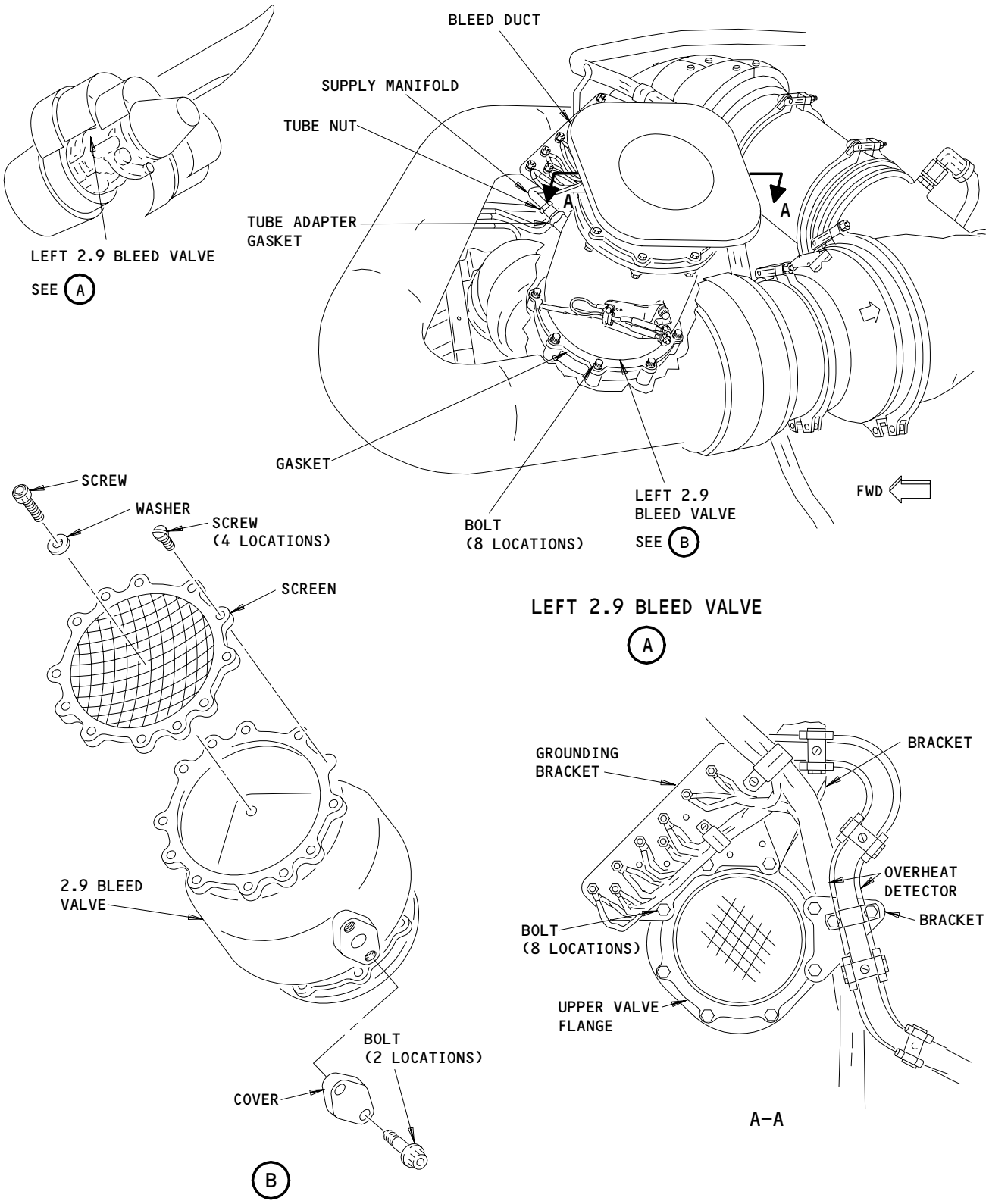
      S 014-003-N00
      (2) Open the fan cowl panels (AMM 71-11-04/201).

      S 044-004-N00

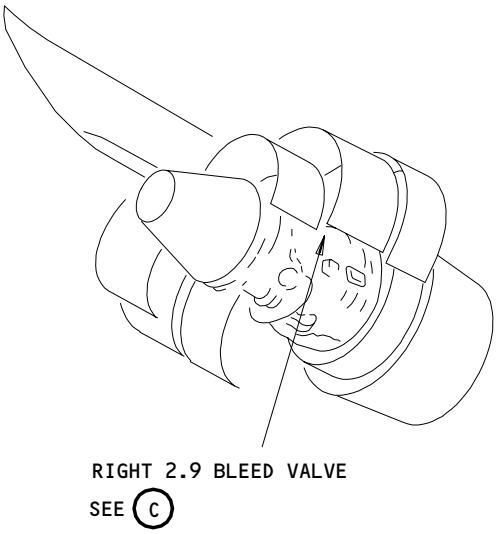
      WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

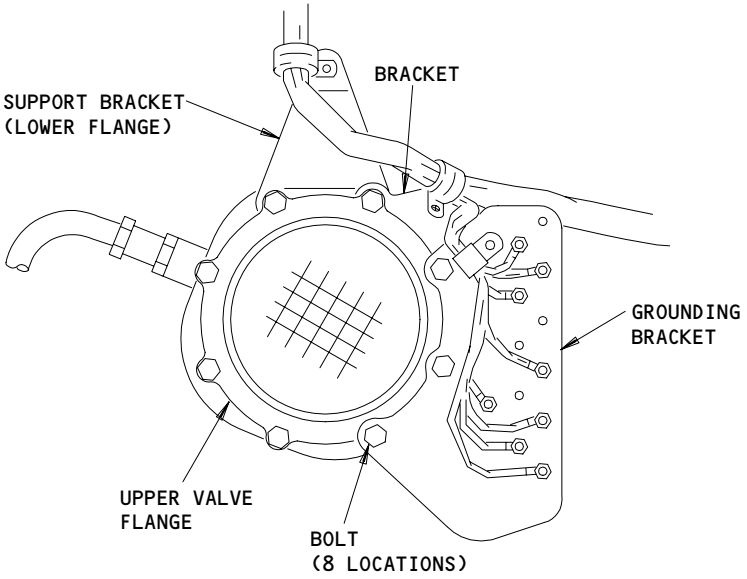
      (3) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

      S 014-005-N00
      (4) Open the core cowl panels (AMM 71-11-06/201).

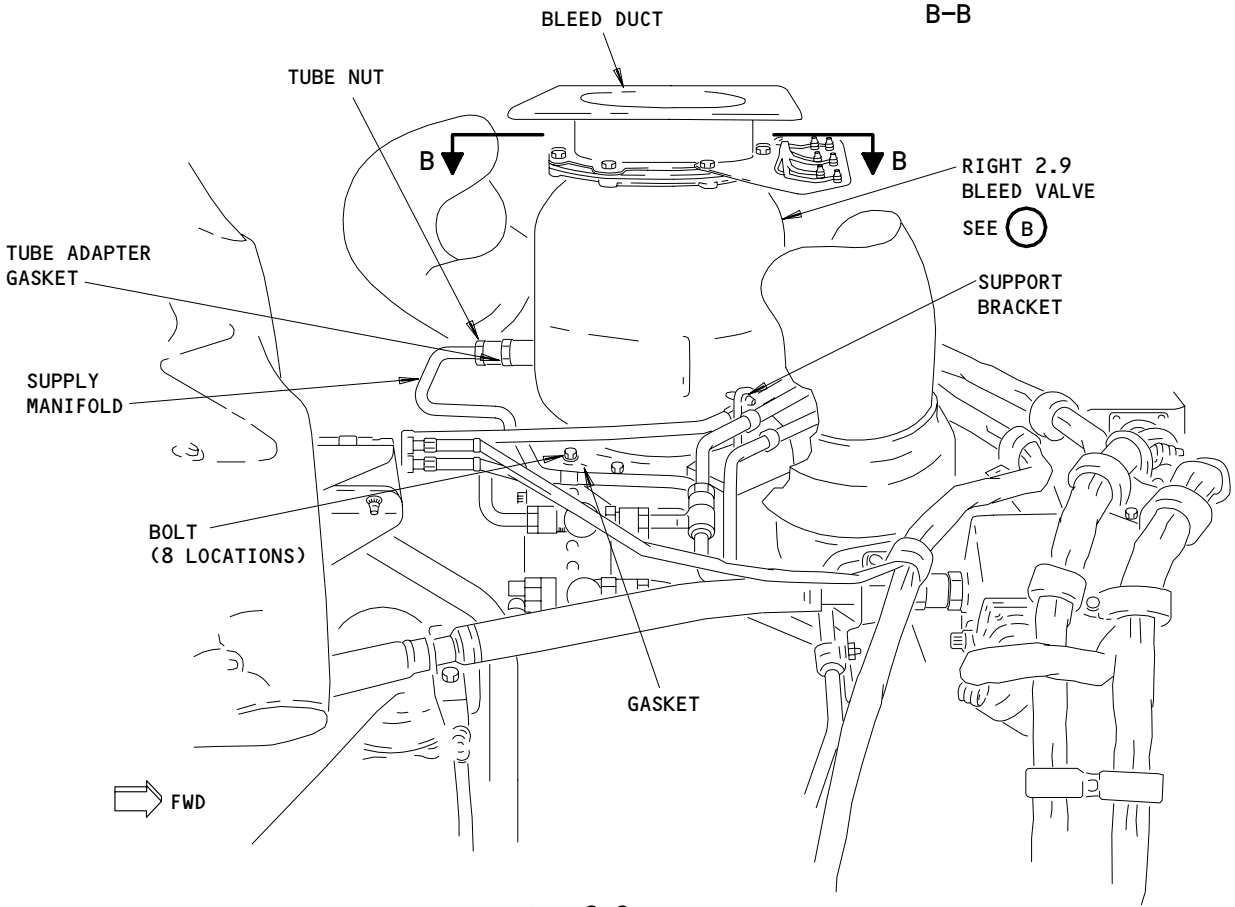


2.9 Bleed Valve Installation
Figure 401 (Sheet 1)





B–B



RIGHT 2.9 BLEED VALVE
C

2.9 Bleed Valve Installation
Figure 401 (Sheet 2)

S 014-006-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT COULD OCCUR.

(5) Open the thrust reversers (AMM 78-31-00/201).

D. Procedure

S 024-042-N00

(1) Remove the 2.9 Bleed Valve (Fig. 401):
  (a) If applicable, remove the thermocouple probe of the 2.9 bleed valve (AMM 75-32-06/401).
  (b) If applicable, remove the bolts and the cover from the boss on the side of the 2.9 bleed valve.
  (c) Disconnect the tube nut of the supply manifold at the 2.9 bleed valve.
  (d) Remove the bolts which attach the grounding bracket and the support brackets to the upper bleed valve flange.
  (e) Remove the remaining bolts which attach the bleed duct to the 2.9 bleed valve.
    1) Remove the bleed duct.
  (f) If necessary, use the PWA 85436 torque adapter and remove the bolts which attach the 2.9 bleed valve and the support brackets to the engine boss.
  (g) Remove the 2.9 bleed valve.
  (h) Remove the gasket from the engine boss.
    1) Discard the gasket.
  (i) Install protective caps on all openings.

S 024-043-N00

(2) If it is necessary to replace the 2.9 bleed valve, do the steps that follow:
  (a) Remove the tube adapter and the gasket from the 2.9 bleed valve.
    1) Discard the gasket.

S 024-044-N00

(3) If necessary, remove the screen for the 2.9 bleed valve with the steps that follow:
(a) Remove the screw from the center of the screen.
(b) Remove the four screws which attach the screen to the flange of the 2.9 bleed valve.
(c) Remove the screen from the 2.9 bleed valve.
(d) Install the protection cover on the opening.

TASK 75-32-03-424-017-N00

3. Install the 2.9 Bleed Valve

A. Equipment
(1) Torque Adapter - PWA 85436, Pratt & Whitney, East Hartford, Conn.
(2) M303, M305, or M307 Bergen Mechanical Crimper
Bergen Cable Technologies Inc
170 Gregg St
P.O. Box 1300
Lodi, NJ 07644-9982

B. Consumable Materials
(1) D00137 Engine Oil - PWA 521

(2) D50124 Paste - Anti-seize - PWA 36246
(3) G02334 Lockwire - AS3214-02
(4) G02332 Ferrule - P05-292 (Optional)
(5) G02335 Cable - Safety - P05-291 (Optional)

C. References
(1) AMM 20-10-21/601, Electrical Bonding
(2) AMM 24-22-00/201, Electrical Power - Control
(3) AMM 70-50-00/201, Standard Torque Values
(4) AMM 71-00-00/501, Power Plant - General
(5) AMM 71-11-04/201, Fan Cowl Panels
(6) AMM 71-11-06/201, Core Cowl Panels
(7) AMM 75-32-06/401, 2.9 Bleed Valve Thermocouple Probe
(8) AMM 78-31-00/201, Thrust Reverser System

D. Access
(1) Location Zones
411 Left Engine
421 Right Engine

(2) Access Panels
415AL Fan Reverser (Left), Left Engine
416AR Fan Reverser (Right), Left Engine
425AL Fan Reverser (Left), Right Engine
426AR Fan Reverser (Right), Right Engine

E. Prepare to Install the 2.9 Bleed Valve (Fig. 401)

S 424-045-N00
(1) Remove the protective caps.

S 424-046-N00

(2) If necessary, install the screen for the 2.9 bleed valve with the steps that follow:
   (a) Install the screen on the 2.9 bleed valve with the four screws.
      1) Tighten the screws to 32-36 pound-inches (3.6-4.1 newton-meters).
   (b) Attach the screen to the housing of the 2.9 bleed valve through the center of the screen with a screw and washer.
      1) Tighten the screw to 25-30 pound-inches (2.8-3.4 newton-meters).

S 424-047-N00

(3) If it is necessary to replace the 2.9 bleed valve, do the steps that follow:
   (a) Install the gasket on the tube adapter.
   (b) Lubricate the threads of the tube adapter with engine oil.
   (c) Install the tube adapter in the port on the 2.9 bleed valve.
      1) Tighten the tube adapter to 110-120 pound-inches (12.4-13.6 newton-meters).

F. Procedure

S 424-048-N00

(1) Install the 2.9 bleed valve:
   (a) Install the new gasket in the groove of the engine boss.
   (b) While you put the 2.9 bleed valve on the engine boss, correctly align the tube adapter with the tube nut of the supply manifold.
   (c) For the right 2.9 bleed valve, put the support brackets over the lower valve flange.
      1) Align the bolt holes.
   (d) Lubricate the threads of the bolts which attach the 2.9 bleed valve with engine oil.
   (e) Attach the 2.9 bleed valve and the support brackets to the engine boss with the bolts.

      CAUTION: THE TORQUE ON THE BOLTS IS LARGER THAN INDICATED BY THE TORQUE WRENCH WHEN YOU USE THE TORQUE ADAPTER. IT IS NECESSARY TO CORRECT THE INDICATED TORQUE FOR THE EFFECT OF THE TORQUE ADAPTER OR DAMAGE TO THE ENGINE CAN OCCUR. REFER TO THE STANDARD PRACTICES (AMM 70-50-00/201).

      1) Use the PWA 85436 torque adapter and tighten the bolts to 85-95 pound-inches (9.6-10.7 newton-meters).

2) Without loosening, tighten the bolts again until the torque is kept.

(f) Lubricate the tube nut of the supply manifold with anti-seize paste.

(g) Connect the tube nut to the adapter on the 2.9 bleed valve.
1) Tighten the tube nut to 200-225 pound-inches (22.6-25.4 newton-meters).
2) Safety the tube nut with lockwire or safety cable and safety cable ferrule.

CAUTION: DO NOT INTERCHANGE THE LEFT AND RIGHT 2.9 BLEED DUCTS. THE ENGINE COWL WILL NOT CLOSE IF THE LEFT DUCT IS ATTACHED TO THE RIGHT VALVE. NO SEAL WILL OCCUR BETWEEN THE DUCT AND COWL IF THE RIGHT DUCT IS ATTACHED TO THE LEFT VALVE.

(h) Attach the bleed duct, grounding bracket and support brackets at the upper valve flange with the bolts, washers and nuts.

(i) Make sure the resistance of the bond between the grounding bracket and the 2.9 bleed valve is not more than 0.005 ohms (AMM 20-10-21/601).

(j) If applicable, install the 2.9 bleed valve thermocouple probe (AMM 75-32-06/401).

(k) If applicable, install the cover to the boss on the 2.9 bleed valve with the steps that follow:
1) Lubricate the threads of the bolts, which attach the cover, with engine oil.
2) Install the cover to the boss on the side of the 2.9 bleed valve with the bolts.
a) Tighten the bolts to 85-95 pound-inches (9.6-10.7 newton-meters).

G. Return the Aircraft to Its Usual Condition

S 414-032-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT COULD OCCUR.

(1) Close the thrust reversers (AMM 78-31-00/201).

S 414-033-N00

(2) Close the core cowl panels (AMM 71-11-06/201).

S 414-034-N00
(3) Close the fan cowl panels (AMM 71-11-04/201).

S 444-035-N00
(4) Do the activation procedure for the thrust reversers (AMM 78-31-00/201).

S 714-036-N00
(5) Do the test of the 2.9 Bleed Valve that is shown in the Power Plant Reference Table (AMM 71-00-00/501).

2.9 BLEED VALVE SOLENOID - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks. One task is to remove the 2.9 bleed valve solenoid. The other task is to install the 2.9 bleed valve solenoid.
   B. The 2.9 bleed valve solenoid is installed on the aft face of the intermediate case at the 5 o'clock position.
   C. You can get access to the 2.9 bleed valve solenoid through the right thrust reverser.

TASK 75-32-04-004-001-N00

2. Remove the 2.9 Bleed Valve Solenoid
   A. References
      (1) AMM 71-11-04/201, Fan Cowl Panels
      (2) AMM 71-11-06/201, Core Cowl Panels
      (3) AMM 72-34-03/401, Fan Exit Liner Segment
      (4) AMM 78-31-00/201, Thrust Reverser System
   B. Access
      (1) Location Zones
          411 Left Engine
          421 Right Engine

      (2) Access Panels
          414AR Fan Cowl Panel (Right), Left Engine
          416AR Fan Reverser (Right), Left Engine
          424AR Fan Cowl Panel (Right), Right Engine
          426AR Fan Reverser (Right), Right Engine

   C. Prepare to Remove 2.9 Bleed Valve Solenoid

      S 864-002-N00
      (1) For the left engine, open these cirucit breakers on the overhead circuit breaker panel, P11, and attach DO-NOT-CLOSE tags:
          (a) 11L3, L ENG PERF SOL CHAN A
          (b) 11L4, L ENG PERF SOL CHAN B

      S 864-003-N00
      (2) For the right engine, open these circuit breakers on the overhead circuit breaker panel, P11, and attach DO-NOT-CLOSE tags:
          (a) 11L30, R ENG PERF SOL CHAN A
          (b) 11L31, R ENG PERF SOL CHAN B

      S 014-004-N00
      (3) Open the right fan cowl panel (AMM 71-11-04/201).

S 044-005-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(4) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 014-006-N00

(5) Open the right core cowl panel (AMM 71-11-06/201).

S 014-007-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(6) Open the right thrust reverser (AMM 78-31-00/201).

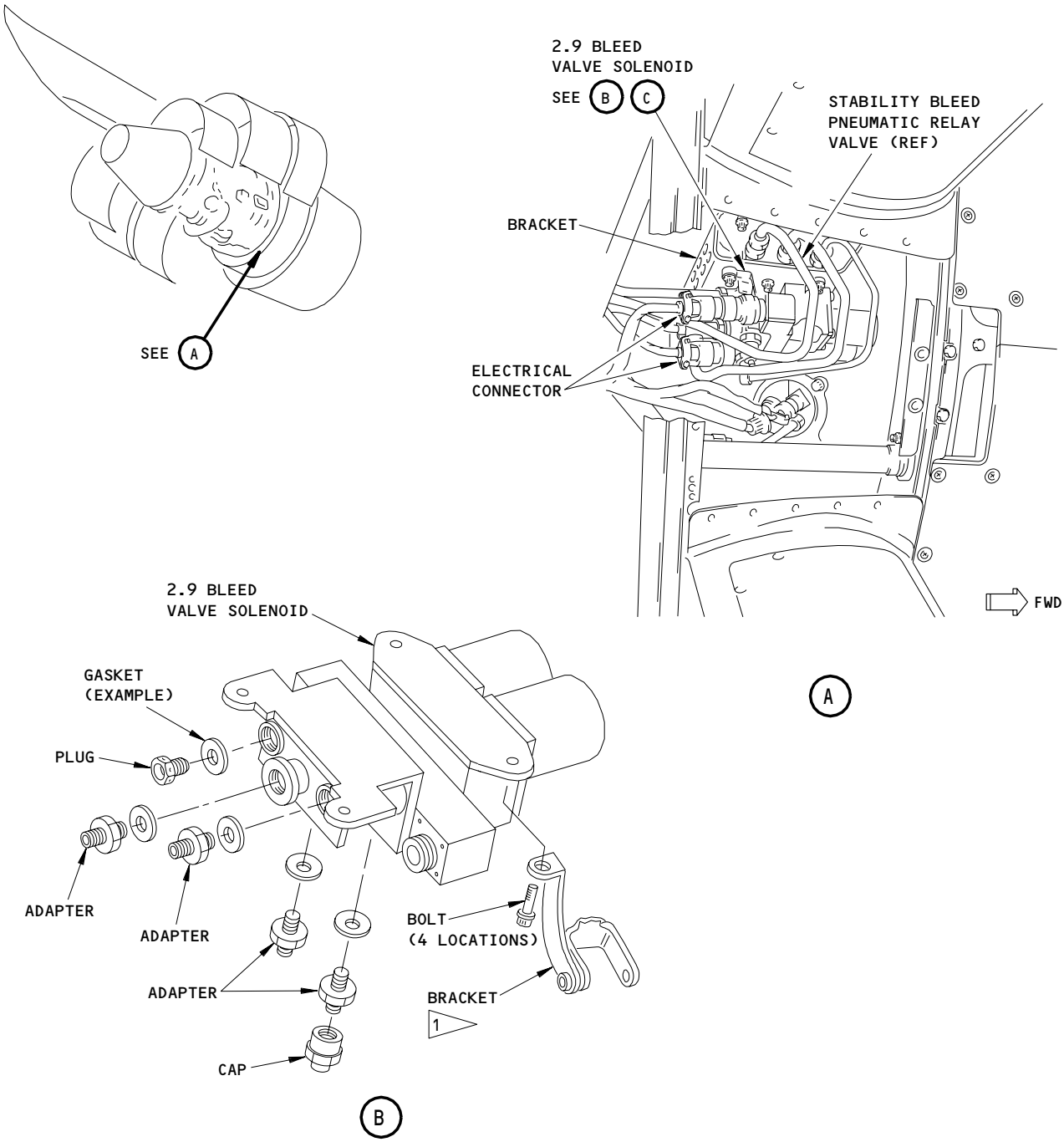
D. Procedure (Fig. 401)

S 024-053-N00

(1) Remove the fan exit liner segment at the 5 o'clock position (AMM 72-34-03/401).

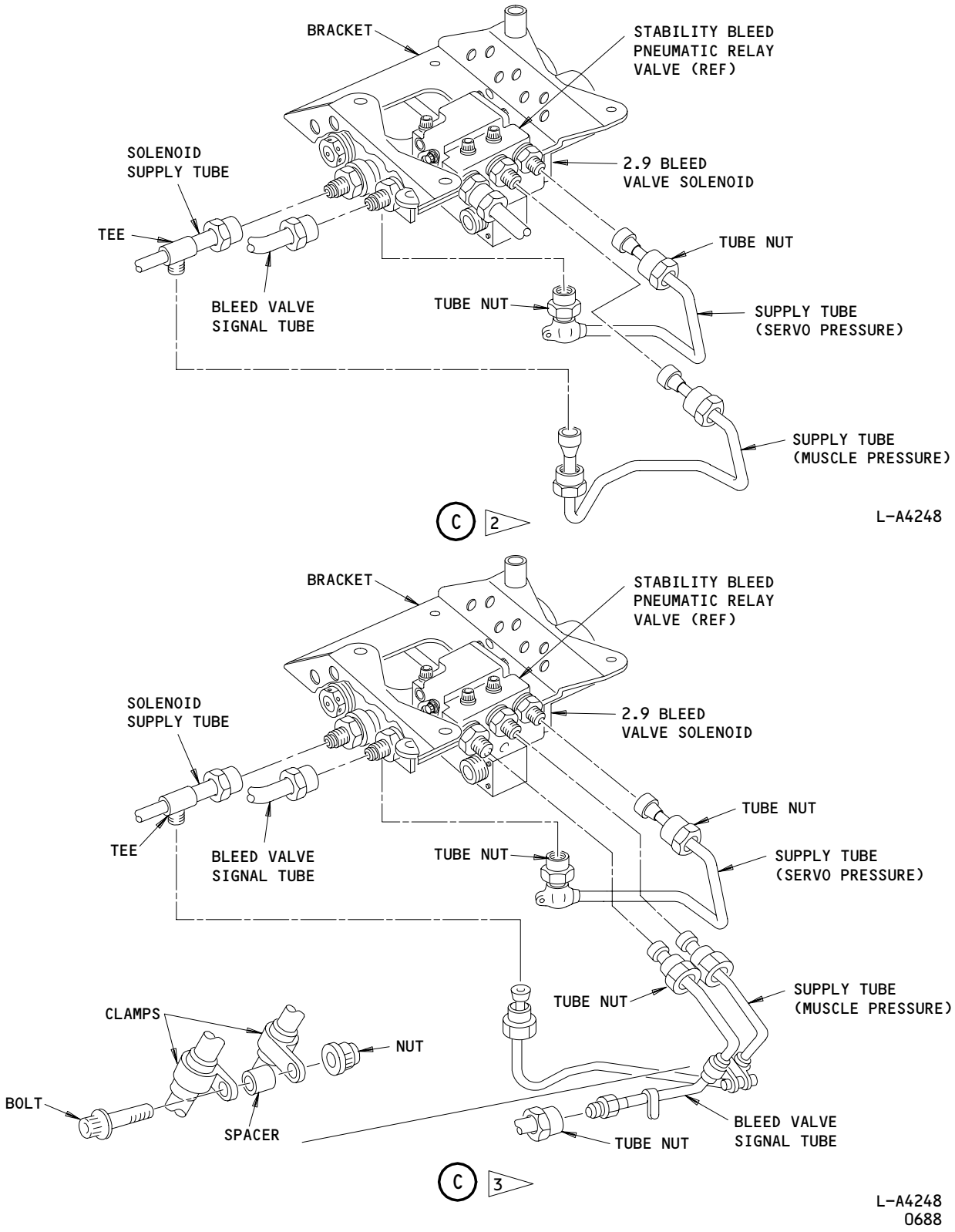
S 024-054-N00

(2) Remove the 2.9 Bleed Valve Solenoid.
  (a) Disconnect the electrical connectors from the 2.9 bleed valve solenoid.
  (b) ENGINES POST-PW-SB 75-28;
  Remove the supply tube with the steps that follow:
    1) Disconnect the supply tube at the maintenance break and at the aft port of the pneumatic relay valve for the stability bleed.
    2) ENGINES PRE-PW-SB 75-41;
    Remove the bolt, spacer, and nut from the clamps for the supply tube.
    3) ENGINES POST-PW-SB 75-41;
    Remove the bolt and nut from the clamp which holds the bracket and supply tubes together.
    4) Move the supply tubes clear of the 2.9 bleed valve solenoid.
  (c) ENGINES PRE-PW-SB 75-28;
  Do the steps that follow:
    1) Disconnect the supply tube (muscle pressure) from the tube tee and from the middle inlet port of the pneumatic relay valve.

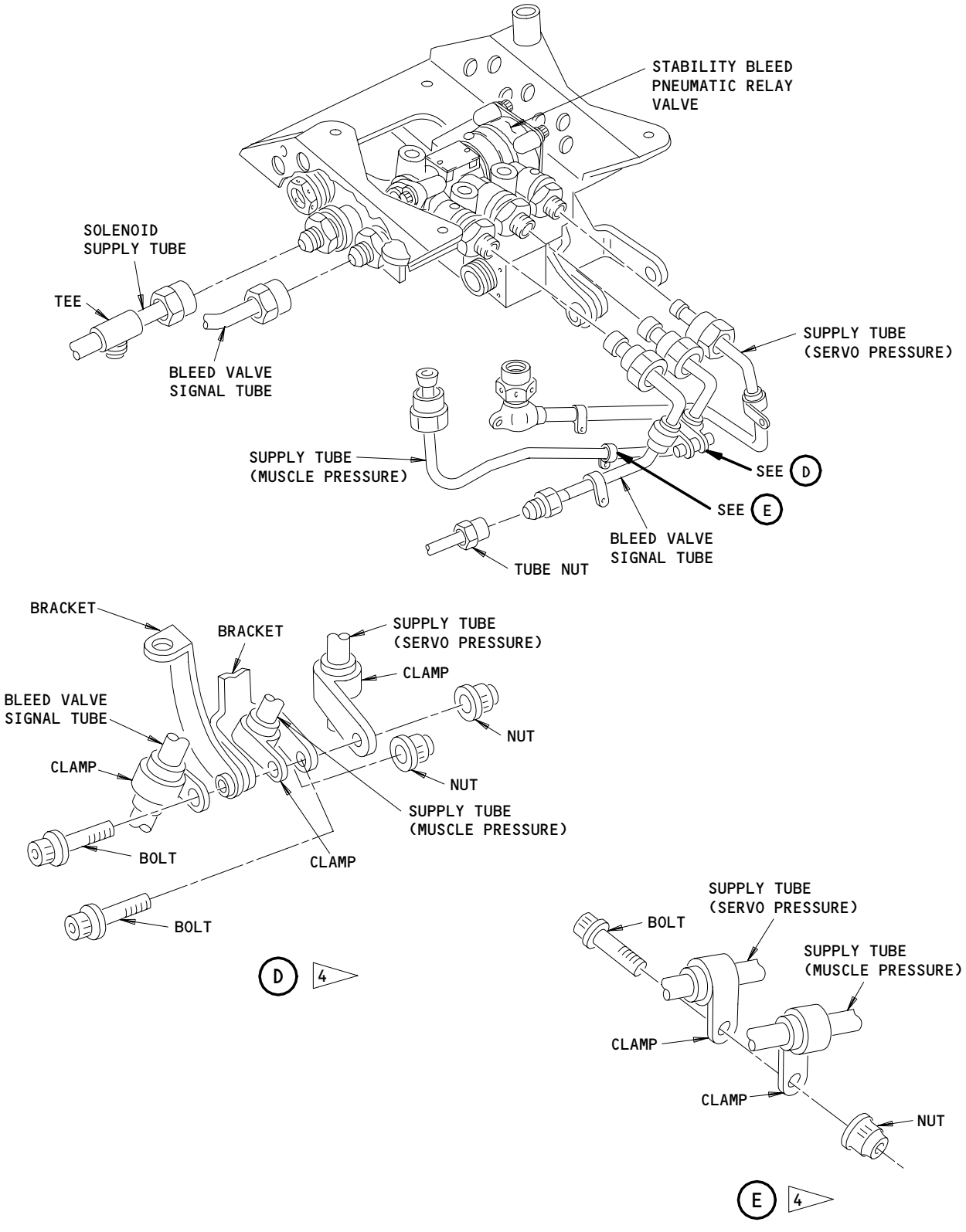


1 ENGINES POST-PW-SB 75-41
2 ENGINES PRE-PW-SB 75-28 AND PRE-PW-SB 75-41
3 ENGINES POST-PW-SB 75-28 AND PRE-PW-SB 75-41
4 ENGINES POST-PW-SB 75-28 AND POST-PW-SB 75-41

2.9 Bleed Valve Solenoid Installation
Figure 401 (Sheet 1)



2.9 Bleed Valve Solenoid Installation
Figure 401 (Sheet 2)



2.9 Bleed Valve Solenoid Installation
Figure 401 (Sheet 3)

2) Remove the supply tube.
3) Install the protection caps.

(d) Disconnect the supply tube (servo pressure) from the 2.9 bleed valve solenoid and from the servo front port of the pneumatic relay valve.

(e) ENGINES POST-PW-SB 75-41;
Remove the bolt and the nut from the clamps on the supply tube.

(f) Remove the supply tube (servo pressure).
1) Install the protection caps.

(g) Disconnect the solenoid supply tube and the bleed valve signal tube from the rear face of the 2.9 bleed valve solenoid.

(h) ENGINES PRE-PW-SB 75-41;
Remove the bolts which attach the 2.9 bleed valve solenoid to the mounting bracket on the intermediate case.

(i) ENGINES POST-PW-SB 75-41;
Remove the bolts and the bracket which attach the 2.9 bleed valve solenoid to the mounting bracket on the intermediate case.

(j) Remove the 2.9 bleed valve solenoid.

S 024-060-N00

(3) If necessary, remove the four bolts that attach the mounting bracket to the intermediate case.
(a) Remove the mounting bracket.

S 024-055-N00

(4) If it is necessary to replace the 2.9 bleed valve solenoid, do the steps that follow:
(a) Remove the tube adapters and the plug from the rear of the 2.9 bleed valve solenoid.
1) Discard the gaskets.

(b) Remove the cap from the adapter, which is not used, on the bottom of the 2.9 bleed valve solenoid.

(c) Remove the adapters from the bottom of the 2.9 bleed valve solenoid.
1) Discard the gaskets.

(d) Install the protection caps to all the openings on the 2.9 bleed valve solenoid.

TASK 75-32-04-404-023-N00

3. Install the 2.9 Bleed Valve Solenoid

NOTE: Make sure to use the correct part number when you replace the 2.9 bleed valve solenoid. The interchangeable 2.9 bleed valve solenoid has an effect on the W4 wiring harness connector. Refer to the PW Illustrated Parts Catalog or the PW SB 73-70 for the correct selection of the 2.9 bleed valve solenoid.

A. Equipment
(1) M303, M305, or M307 Bergen Mechanical Crimper
Bergen Cable Technologies Inc
170 Gregg St
P.O. Box 1300
Lodi, NJ 07644-9982

B. Consumable Materials
(1) D00137 Engine Oil - PWA 521
(2) D50124 Paste - Anti-seize - PWA 36246
(3) G02334 Lockwire - AS3214-02
(4) G02332 Ferrule - P05-292 (Optional)
(5) G02335 Cable - Safety - P05-291 (Optional)

C. References
(1) AMM 70-24-05/201, Electrical Harnesses
(2) AMM 71-00-00/501, Power Plant
(3) AMM 71-11-04/201, Fan Cowl Panels
(4) AMM 71-11-06/201, Core Cowl Panels
(5) AMM 72-34-03/401, Fan Exit Liner Segment
(6) AMM 78-31-00/201, Thrust Reverser System

D. Access
(1) Location Zones
411 Left Engine
421 Right Engine

(2) Access Panels
414AR Fan Cowl Panel (Right), Left Engine
416AR Fan Reverser (Right), Left Engine
424AR Fan Cowl Panel (Right), Right Engine
426AR Fan Reverser (Right), Right Engine

E. Prepare to Install the 2.9 Bleed Valve Solenoid (Fig. 401)

S 424-056-N00
(1) If it is necessary to install a new 2.9 bleed valve solenoid, do the steps that follow:
(a) Remove the protection caps from all the openings on the 2.9 bleed valve solenoid.

(b) Install the adapters and the cap to the bottom of the 2.9 bleed valve solenoid with the steps that follow:
1) Install the gaskets to the adapters.
2) Lubricate the threads of the adapters with engine oil.
3) Install the adapters into the 2.9 bleed valve solenoid.
a) Tighten the adapters to 65-75 pound-inches (7.3-8.5 newton-meters).
4) Lubricate the threads of the cap with engine oil.
5) Install the cap on the outboard adapter.
a) Tighten the cap to 90-100 pound-inches (10.2-11.3 newton-meters).

(c) Install the adapters for the supply tube and the plug to the rear of the 2.9 bleed valve solenoid with the steps that follow:
1) Install the gaskets to the adapters and the plug.
2) Lubricate the threads of the adapters with engine oil.
3) Install the adapters on the rear of the 2.9 bleed valve solenoid with the larger adapter in the middle port.
4) Tighten the smaller adapter to 110-120 pound-inches (12.4-13.6 newton-meters).
5) Tighten the larger adapter to 150-170 pound-inches (16.9-19.2 newton-meters).
6) Install the plug into the rear of the 2.9 bleed valve solenoid.
a) Tighten the plug to 110-120 pound-inches (12.4-13.6 newton-meters).

S 424-057-N00

(2) If necessary, install the mounting bracket with the steps that follow:
(a) Lubricate the threads of the bolts, which attach the mounting bracket, with engine oil.
(b) Attach the mounting bracket on the intermediate case at approximately the 5 o'clock position.
1) Tighten the bolts to 85-95 pound-inches (9.6-10.7 newton-meters).

F. Procedure

S 424-058-N00

(1) Install the 2.9 bleed valve solenoid:

(a) Lubricate the threads of the bolts with engine oil.

(b) ENGINES PRE-PW-SB 75-41;
Attach the 2.9 bleed valve solenoid to the mounting bracket with the bolts.

NOTE: Make sure the electrical connectors point to the rear.

(c) ENGINES POST-PW-SB 75-41;
Attach the 2.9 bleed valve solenoid and the clamp bracket to the mounting bracket with the bolts.

NOTE: Make sure the electrical connectors point to the rear.

1) Tighten the bolts to 85-95 pound-inches (9.6-10.7 newton-meters).

NOTE: ENGINES POST-PW-SB 75-41;
You must align the bolt holes for the clamp bracket. Loosen and tighten the bolts again, if it is necessary.

(d) Lubricate the tube nut of the solenoid supply tube with anti-seize paste.

(e) Install the solenoid supply tube to the middle adapter on the rear face of the 2.9 bleed valve solenoid.
1) Tighten the tube nut to 225-250 pound-inches (25.4-28.2 newton-meters).

(f) Lubricate the tube nut for the bleed valve signal tube with anti-seize paste.

(g) Install the bleed valve signal tube to the outboard tube adapter on the rear face of the 2.9 bleed valve solenoid.
1) Tighten the tube nut to 200-225 pound-inches (22.6-25.4 newton-meters).

(h) Safety the two tube nuts and the plug on the rear face of the 2.9 bleed valve solenoid with lockwire or safety cable and safety cable ferrule.

(i) Install the supply tube (servo pressure) with the steps that follow:
1) Lubricate the tube nut on the elbow end of the supply tube with engine oil.
2) Attach the supply tube to the adapter at the bottom of the 2.9 bleed valve solenoid.
3) Lubricate the tube nut on the straight end of the supply tube with anti-seize paste.
4) Attach the tube nut to the servo front port of the pneumatic relay valve for the stability bleed.

5) ENGINES PRE-PW-SB 75-41;
Do the steps that follow:
a) Tighten the tube nut on the straight end to 65-75 pound-inches (7.3-8.5 newton-meters).
b) Tighten the tube nut on the bottom to 90-100 pound-inches (10.2-11.3 newton-meters).
c) Safety the two tube nuts with lockwire or safety cable and safety cable ferrule.
6) ENGINES POST-PW-SB 75-41;
Do not tighten the tube nuts at this time.

(j) Install the supply tube (muscle pressure) with the steps that follow:
1) Lubricate the tube nuts with anti-seize paste.
2) Attach the supply tube to the tube tee and the middle port on the pneumatic relay valve.
3) ENGINES PRE-PW-SB 75-41;
Do the steps that follow:
a) Tighten the tube nuts to 200-225 pound-inches (22.6-25.4 newton-meters).
b) Safety the tube nuts with lockwire or safety cable and safety cable ferrule.
4) ENGINES POST-PW-SB 75-41;
Do not tighten the tube nuts at this time.

(k) Install the bleed valve signal tube with the steps that follow:
1) Lubricate the threads of the tube nuts with anti-seize paste.
2) Attach the bleed valve signal tube to the maintenance break and to the aft port on the pneumatic relay valve.
3) ENGINES PRE-PW-SB 75-41;
Do the steps that follow:
a) Lubricate the threads of the bolt, which attaches the clamps between the tubes, with engine oil.
b) Install the bolt, spacer and nut to the clamps.
c) Tighten the bolt to 36-40 pound-inches (4.1-4.5 newton-meters).
d) Tighten the tube nut at the maintenance break to 200-225 pound-inches (22.6-25.4 newton-meters).
e) Tighten the tube nut at the aft port to 225-250 pound-inches (25.4-28.2 newton-meters).
f) Safety the tube nuts with lockwire or safety cable and safety cable ferrule.
4) ENGINES POST-PW-SB 75-41;
Do the steps that follow:
a) Lubricate the threads of the bolts, which attach the clamps, with engine oil.
b) Install the clamps, which attach the supply tubes for the servo and muscle pressure, with the bolts.
c) Tighten the bolts to 36-40 pound-inches (4.1-4.5 newton-meters).
5) ENGINES POST-PW-SB 75-41;
Tighten all of the tube nuts with the steps that follow:

a) Tighten the tube nut of the supply tube (servo pressure) on the straight end to 65-75 pound-inches (7.3-8.5 newton-meters).
b) Tighten the tube nut of the supply tube (servo pressure) on the bottom of the 2.9 bleed valve solenoid to 90-100 pound-inches (10.2-11.3 newton-meters).
c) Tighten the tube nuts of the supply tube (muscle pressure) to 200-225 pound-inches (22.6-25.4 newton-meters).
d) Tighten the tube nut of the bleed valve signal tube at the maintenance break to 200-225 pound-inches (22.6-25.4 newton-meters).
e) Tighten the tube nut of the bleed valve signal tube at the aft port on the side to 225-250 pound-inches (25.4-28.2 newton-meters).

6) Safety all tube nuts with lockwire or safety cable and safety cable ferrule.

CAUTION: USE THE CORRECT ASSEMBLY PROCEDURE, AND TOOLS, FOR THE HARNESS CONNECTOR INSTALLATION (AMM 70-24-05/201). IF YOU USE THE INCORRECT ASSEMBLY PROCEDURE, OR TOOLS, A DAMAGED OR LOOSE CONNECTOR CAN OCCUR. A LOOSE CONNECTOR PERMITS VIBRATION, WHICH CAUSES THE CONTACTS TO WEAR AND DECREASES THE LIGHTNING PROTECTION.

(l) Connect the electrical connectors to the solenoid for the 2.9 bleed valve (AMM 70-24-05/201).

S 424-059-N00

(2) Install the fan exit liner segment at the 5 o'clock position (AMM 72-34-03/401).

G. Return the Aircraft to Its Usual Condition

S 414-039-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT COULD OCCUR.

(1) Close the right thrust reverser (AMM 78-31-00/201).

S 414-040-N00

(2) Close the right core cowl panel (AMM 71-11-06/201).

S 414-041-N00

(3) Close the right fan cowl panel (AMM 71-11-04/201).

S 444-042-N00

(4) Do the activation procedure for the thrust reversers (AMM 78-31-00/201).

S 864-043-N00

(5) For the left engine, remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:
(a) 11L3, L ENG PERF SOL CHAN A
(b) 11L4, L ENG PERF SOL CHAN B

S 864-044-N00

(6) For the right engine, remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:
(a) 11L30, R ENG PERF SOL CHAN A
(b) 11L31, R ENG PERF SOL CHAN B

S 714-045-N00

(7) Do the test of the 2.9 bleed valve solenoid that is shown in the Power Plant Reference Table (AMM 71-00-00/501).

STABILITY BLEED PNEUMATIC RELAY VALVE - REMOVAL/INSTALLATION

1. General
   A. This procedure gives the instructions to remove and install the stability bleed pneumatic relay valve.
   B. The stability bleed pneumatic relay valve is referred to as the relay valve in this procedure.
   C. The relay valve is installed on the aft face of the intermediate case at the 5 o'clock position.
   D. You can get access to the relay valve through the right thrust reverser.

TASK 75-32-05-004-001-N00

2. Remove the Stability Bleed Pneumatic Relay Valve
   A. References
      (1) AMM 71-11-04/201, Fan Cowl Panels
      (2) AMM 71-11-06/201, Core Cowl Panels
      (3) AMM 72-34-03/401, Fan Exit Liner Segments
      (4) AMM 75-32-04/401, 2.9 Bleed Valve Solenoid
      (5) AMM 78-31-00/201, Thrust Reverser System
   B. Access
      (1) Location Zones
          411 Left Engine
          421 Right Engine

      (2) Access Panels
          413AR Fan Cowl Panel (Right), Left Engine
          415AR Fan Reverser (Right), Left Engine
          423AR Fan Cowl Panel (Right), Right Engine
          425AR Fan Reverser (Right), Right Engine

   C. Prepare to Remove the Stability Bleed Pneumatic Relay Valve

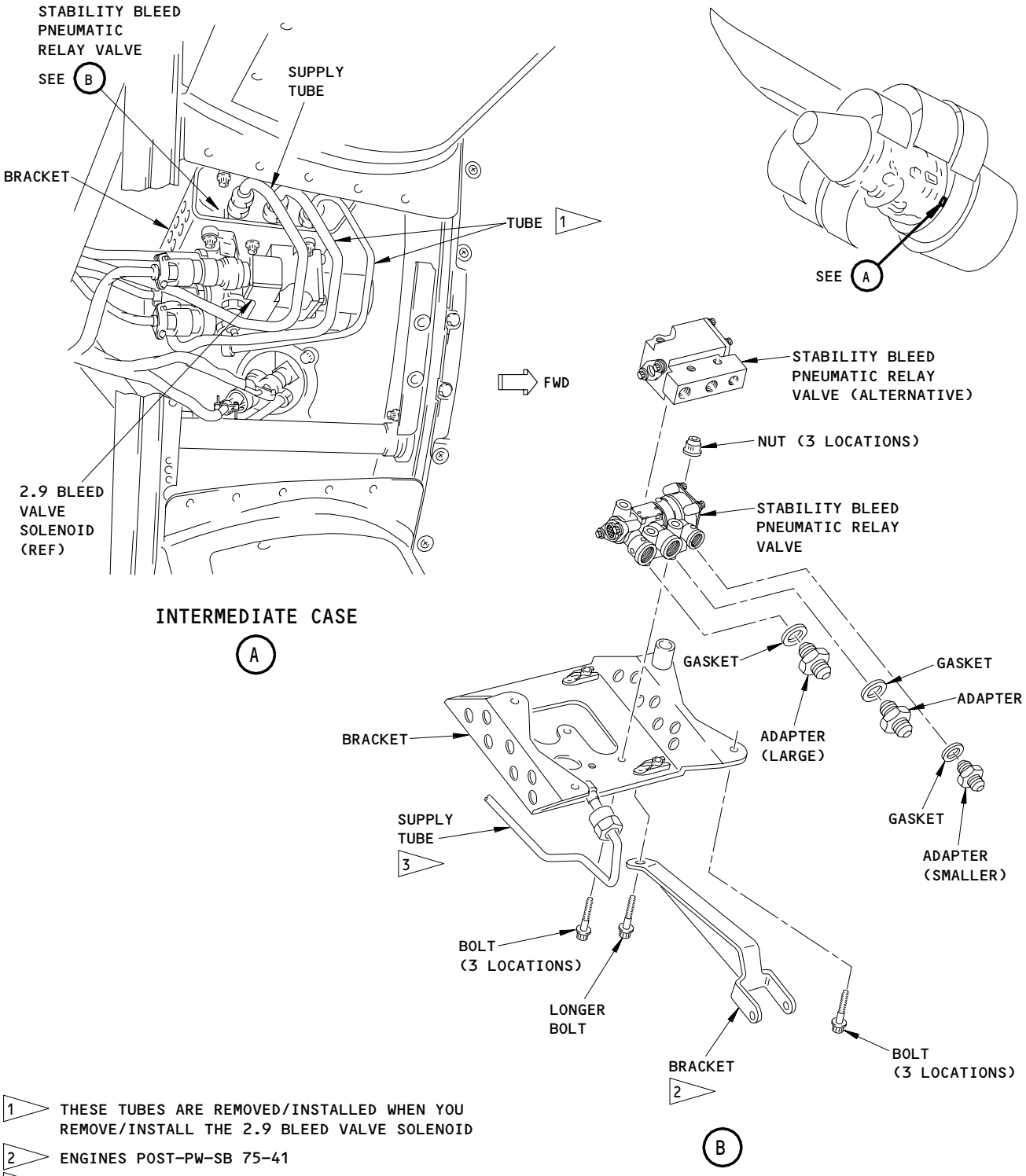
      S 014-002-N00
      (1) Open the right fan cowl panel (AMM 71-11-04/201).

      S 044-003-N00

      WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

      (2) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

      S 014-004-N00
      (3) Open the right core cowl panel (AMM 71-11-06/201).



1 THESE TUBES ARE REMOVED/INSTALLED WHEN YOU REMOVE/INSTALL THE 2.9 BLEED VALVE SOLENOID

2 ENGINES POST-PW-SB 75-41

3 ENGINES PRE-PW-SB 75-28

Stability Bleed Pneumatic Relay Valve Installation
Figure 401

S 014-005-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT COULD OCCUR.

(4) Open the right thrust reverser (AMM 78-31-00/201).

D. Procedure (Fig. 401)

S 014-035-N00

(1) Remove the fan exit liner segment from the 5 o'clock position (AMM 72-34-03/401).

S 014-036-N00

(2) Remove the 2.9 bleed valve solenoid (AMM 75-32-04/401).

S 024-037-N00

(3) Remove the stability bleed pneumatic relay valve.
   (a) ENGINES PRE-PW-SB 75-28;
   Disconnect the supply tube from the adapter on the relay valve.
   (b) ENGINES PRE-PW-SB 75-41;
   Remove the bolts which attach the bracket for the relay valve to the intermediate case.
   (c) ENGINES POST-PW-SB 75-41;
   Remove the bolts and the bracket which attach the bracket and the relay valve to the intermediate case.
   (d) Remove the bracket with the relay valve attached to it.
   (e) Remove the bolts which attach the relay valve to the bracket.
   (f) Remove the relay valve from the bracket.

S 024-038-N00

(4) If it is necessary to install a new relay valve, remove the adapters with the gaskets.

S 024-039-N00

(5) Install the protection caps.

TASK 75-32-05-404-016-N00

3. Install the Stability Bleed Pneumatic Relay Valve

A. Consumable Materials
   (1) D00137 Engine Oil - PWA 521
   (2) D00247 Antigalling Compound - PWA 586

B. References
   (1) AMM 71-11-04/201, Fan Cowl Panels
   (2) AMM 71-11-06/201, Core Cowl Panels
   (3) AMM 72-34-03/401, Fan Exit Liner Segments
   (4) AMM 75-32-04/401, 2.9 Bleed Valve Solenoid
   (5) AMM 78-31-00/201, Thrust Reverser System

C. Access
   (1) Location Zones
       411 Left Engine
       421 Right Engine

   (2) Access Panels
       413AR Fan Cowl Panel (Right), Left Engine
       415AR Fan Reverser (Right), Left Engine
       423AR Fan Cowl Panel (Right), Right Engine
       425AR Fan Reverser (Right), Right Engine

D. Prepare to Install the Stability Bleed Pneumatic Relay Valve (Fig. 401)

   S 424-040-N00
   (1) Remove the protection caps.

   S 424-041-N00
   (2) If it is necessary to install a new relay valve, install the adapters with the steps that follow:
       (a) Install the gaskets to the adapters.
       (b) Lubricate the threads of the adapters with engine oil.
       (c) Install the adapters to the relay valve.
       (d) Tighten the forward adapter to 65-75 pound-inches (7.3-8.5 newton-meters).
       (e) Tighten the middle adapter to 110-120 pound-inches (12.4-13.6 newton-meters).
       (f) Tighten the aft adapter to 150-170 pound-inches (16.9-19.2 newton-meters).

E. Procedure

S 424-042-N00

(1) Install the stability bleed pneumatic relay valve.
  (a) Lubricate the threads of the bolts, which attach the relay valve to the bracket, with engine oil.
  (b) Install the relay valve to the bracket with the bolts and nuts.
    1) Tighten the bolts to 85-95 pound-inches (9.6-10.7 newton-meters).
  (c) Lubricate the threads of the bolts, which attach the relay valve and the bracket, with engine oil.
  (d) ENGINES PRE-PW-SB 75-41;
  Do the steps that follow:
    1) Install the relay valve and the bracket to the intermediate case with the bolts.
      a) Tighten the bolts to 85-95 pound-inches (9.6-10.7 newton-meters).
  (e) ENGINES POST-PW-SB 75-41;
  Do the steps that follow:
    1) Install the relay valve and the bracket to the intermediate case with the bolts and the bracket.
      a) Tighten the bolts to 85-95 pound-inches (9.6-10.7 newton-meters).
  (f) ENGINES PRE-PW-SB 75-28;
  Do the steps that follow:
    1) Lubricate the threads of the tube nut for the supply tube with the antigalling compound.
    2) Connect the tube nut for the supply tube to the relay valve.
      a) Tighten the tube nut to 200-225 pound-inches (22.6-25.4 newton-meters).

S 424-043-N00

(2) Install the 2.9 bleed valve solenoid (AMM 75-32-04/401).

NOTE: ENGINES POST-PW-SB 75-41;
You must align the clamp bracket when you install the 2.9 bleed valve solenoid.

S 424-044-N00

(3) Install the fan exit liner segment to the 5 o'clock position (AMM 72-34-03/401).

S 424-045-N00

(4) Install the supply tube to the aft port on the pneumatic relay valve.

(a) Tighten the tube nut to 225-250 pound-inches (25.4-28.2 newton-meters).

F. Return the Aircraft to Its Usual Condition

S 414-028-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT COULD OCCUR.

(1) Close the right thrust reverser (AMM 78-31-00/201).

S 414-029-N00

(2) Close the right core cowl panel (AMM 71-11-06/201).

S 414-030-N00

(3) Close the right fan cowl panel (AMM 71-11-04/201).

S 444-031-N00

(4) Do the activation procedure for the thrust reversers (AMM 78-31-00/201).

2.9 BLEED VALVE THERMOCOUPLE PROBE - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks. One task is to remove the 2.9 bleed valve thermocouple probe. The other task is to install the 2.9 bleed valve thermocouple probe.

   TASK 75-32-06-024-001-N00

2. Remove the 2.9 Bleed Valve Thermocouple Probe

   NOTE: Use this procedure for the removal of the left or right thermocouple probe.

   A. References
      (1) AMM 71-11-04/201, Fan Cowl Panels
      (2) AMM 71-11-06/201, Core Cowl Panels
      (3) AMM 78-31-00/201, Thrust Reverser System
   B. Access
      (1) Location Zones
          411 Left Engine
          421 Right Engine

      (2) Access Panels
          415AL Fan Reverser (Left)
          416AR Fan Reverser (Right)
          425AL Fan Reverser (Left)
          426AR Fan Reverser (Right)

   C. Prepare to Remove the Thermocouple Probe for the 2.9 Bleed Valve

      S 014-002-N00
      (1) Open the fan cowl panels (AMM 71-11-04/201).

      S 044-003-N00

      WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

      (2) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 014-032-N00
(3) Open the core cowl panels (AMM 71-11-06/201).

S 014-004-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(4) Open the thrust reversers (AMM 78-31-00/201).

S 864-006-N00
(5) For the left engine, open this circuit breaker on the APU external power panel P34 and attach DO-NOT-CLOSE tag:
(a) 34P2, EEC GRD TEST L ENG

S 864-007-N00
(6) For the right engine, open this circuit breaker on the APU external power panel P34 and attach DO-NOT-CLOSE tag:
(a) 34P3, EEC GRD TEST R ENG

D. Remove the Thermocouple Probe for the 2.9 Bleed Valve (Fig. 401)

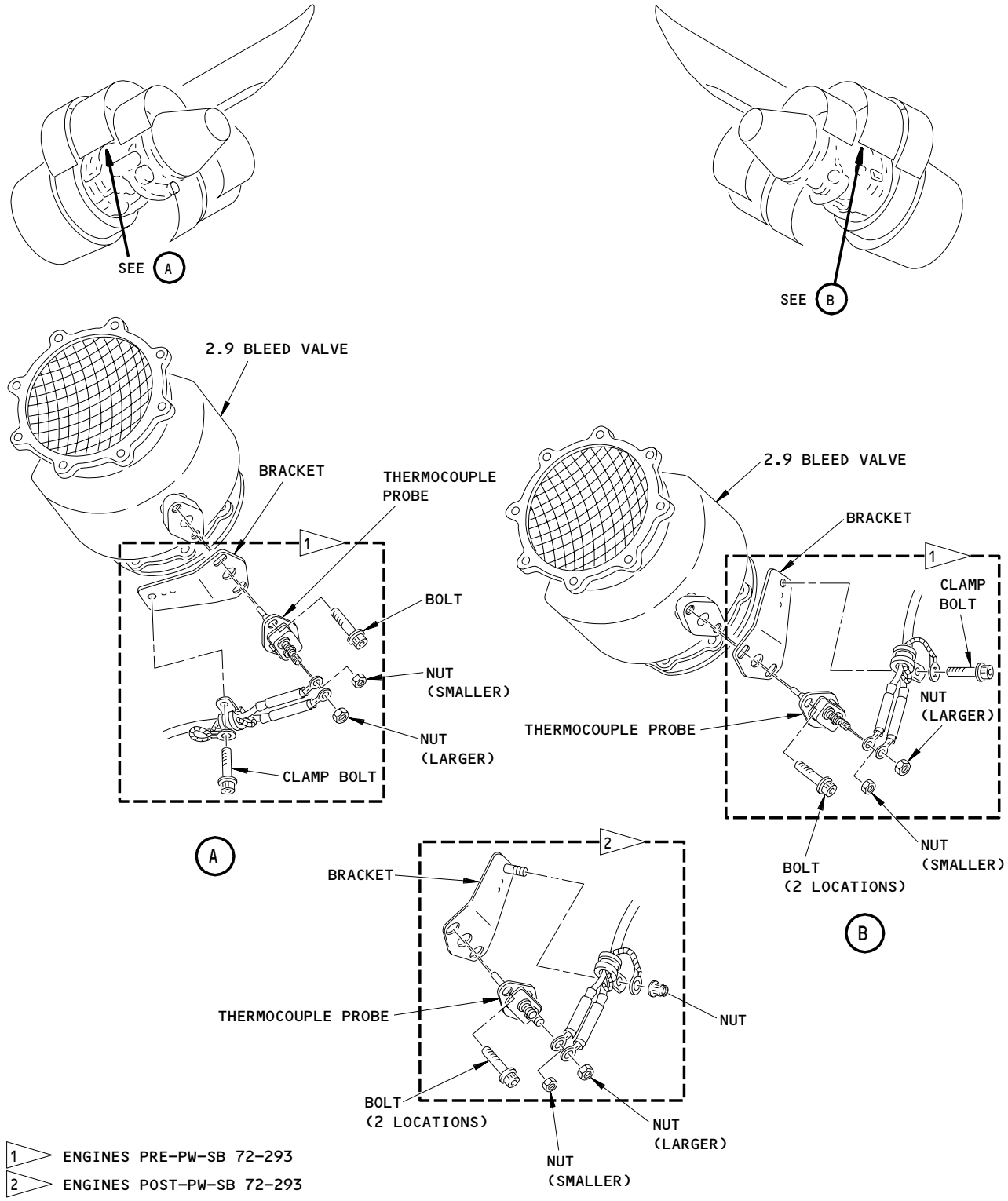
S 034-027-N00
(1) ENGINES PRE-PW-SB 72-293;
Remove the nuts and the clamp bolt that attach the harness lead to the thermocouple probe and the bracket.

S 034-028-N00
(2) ENGINES POST-PW-SB 72-293;
Remove the nuts which attach the harness lead to the thermocouple probe and the bracket.

S 034-009-N00
(3) Remove the bolts that attach the bracket and the thermocouple probe to the 2.9 bleed valve.

S 024-010-N00
(4) Remove the thermocouple probe and the bracket from the 2.9 bleed valve.

S 034-011-N00
(5) Install a protective cap to the opening on the 2.9 bleed valve.



2.9 Bleed Valve Thermocouple Probe
Figure 401

TASK 75-32-06-424-012-N00

3. Install the 2.9 Bleed Valve Thermocouple Probe

NOTE: Use this procedure for the installation of the left or right thermocouple probe.

A. Consumable Materials
   (1) D00137 Engine Oil - PWA 521
B. References
   (1) AMM 71-11-04/201, Fan Cowl Panel
   (2) AMM 71-11-06/201, Core Cowl Panels
   (3) AMM 78-31-00/201, Thrust Reverser System
C. Access
   (1) Location Zones
       411 Left Engine
       421 Right Engine

   (2) Access Panels
       415AL Fan Reverser (Left)
       416AR Fan Reverser (Right)
       425AL Fan Reverser (Left)
       426AR Fan Reverser (Right)

D. Install the Thermocouple Probe for the 2.9 Bleed Valve

   S 434-013-N00
   (1) Remove the protective cap from the port on the 2.9 bleed valve.

   S 644-014-N00
   (2) Lubricate the threads of the bolts, which attach the bracket and the thermocouple probe, with engine oil.

   S 424-015-N00
   (3) Install the thermocouple probe and the bracket to the port in the 2.9 bleed valve with the bolts.
       (a) Tighten the bolts to 85-95 pound-inches (9.6-10.7 newton-meters).

   S 434-016-N00
   (4) Install the harness leads to the thermocouple probe with the nuts.
       (a) Tighten the nuts with your hand.

S 434-029-N00
(5) ENGINES PRE-PW-SB 72-293;
Install the harness lead to the bracket with the steps that follow:
(a) Attach the small ground lead cable and the clamp to the bracket with the clamp bolt.
(b) Tighten the clamp bolt to 36-40 pound-inches (4.1-4.5 newton-meters).

S 434-030-N00
(6) ENGINES POST-PW-SB 72-293;
Install the harness lead to the bracket with the steps that follow:
(a) Attach the small ground lcable and the clamp to the clamp bolt with the nut.
(b) Tighten the nut to 32-36 pound-inches (3.6-4.1 newton-meters).

S 434-019-N00
(7) Tighten the nut on the larger stud to 18-22 pound-inches (2.0-2.5 newton-meters).

S 434-020-N00
(8) Tighten the nut on the smaller stud to 15-18 pound-inches (1.7-2.0 newton-meters).

E. Put the airplane back to its initial condition.

S 414-021-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Close the thrust reversers (AMM 78-31-00/201).

S 414-031-N00
(2) Close the core cowl panels (AMM 71-11-06/201).

S 414-022-N00
(3) Close the fan cowl panels (AMM 71-11-04/201).

S 444-023-N00
(4) Do the activation procedure for the thrust reversers (AMM 78-31-00/201).

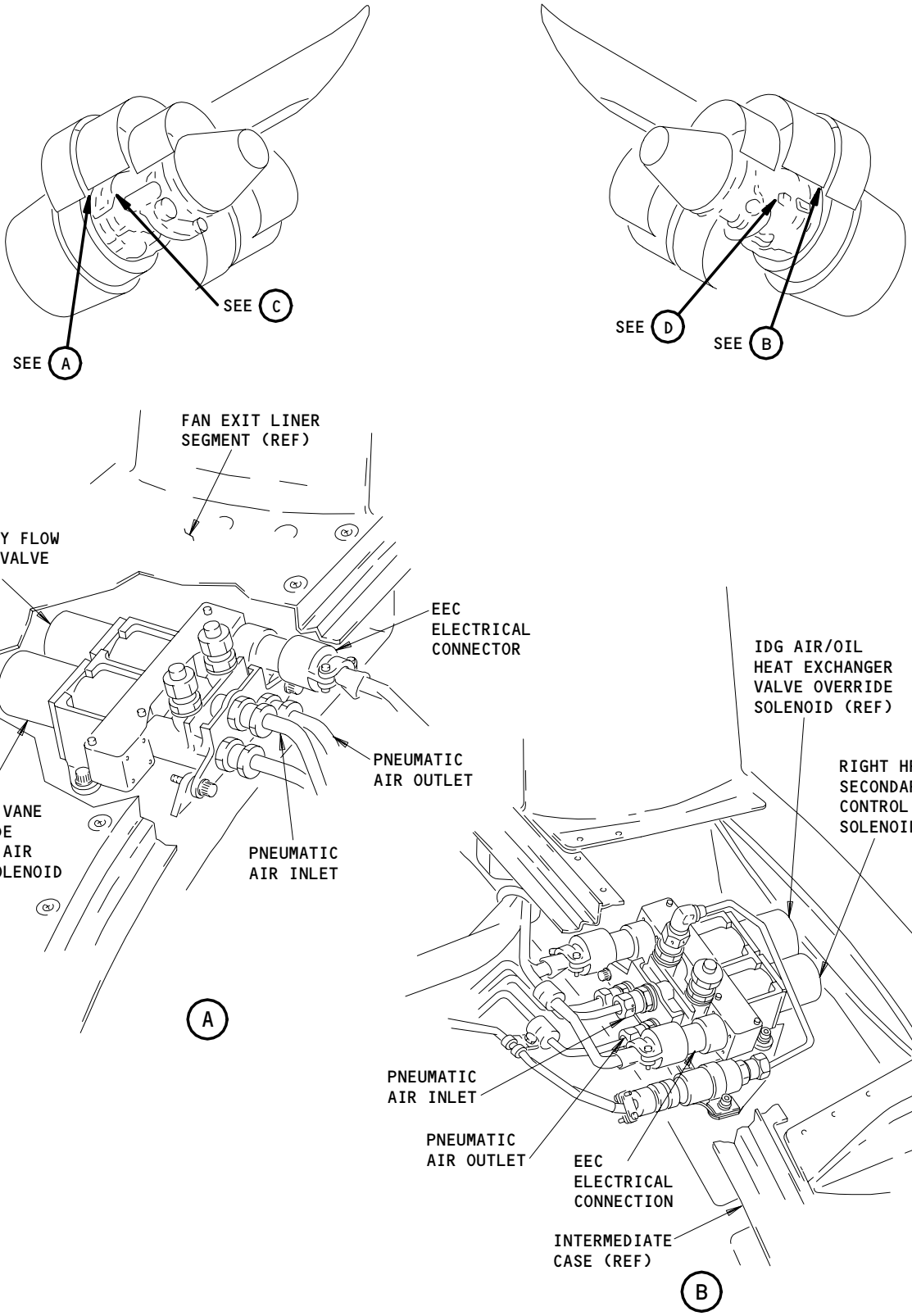
S 864-024-N00
(5) For the left engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P34 panel:
(a) 34P2, EEC GRD TEST L ENG

S 864-025-N00

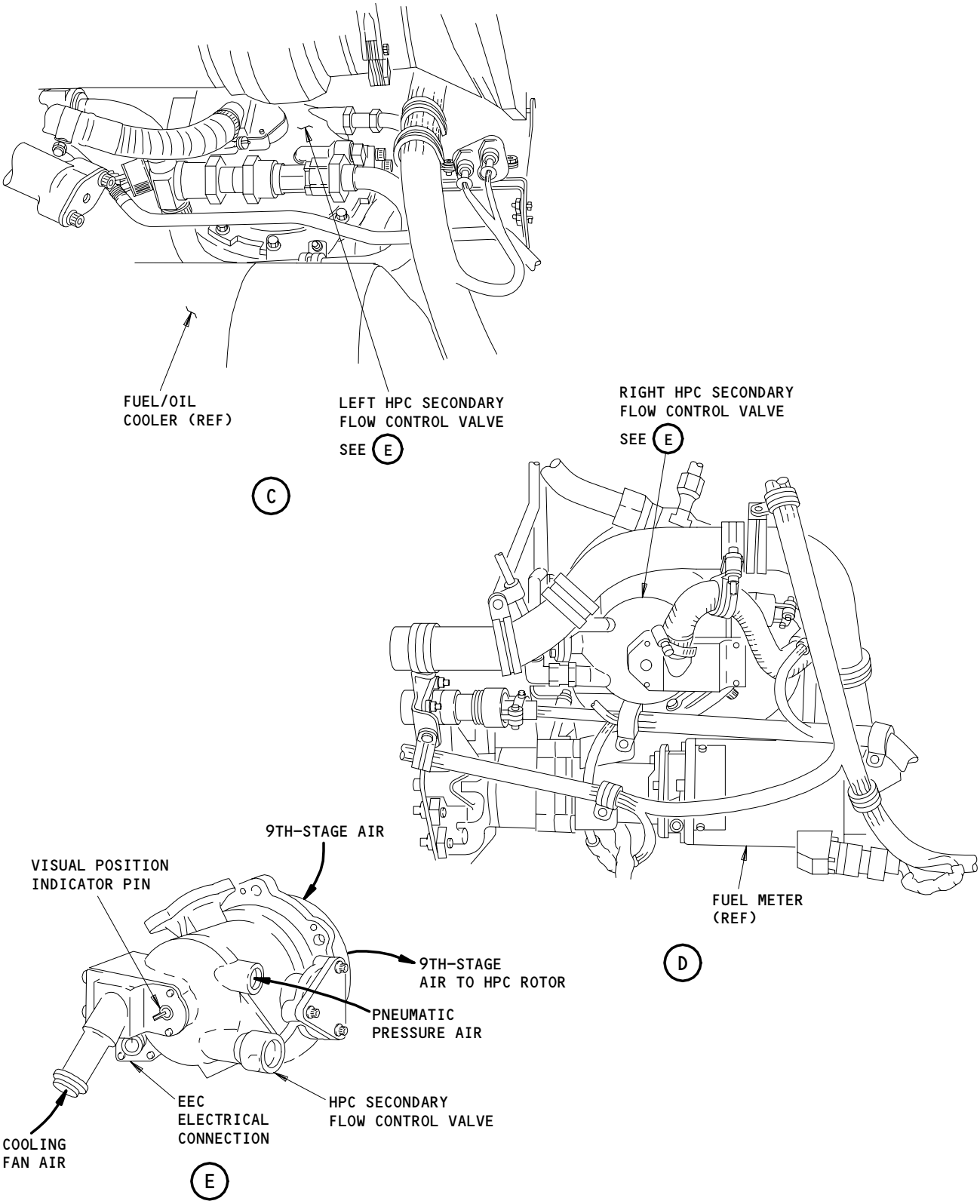
(6) For the right engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P34 panel:
(a) 34P3, EEC GRD TEST R ENG

HPC SECONDARY FLOW CONTROL SYSTEM - DESCRIPTION AND OPERATION

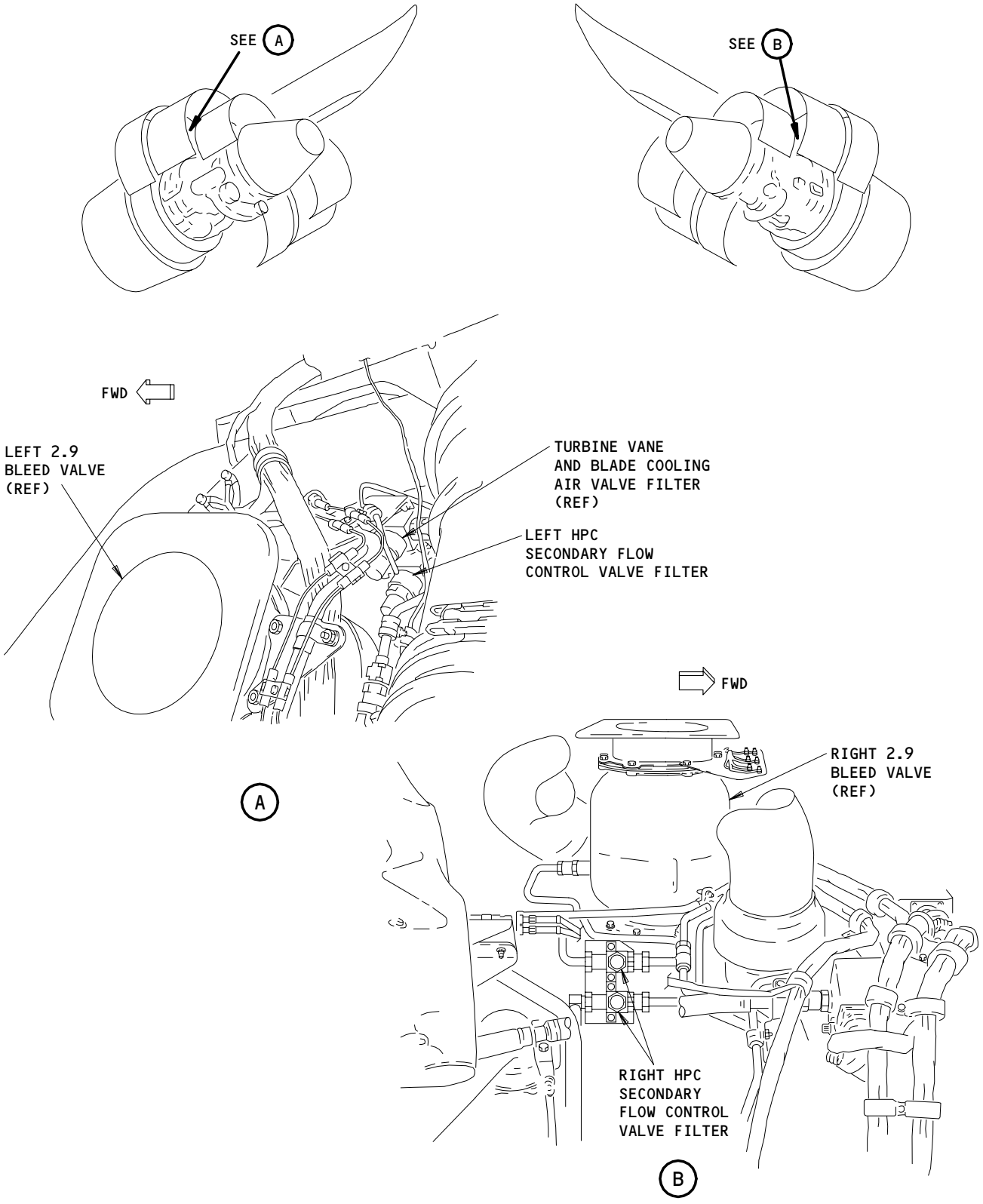
1. General
   A. The HPC secondary flow control system controls the 9th-stage bleed air to the rotor drum for the high pressure compressor (HPC) to decrease the compressor blade tip clearance. This increases the compressor performance.
   B. The HPC secondary flow control system includes two control valves, two solenoids, and three air filters.
2. Component Details
   A. HPC Secondary Flow Control Valves (Fig. 1).
      (1) The HPC secondary flow control valves are installed on the HPC case. The left control valve is at the 9:30 o'clock position and the right control valve is at the 3:30 o'clock position.
      (2) The two control valves are shutoff valves which are spring-loaded open, and pneumatically closed by 15th-stage air.
      (3) Each control valve has an integral position switch. The position switch gives a visual position indication and a position feedback signal to the electronic engine control (EEC).
      (4) The fan air is used to decrease the temperature of the control valves and their position switches.
   B. HPC Secondary Flow Control Valve Solenoids (Fig. 1).
      (1) The solenoids for the control valves are installed on the intermediate case. The left solenoid is at the 10 o'clock position and the right solenoid is at the 1 o'clock position.
      (2) The left solenoid is in the same housing as the air valve solenoid for turbine vane and blade cooling.
      (3) The right solenoid is in the same housing as the valve override solenoid for the IDG air/oil heat exchanger.
      (4) Each solenoid is electrically operated by the EEC and controls 15th-stage air to pneumatically operate the control valves. The left solenoid controls the left control valve, and the right solenoid controls the right control valve.
   C. HPC Secondary Flow Control Valve Filters (Fig. 2).
      (1) The filters for the control valve are installed on the HPC rear case. One filter at the 11 o'clock position and two filters at the 1 o'clock position.
      (2) These filters make sure the 15th-stage pneumatic air is clean before it goes into the control valves and solenoids.
3. Operation
   A. Functional Description
      (1) As a function of altitude and high rotor speed (N2), the EEC controls the two solenoids for the control valves.
      (2) During high engine power, the solenoids are energized by 28 volts dc. This lets 15th-stage pneumatic air flow through the filters to close the control valves. The 9th-stage air then cannot flow to the HPC rotor drum.



HPC Secondary Flow Control System
Figure 1 (Sheet 1)



HPC Secondary Flow Control System
Figure 1 (Sheet 2)



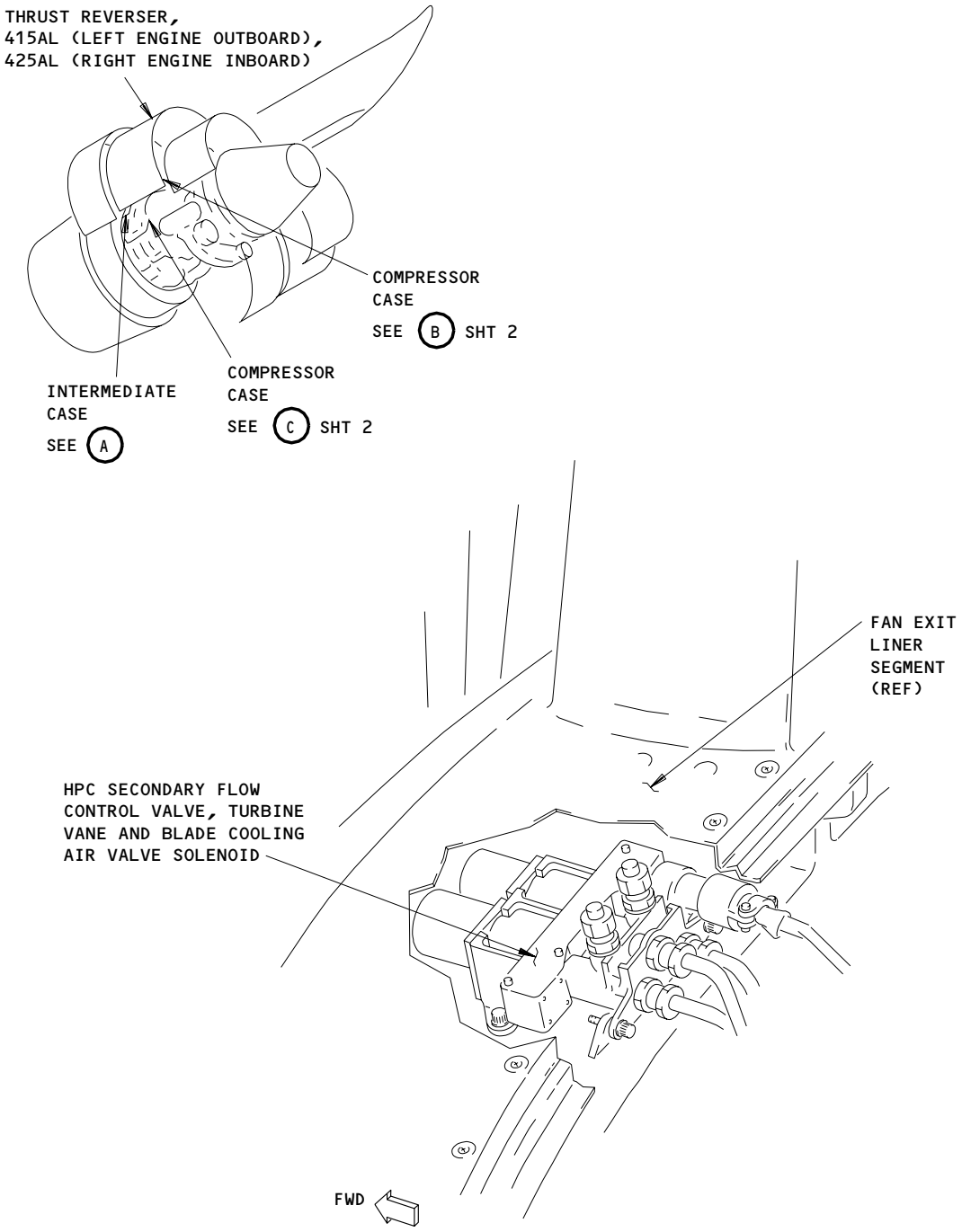
HPC Secondary Flow Control
Figure 2

(3) During low engine power, electrical power is removed from the solenoids which causes the solenoid to stop the pneumatic airflow to the control valves. The control valves are spring-loaded open to let the 9th-stage air flow to the HPC rotor drum.
(4) When the control valve is open, the visual position indicator pin is extended from the control valve. When it is closed, the visual position indicator pin is retracted into the control valve.
(5) The position switch also sends a feedback signal to the EEC to show the control valve position. If the EEC finds a control valve closed when it must be open, the second control valve will be held open at all times during the engine operation.
(6) When pneumatic pressure decreases or an electrical signal failure to the solenoid occurs, the control valves are spring-loaded open to let the 9th-stage air flow.

HPC SECONDARY FLOW CONTROL SYSTEM

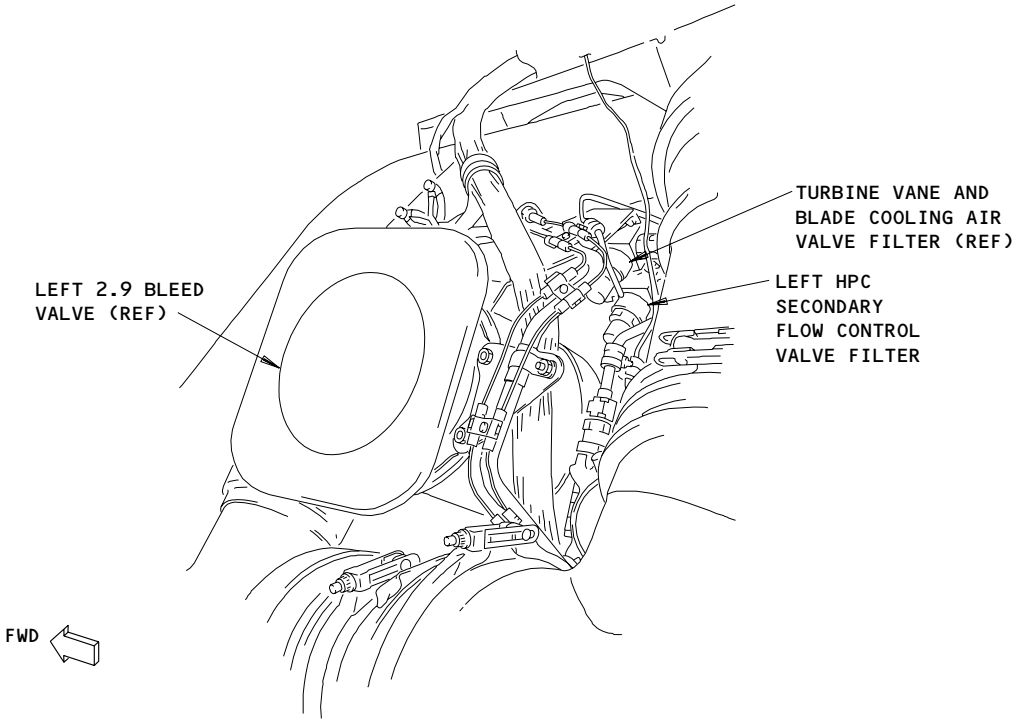
COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	AMM REFERENCE
CONTROL - (FIM 73-21-00/101) ELECTRONIC ENGINE, M7198				
FILTER - HPC SECONDARY FLOW CONTROL VALVE	2	2	415AL,425AL THRUST REVERSER	75-33-02
FILTER - HPC SECONDARY FLOW CONTROL VALVE	3	4	416AR,426AR THRUST REVERSER	75-33-02
SOLENOID - HPC SECONDARY FLOW CONTROL VALVE, IDG AIR/OIL HEAT EXCHANGER VALVE OVERRIDE	4	2	416AR,426AR THRUST REVERSER	75-33-04
SOLENOID - HPC SECONDARY FLOW CONTROL VALVE, TURBINE BLADE AND VANE COOLING AIR VALVE	1	2	415AL,425AL THRUST REVERSER	75-33-03
VALVE - HPC SECONDARY FLOW CONTROL	2	2	415AL,425AL THRUST REVERSER	75-33-01
VALVE - HPC SECONDARY FLOW CONTROL	4	2	416AR,426AR THRUST REVERSER	75-33-01

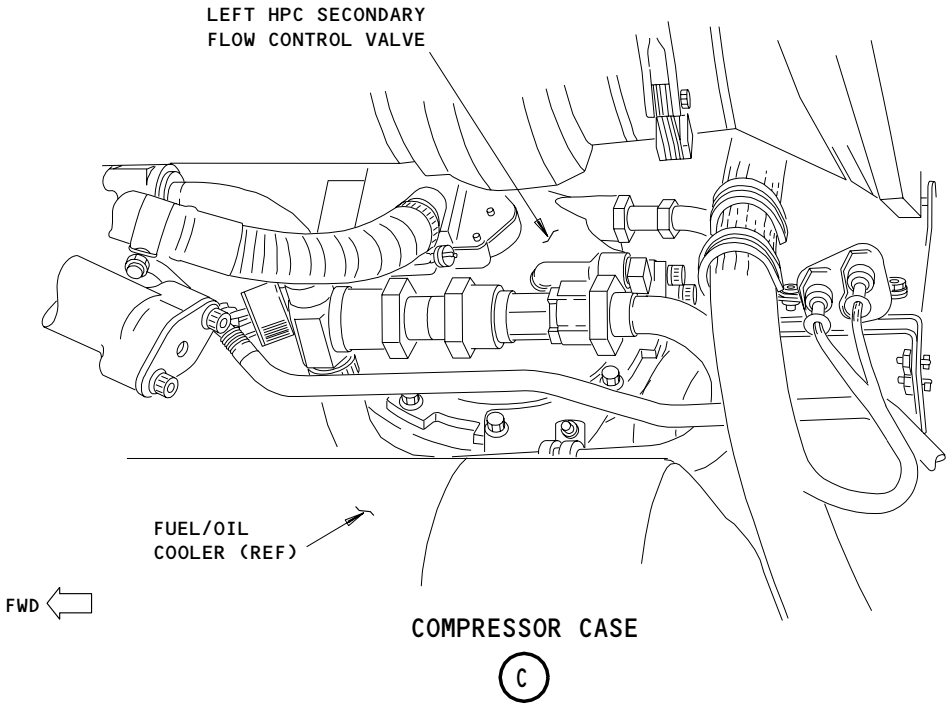
HPC Secondary Flow Control System - Component Index
Figure 101



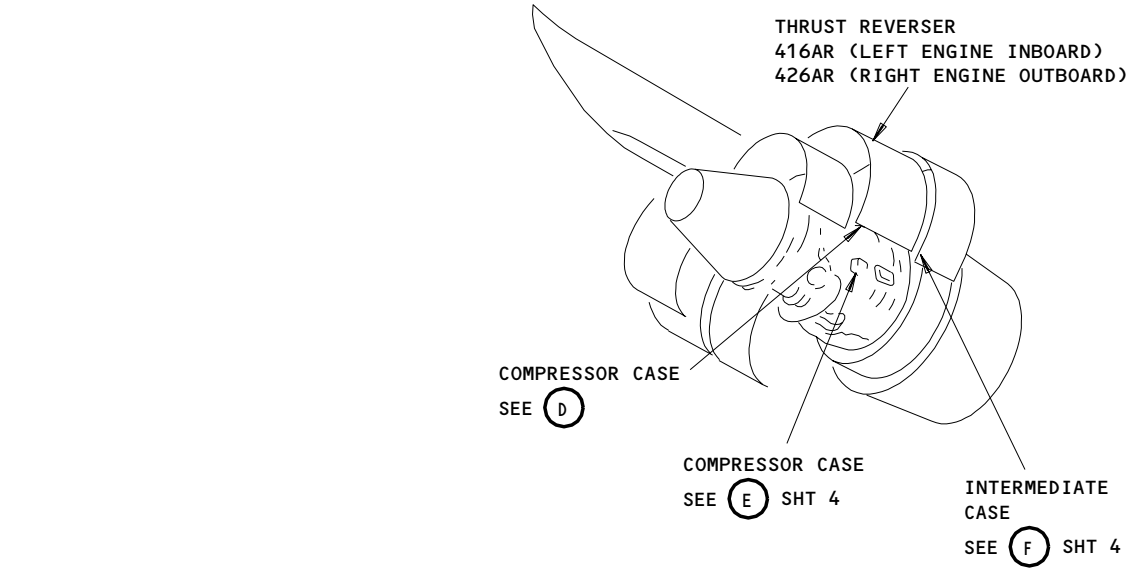
INTERMEDIATE CASE
A

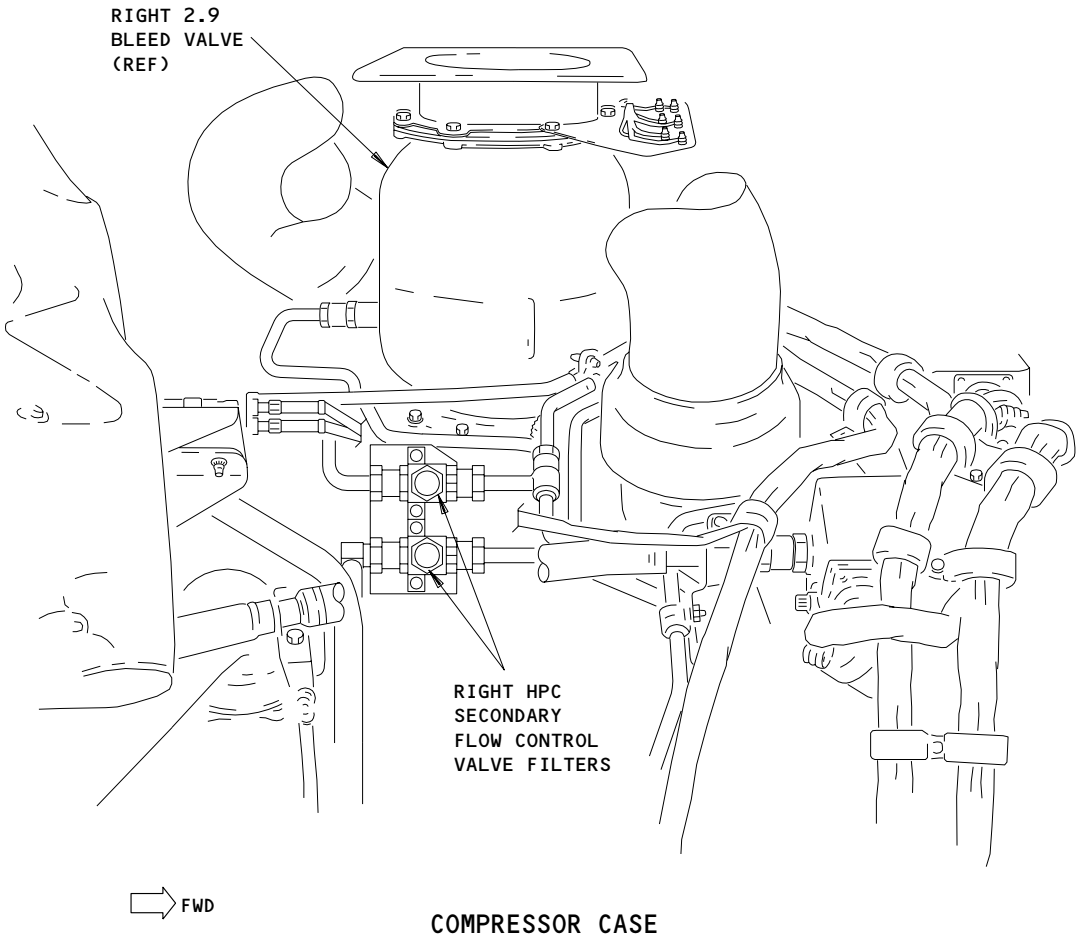
HPC Secondary Flow Control System – Component Location
Figure 102 (Sheet 1)





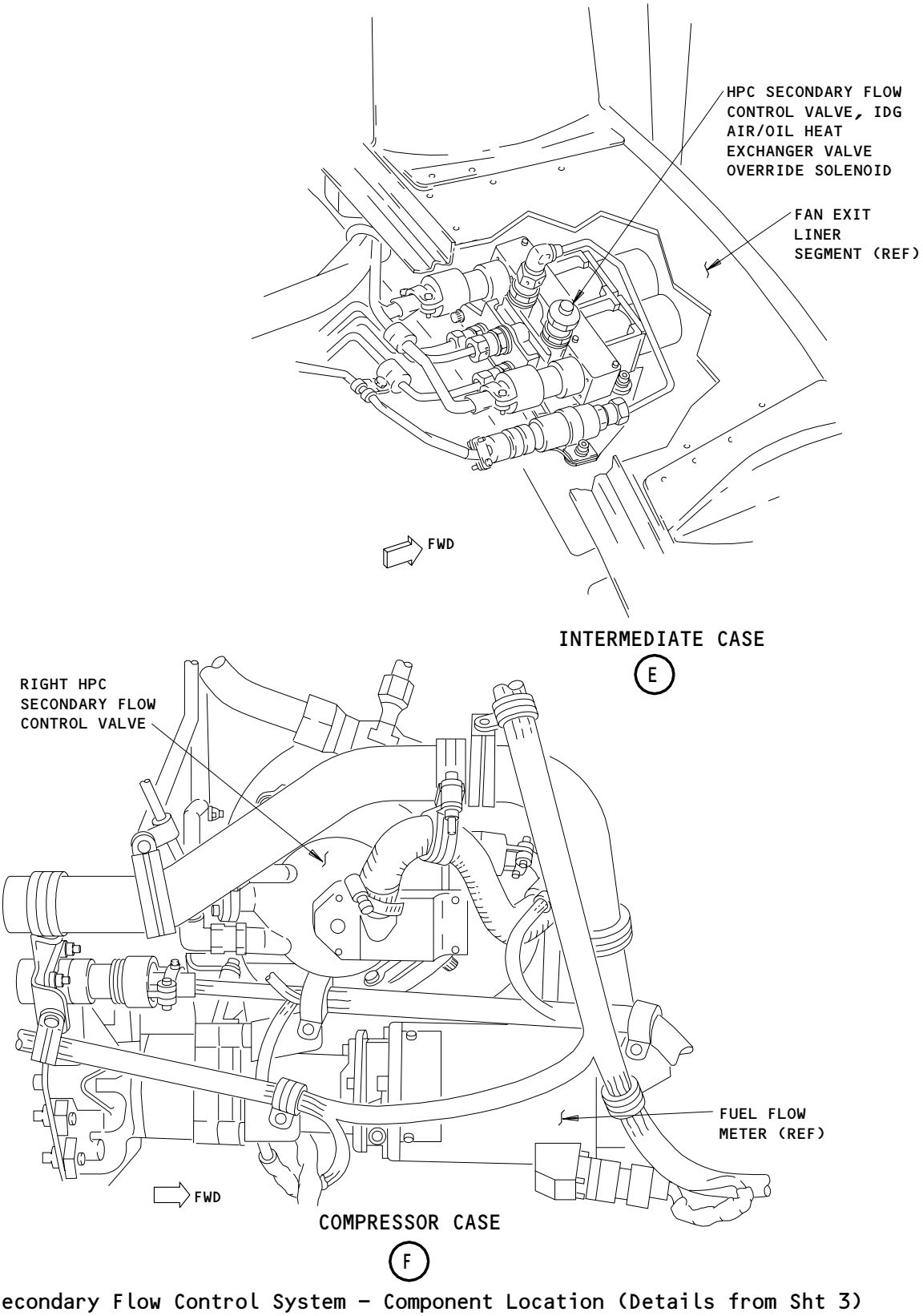
HPC Secondary Flow Control System – Component Location (Details from Sht 1)
Figure 102 (Sheet 2)





COMPRESSOR CASE
D

HPC Secondary Flow Control System – Component Location
Figure 102 (Sheet 3)



HPC Secondary Flow Control System – Component Location (Details from Sht 3)
Figure 102 (Sheet 4)

HPC SECONDARY FLOW CONTROL SYSTEM - ADJUSTMENT/TEST

TASK 75-33-00-825-025-N00

1. HPC Secondary Flow Control System - Adjustment

A. General

(1) This procedure, which was based on PW SB 75-101, has limited effectivity and several terminating actions. Based on this, the procedure has been incorporated in AMM 75-24-00/601.

HPC SECONDARY FLOW CONTROL SYSTEM - INSPECTION/CHECK

1. General
   A. This procedure examines the components of the HPC secondary flow control system for damage and correct installation.
   B. You can get access to these components through the two thrust reverser halves.
   C. For the inspection of the PS3 air filter element, refer to AMM 75-33-05/201.

TASK 75-33-00-206-001-N00

2. Do the Inspection of the HPC Secondary Flow Control System
   A. References
      (1) AMM 71-11-04/201, Fan Cowl Panels
      (2) AMM 71-11-06/201, Core Cowl Panels
      (3) AMM 72-34-03/401, Fan Exit Liner Segment
      (4) AMM 75-33-01/401, HPC Secondary Flow Control Valve
      (5) AMM 75-33-05/401, PS3 Air Filter Assembly
      (6) AMM 75-33-03/401, HPC Secondary Flow Control Valve and Turbine Vane and Blade Cooling Air Valve Solenoid
      (7) AMM 75-33-04/401, HPC Secondary Flow Control Valve and IDG Air/Oil Heat Exchanger Valve Override Solenoid
      (8) AMM 78-31-00/201, Thrust Reverser System
   B. Access
      (1) Location Zones
          411 Left Engine
          421 Right Engine

      (2) Access Panels
          415AL Fan Reverser (Left)
          416AR Fan Reverser (Right)
          425AL Fan Reverser (Left)
          426AR Fan Reverser (Right)

   C. Prepare to Do the Inspection

      S 016-002-N00
      (1) Open the fan cowl panels (AMM 71-11-04/201).

S 046-003-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

(2) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 016-004-N00

(3) Open the core cowl panels (AMM 71-11-06/201).

S 016-005-N00

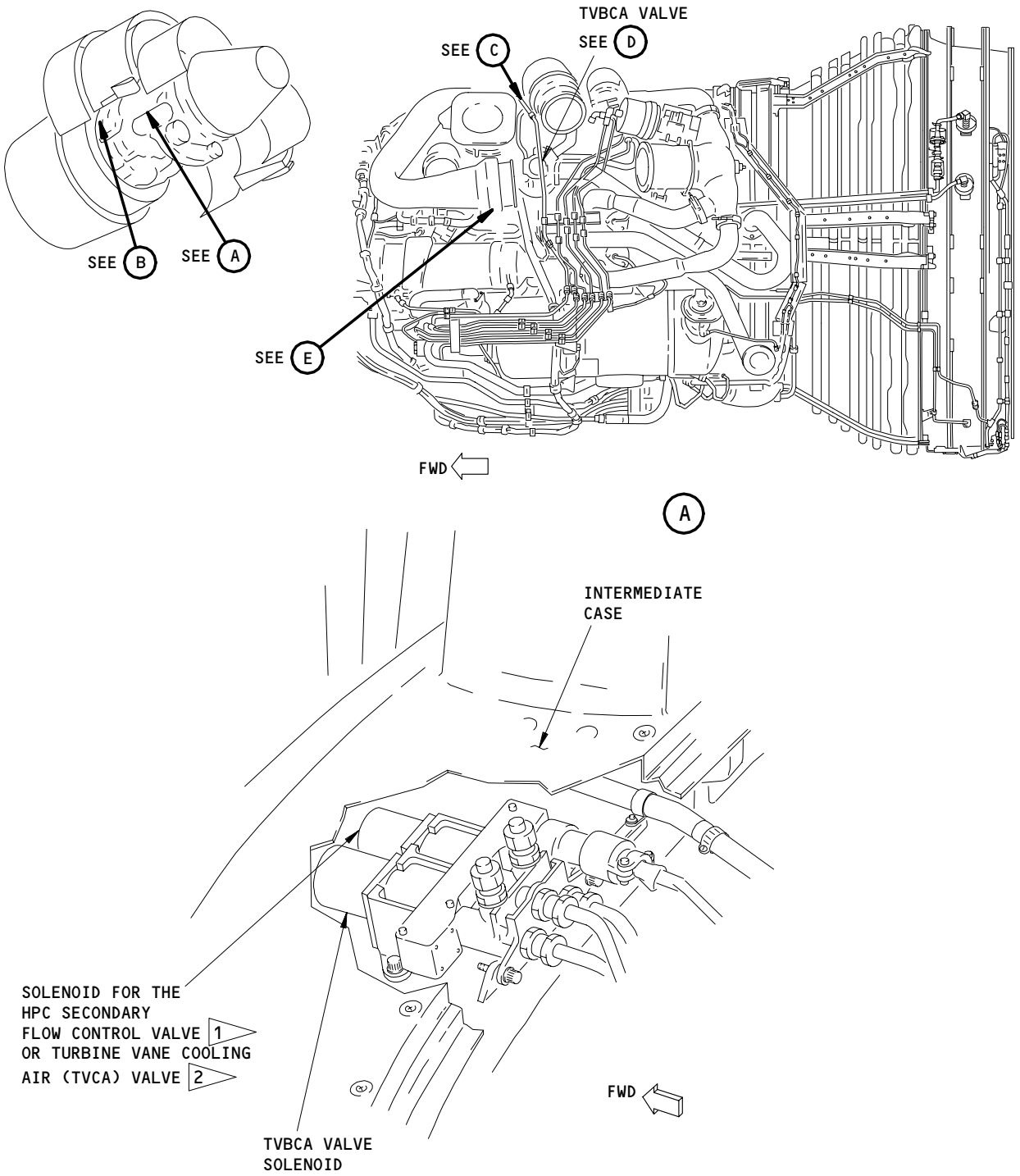
WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(4) Open the thrust reversers (AMM 78-31-00/201).

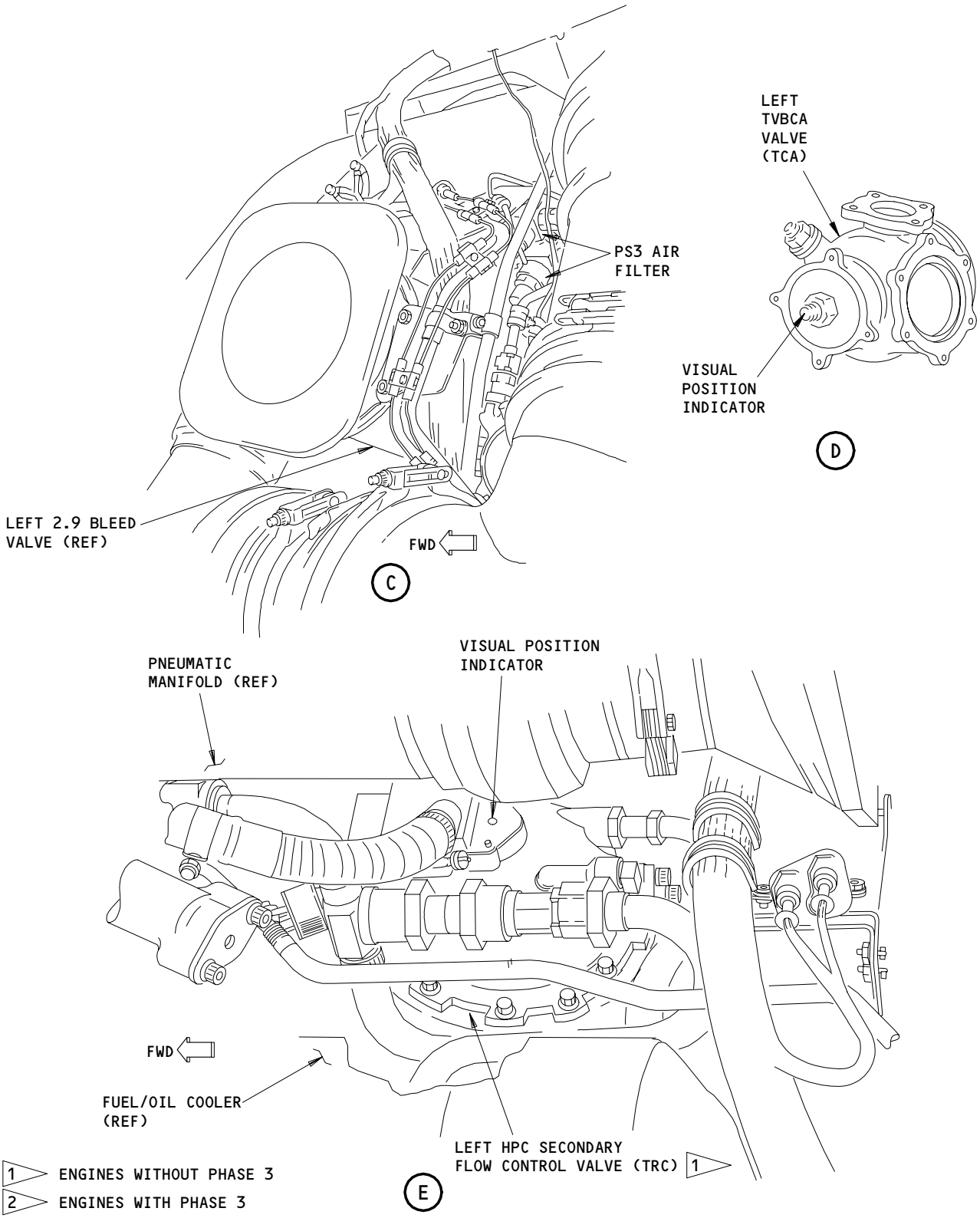
D. Do the Inspection of the Control System for the HPC Secondary Flow (Fig. 601)

S 216-006-N00

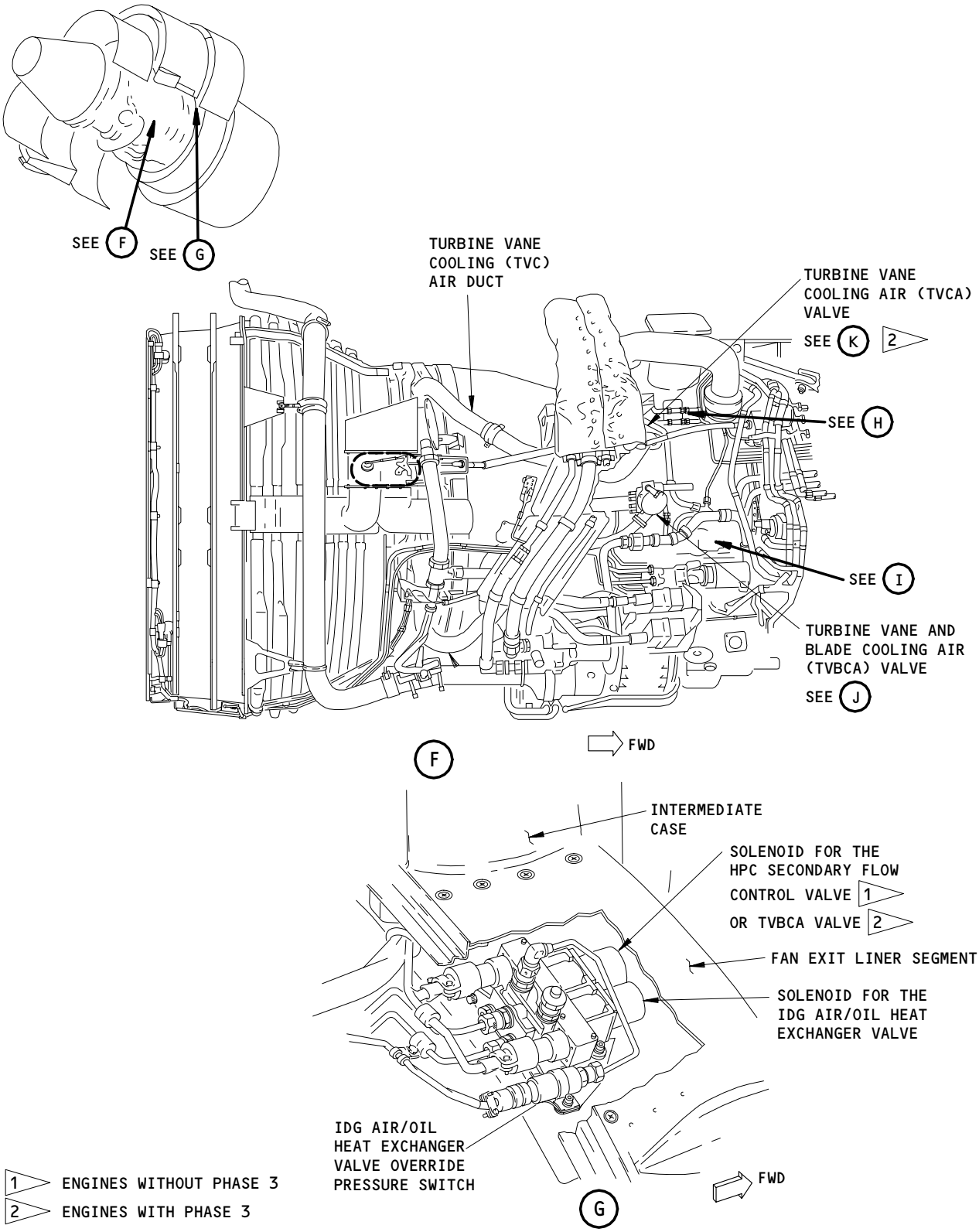
(1) Visually examine the control valves for the HPC secondary flow.
  (a) Examine the control valves for the correct installation.
    1) If there is a loose control valve, tighten or replace the mounting bolts as it is necessary.
  (b) Examine the control valves for cracks.
    1) If there are cracks found on the control valve, replace the control valve (AMM 75-33-01/401).
  (c) Examine the electrical harness for chafing and loose connectors.
    1) Replace the bad electrical harness or connector as it is necessary.



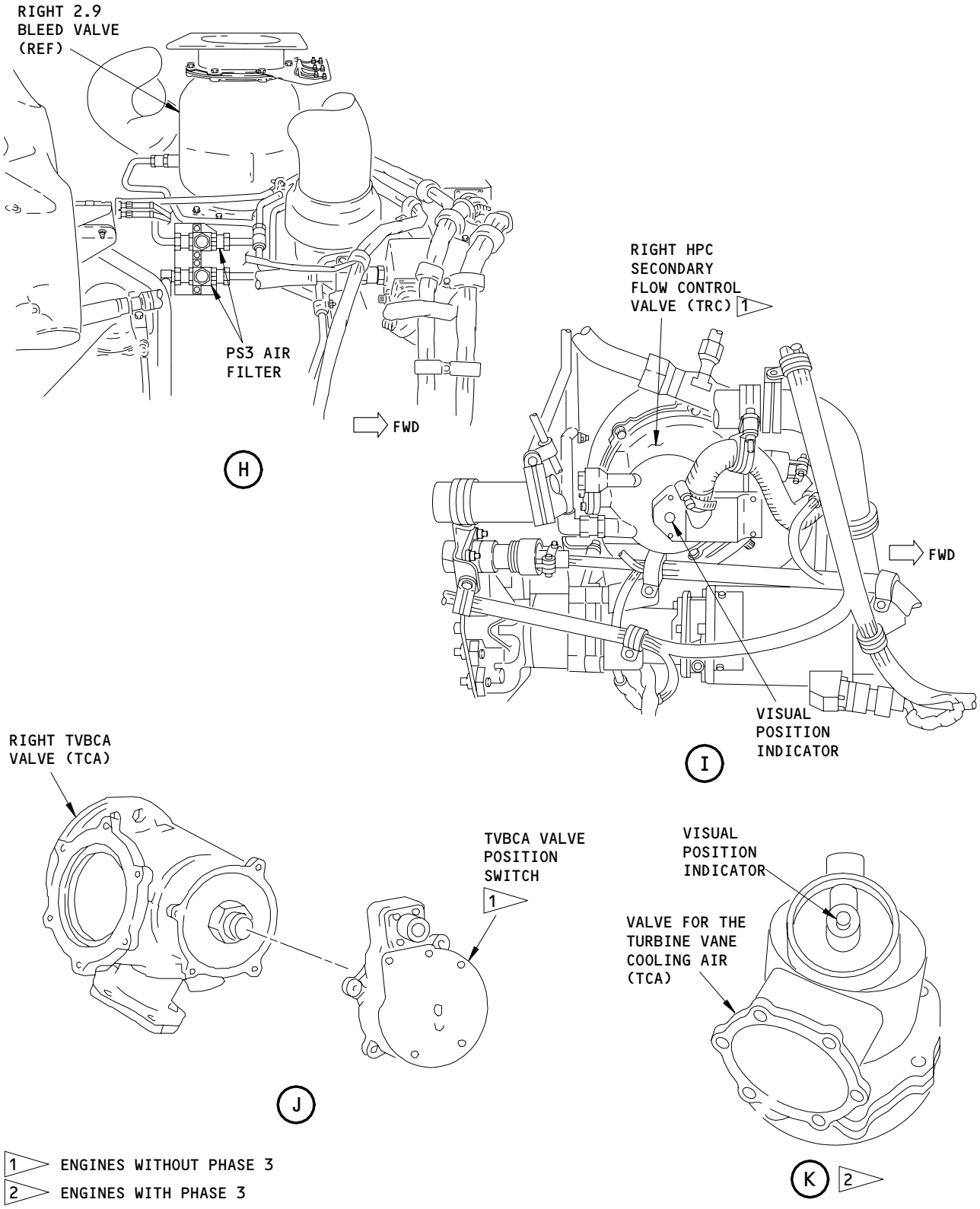
HPC Secondary Flow Control Inspection
Figure 601 (Sheet 1)



HPC Secondary Flow Control System Inspection
Figure 601 (Sheet 2)



HPC Secondary Flow Control System Inspection
Figure 601 (Sheet 3)



1 ENGINES WITHOUT PHASE 3
2 ENGINES WITH PHASE 3

HPC Secondary Flow Control System Inspection
Figure 601 (Sheet 4)

S 216-007-N00

(2) Visually examine the PS3 air filter (HPC secondary flow control valve filter) assemblies for cracks and the correct installation.
   (a) Cracks in the PS3 air filter are not permitted.
      1) Replace the PS3 air filter assembly if you find cracks (AMM 75-33-05/401).
   (b) If you have a loose PS3 air filter assembly, replace or tighten the mounting bolt(s) as it is necessary.

S 036-008-N00

(3) Remove the segment No. 7 of the fan exit liner (AMM 72-34-03/401) to get access to the control valve and the solenoid of the cooling air valve for the turbine vane and blade.

S 216-009-N00

(4) Visually examine the control valve and the solenoid.
   (a) Examine the solenoid for the correct installation.
      1) If you have a loose solenoid, tighten or replace the mounting bolt(s) as it is necessary.
   (b) Examine the solenoid for cracks.
      1) If you find cracks, replace the solenoid (AMM 75-33-03/401).
   (c) Examine the electrical harness to see if it has worn and for loose connectors.
      1) Replace the bad electrical harnesses and the connectors.

S 036-010-N00

(5) Remove the No. 1 segment of the fan exit liner (AMM 72-34-03/401) to get access to the control valve and the override solenoid for the IDG air/oil heat exchanger valve.

S 216-011-N00

(6) Visually examine the control valve and the override solenoid.
   (a) Examine the solenoid for the correct installation.
      1) If you have a loose solenoid, tighten or replace the mounting bolt(s) as it is necessary.

(b) Examine the solenoid for cracks.
1) If you find cracks, replace the solenoid (AMM 75-33-04/401).
(c) Examine the electrical harness to see if it has worn and for loose connectors.
1) Replace the bad electrical harnesses and connectors.

S 216-012-N00

(7) Visually examine the air tubes and the brackets for cracks and correct installation.
(a) If you find cracks or dents in the air tube(s) or cracks in the bracket(s), replace the air tube(s) or bracket(s) as it is necessary.
(b) Small surface damage of the air tube(s) is permitted if the function of the system is not changed.
(c) If you have a loose clamp(s) and bracket(s), replace or tighten the mounting bolt(s).

S 436-013-N00

(8) Install the No. 1 and No. 7 segments of the fan exit liner (AMM 72-34-03/401).

E. Put the Airplane Back to Its Usual Condition

S 416-014-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Close the thrust reversers (AMM 78-31-00/201).

S 416-015-N00

(2) Close the core cowl panels (AMM 71-11-06/201).

S 416-016-N00

(3) Close the fan cowl panels (AMM 71-11-04/201).

S 446-017-N00

(4) Do the activation procedure for the thrust reversers (AMM 78-31-00/201).

TASK 75-33-00-216-018-N00

3. Do the Inspection of the HPC Secondary Flow Control Valves

A. General

(1) ENGINES WITHOUT PHASE 3 AND PRE-PW-SB 75-91;
ENGINES WITHOUT PHASE 3, PRE-PW-SB 75-116 AND PRE-PW-SB 75-120;
ENGINES WITHOUT PHASE 3, POST-PW-SB 72-504 AND PRE-PW-SB 75-121:
This inspection examines the visual position indicators in the TCA (Turbine Cooling Air) valves and in the TRC (Thermatic Rotor Control) valves. The valves are located on the HPC case.

(2) ENGINES WITH PHASE 3;
This inspection examines the visual position indicators in the TCA (Turbine Cooling Air) valves. The valves are located on the HPC case.

B. References

(1) AMM 71-11-04/201, Fan Cowl Panels
(2) AMM 71-11-06/201, Core Cowl Panels
(3) AMM 75-24-01/401, Turbine Vane and Blade Cooling Air Valves
(4) AMM 75-24-16/401, Turbine Vane Cooling Air Valve
(5) AMM 75-33-01/401, HPC Secondary Flow Control Valve
(6) AMM 78-31-00/201, Thrust Reverser System

C. Access

(1) Location Zones

411 Left Engine
421 Right Engine

(2) Access Panels

415AL Fan Reverser (Left)
416AR Fan Reverser (Right)
425AL Fan Reverser (Left)
426AR Fan Reverser (Right)

D. Prepare to Do the Inspection

S 046-020-N00

WARNING: DO THE DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

(1) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).

S 016-021-N00

(2) Open the fan cowl panels (AMM 71-11-04/201).

S 016-022-N00

(3) Open the core cowl panels (AMM 71-11-06/201).

S 016-023-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 TO OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(4) Open the thrust reversers (AMM 78-31-00/201).

E. Do the Inspection of the Visual Position Indicators (Fig. 601)

S 216-029-N00

(1) ENGINES WITHOUT PHASE 3 AND PRE-PW-SB 75-91;
ENGINES WITHOUT PHASE 3, PRE-PW-SB 75-116 AND PRE-PW-SB 75-120;
ENGINES WITHOUT PHASE 3, POST-PW-SB 72-504 AND PRE-PW-SB 75-121:
Examine the position of the visual position indicators in the control valves.

NOTE: Visual position indicators are in the TCA (Turbine Cooling Air) valves and the TRC (Thermatic Rotor Control) valves. The TCA valves are located at the 9:30 and 3:00 o'clock positions on the HPC case. The TRC valves are located at the 9:00 and 3:30 o'clock positions on the HPC case.

NOTE: TCA System: If the position indicator pin is not in the up position, the valve is stuck in the closed position. The valve must be replaced in ten (10) days or less.

NOTE: TRC System: If the position indicator pin is not in the up position, the valve is stuck in the closed position. The valve must be replaced in 500 hours or less.

S 216-031-N00

(2) ENGINES WITH PHASE 3;
Examine the position of the visual position indicators in the control valves.

NOTE: Visual position indicators are in the TCA (Turbine Cooling Air) valves located at the 9:30, 2:30, and 3:00 o'clock positions on the HPC case.

(a) If the position indicator pins are not fully extended, replace the defective control valve as it is necessary (AMM 75-24-01/401, 75-24-16/401).

NOTE: If the position indicator pin in the valve is not in the up position, the valve is stuck in the closed position. The valve must be replaced in ten (10) days or less.

F. Put the Airplane Back to Its Usual Condition

S 416-025-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 TO CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Close the thrust reversers (AMM 78-31-00/201).

S 416-026-N00

(2) Close the core cowl panels (AMM 71-11-06/201).

S 416-027-N00

(3) Close the fan cowl panels (AMM 71-11-04/201).

S 446-028-N00

(4) Do the activation procedure for the thrust reversers (AMM 78-31-00/201).

HPC SECONDARY FLOW CONTROL VALVE - REMOVAL/INSTALLATION

1. General
   A. This procedure is for engines without the Phase 3 engines. The Phase 3 engines do not have these valves.
   B. There are two control valves for the HPC secondary flow installed. One is installed on the left side of the compressor case at approximately the 9 o'clock position. The other is installed on the right side of the compressor case at approximately the 3 o'clock position. The control valves for the HPC secondary flow will be referred to as the control valves for this procedure.

TASK 75-33-01-004-001-N00

2. Remove the HPC Secondary Control Valve
   A. References
      (1) AMM 71-11-04/201, Fan Cowl Panels
      (2) AMM 71-11-06/201, Core Cowl Panels
      (3) AMM 75-32-03/401, 2.9 Bleed Valve
      (4) AMM 78-31-00/201, Thrust Reverser System
   B. Access
      (1) Location Zones

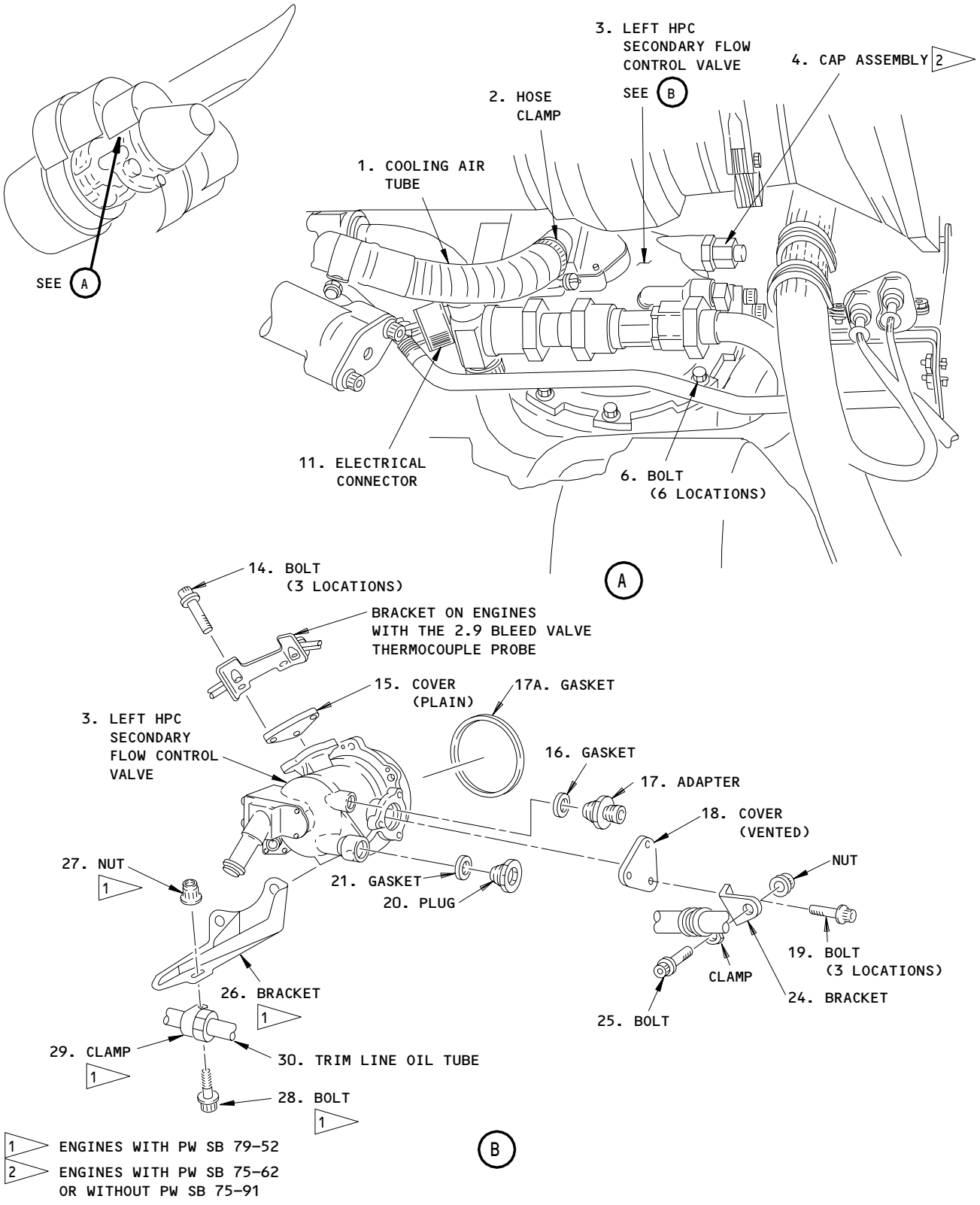
411	Left Engine
421	Right Engine

      (2) Access Panels

413AL	Fan Cowl Panel (Left), Left Engine
414AR	Fan Cowl Panel (Right), Left Engine
415AL	Thrust Reverser (Left), Left Engine
416AR	Thrust Reverser (Right), Left Engine
417AL	Core Cowl Panel (Left), Left Engine
418AR	Core Cowl Panel (Right), Left Engine
423AL	Fan Cowl Panel (Left), Right Engine
424AR	Fan Cowl Panel (Right), Right Engine
425AL	Thrust Reverser (Left), Right Engine
426AR	Thrust Reverser (Right), Right Engine
427AL	Core Cowl Panel (Left), Right Engine
428AR	Core Cowl Panel (Right), Right Engine

   C. Prepare to Remove the Control Valves

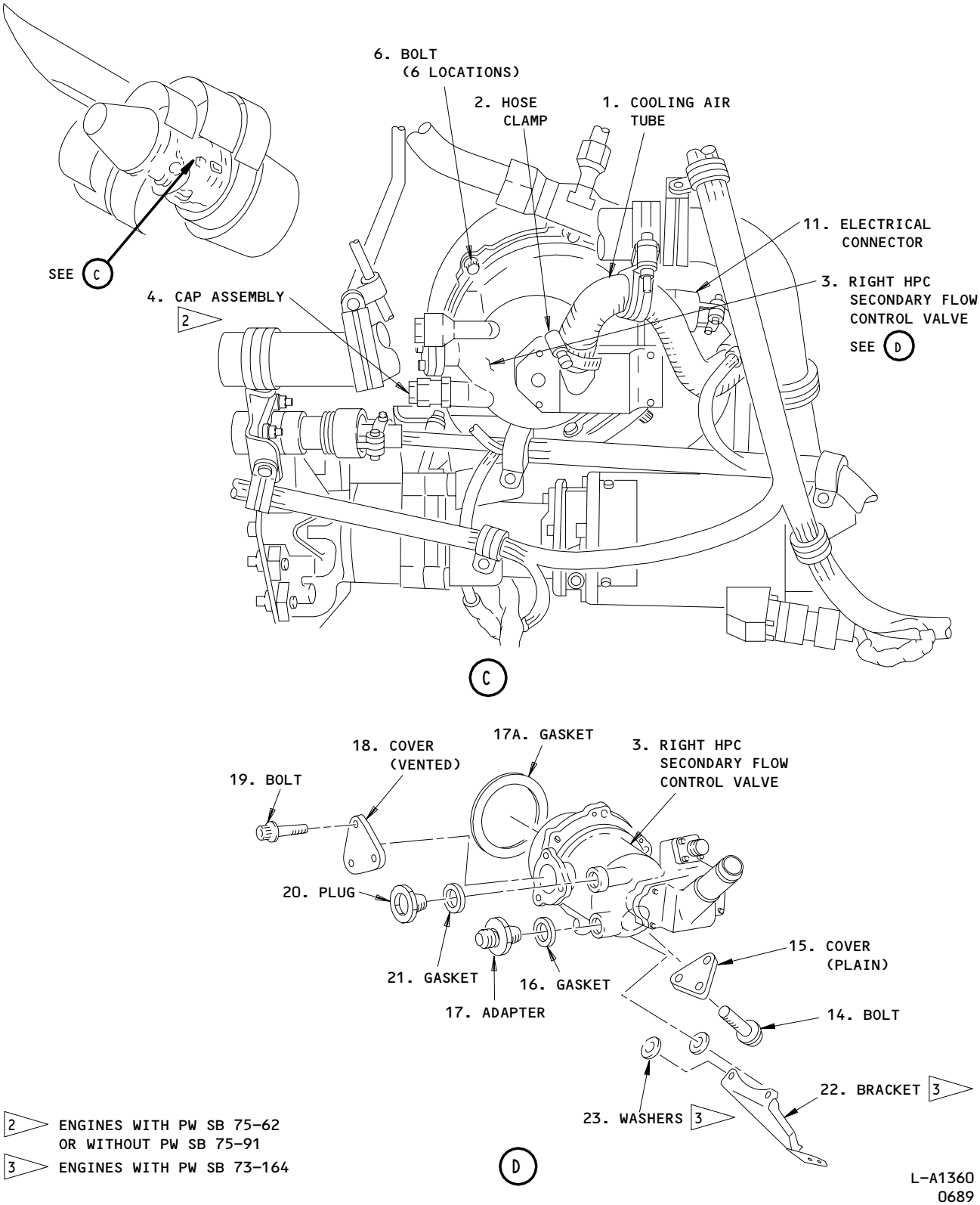
      S 014-002-N00
      (1) Open the fan cowl panels (AMM 71-11-04/201).



HPC Secondary Flow Control Valve Installation
Figure 401 (Sheet 1)

EFFECTIVITY
ENGINES WITHOUT PHASE 3 CHANGES

285326



HPC Secondary Flow Control Valve Installation
Figure 401 (Sheet 2)

S 044-003-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(2) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 014-004-N00

(3) Open the core cowl panels (AMM 71-11-06/201).

S 014-005-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(4) Open the thrust reversers (AMM 78-31-00/201).

D. Procedure

S 024-046-N00

(1) Remove the control valves (Fig. 401):
  (a) For the left control valve, remove the left 2.9 bleed valve (AMM 75-32-03/401).
  (b) ENGINES WITH THE 2.9 BLEED VALVE THERMOCOUPLE PROBE;
  For the left control valve, do the steps that follow:
    1) Remove the bolts (14) that attach the bracket.
    2) Move the bracket, with the harness attached, up and away from the control valve.
  (c) Disconnect the electrical connector (11) from the control valve (3).
    1) Install protection caps to the electrical connector (11) and the receptacle on the control valve (3).
  (d) ENGINES POST-PW-SB 75-91;
  Disconnect the air signal tube from the adapter (17).
  (e) Loosen the hose clamp (2) on the cooling air tube (1).
    1) Disconnect the cooling air tube (1) from the control valve (3).
  (f) For the left control valve, do the steps that follow:
    1) Loosen the clamp bolt (25).
    2) Remove the bolts (19) which attach the bracket (24) to the cover (18).
    3) Move the bracket (24) rearward and away from the control valve (3).

(g) ENGINES POST-PW-SB 73-164;
For the right control valve, do the steps that follow:
1) Remove the bolts (14) and washers (23) which attach the bracket (22).
2) Move the bracket (22) away from the control valve (3).
(h) ENGINES POST-PW-SB 79-52;
For the left control valve, do the steps that follow:
1) Remove the nut (27) and bolt (28) that attach the clamp (29) of the trim line oil tube (30) to the bracket (26).
2) Remove the bolts (6) which attach the control valve (3) and the bracket (26) to the HPC case.
(i) ENGINES PRE-PW-SB 79-52;
Remove the bolts (6) which attach the control valve (3) to the HPC case.
(j) Remove the control valve (3) from the engine.
1) Discard the gasket (17A).
(k) Install a protection cap to the mounting flange on the HPC case.

S 024-047-N00

(2) If it is necessary to replace the control valve, do the steps that follow:
(a) ENGINES POST-PW-SB 75-62 OR PRE-PW-SB 75-91;
Remove the cap assembly (4) from the adapter (17).
(b) Remove the adapter (17).
1) Discard the gasket (16).
(c) Remove the bolts (14, 19) which attach the covers (15, 18).
1) Remove the covers (15, 18).
(d) Remove the plug (20) from the control valve (3).
1) Discard the gasket (21).

S 024-050-N00

(3) Install protection caps to all openings in the control valve (3).

TASK 75-33-01-404-015-N00

3. Install the HPC Secondary Flow Control Valve

A. Equipment
(1) M303, M305, or M307 Bergen Mechanical Crimper
Bergen Cable Technologies Inc
170 Gregg St
P.O. Box 1300
Lodi, NJ 07644-9982
(2) Wrench - Strap, Model TG-70, Glenair, Inc., 1211 Air Way, Glendale, CA 91201; or Model BT-BS-601, Daniels Mfg. Corp., 6103 Anno Ave., Orlando, FL 32809

B. Consumable Materials
(1) D00137 Engine Oil - PWA 521
(2) G02030 Paraffin Wax - PMC 9552
(3) D50124 Paste, Anti-seize P06-054
(4) G02334 Lockwire - AS3214-02
(5) G02332 Ferrule - P05-292 (Optional)

(6) GO2335 Cable - Safety - PO5-291 (Optional)

C. Parts

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	3	HPC Secondary Flow Control Valve	75-33-01	01	45
	16	Gasket			15
	17A	Gasket			50
	21	Gasket			15

D. References

(1) AMM 70-24-05/201, Electrical Harnesses
(2) AMM 71-00-00/501, Power Plant - General
(3) AMM 71-11-04/201, Fan Cowl Panels
(4) AMM 71-11-06/201, Core Cowl Panels
(5) AMM 75-32-03/401, 2.9 Bleed Valve
(6) AMM 78-31-00/201, Thrust Reverser System

E. Access

(1) Location Zones

411 Left Engine
421 Right Engine

(2) Access Panels

413AL Fan Cowl Panel (Left), Left Engine
414AR Fan Cowl Panel (Right), Left Engine
415AL Thrust Reverser (Left), Left Engine
416AR Thrust Reverser (Right), Left Engine
417AL Core Cowl Panel (Left), Left Engine
418AR Core Cowl Panel (Right), Left Engine
423AL Fan Cowl Panel (Left), Right Engine
424AR Fan Cowl Panel (Right), Right Engine
425AL Thrust Reverser (Left), Right Engine
426AR Thrust Reverser (Right), Right Engine
427AL Core Cowl Panel (Left), Right Engine
428AR Core Cowl Panel (Right), Right Engine

F. Prepare to Install the Control Valves (Fig. 401)

S 424-051-N00

(1) Remove the protection caps from the openings in the control valve (3).

S 424-048-N00

(2) If it is necessary to install a new control valve, do the steps that follow:
(a) Install a new gasket (21) on the plug (20).
(b) Lubricate the threads of the plug (20) with engine oil.

(c) Install the plug (20) in the control valve (3).
1) Tighten the plug (20) to 110-120 pound-inches (12.4-13.6 newton-meters).
2) Safety the plug (20) with lockwire or safety cable and safety cable ferrule.
(d) Lubricate the threads of the bolts (14, 19) with engine oil.
(e) Install the covers (15, 18) on the control valve (3) with the bolts (14, 19).

NOTE: Make sure the vent holes in the vented cover (18) are on the side of the flange of the control valve.

1) Tighten the bolts (14, 19) with your hand.
(f) Install a new gasket (16) on the adapter (17).
(g) Lubricate the threads of the adapter (17) with engine oil.
(h) Install the adapter (17) to the control valve (3).
1) Tighten the adapter to 110-120 pound-inches (12.4-13.6 newton-meters).
(i) ENGINES POST-PW-SB 75-62R2 OR PRE-PW-SB 75-91;
Install the cap assembly (4) with the steps that follow:
1) Lubricate the threads of the cap assembly (4) with engine oil.
2) Install the cap assembly (4) to the adapter (17).
a) Hold the adapter (17) and tighten the cap assembly (4) to 270-300 pound-inches (30.5-33.9 newton-meters).
b) Safety the cap assembly (4) with lockwire or safety cable and safety cable ferrule.

G. Procedure

S 424-049-N00
(1) Install the control valves:
(a) Remove the protection cap from the mounting flange on the HPC case.
(b) Attach a new gasket (17A) on the mounting flange on the HPC case with paraffin wax.
(c) Lubricate the threads of the bolts (6), which attach the control valve (3), with engine oil.
(d) ENGINES PRE-PW-SB 79-52;
For the left control valve, install the control valve (3) with the bolts (6).
(e) ENGINES POST-PW-SB 79-52;
For the left control valve, install the control valve (3) and the bracket (26) with the bolts (6).
(f) For the right control valve, install the control valve (3) with the bolts (6).
(g) Tighten the bolts (6) from one side to the other to 85-95 pound-inches (9.6-10.7 newton-meters).
1) Without loosening, tighten the bolts (6) again until the necessary torque is kept.

(h) ENGINES POST-PW-SB 79-52;
For the left control valve, attach the trim line oil-tube with the steps that follow:
1) Lubricate the threads of the bolt (28) with engine oil.
2) Attach the clamp (29) of the trim line oil-tube (30) to the bracket (26) with the bolt (28) and the nut (27).
a) Tighten the nut (27) to 36-40 pound-inches (4.1-4.5 newton-meters).

(i) For the left control valve, do the steps that follow:
1) Attach the bracket (24) to the cover (18) with two bolts (19).
a) Tighten the bolts (19) with your hand.

(j) ENGINES WITH THE 2.9 BLEED VALVE THERMOCOUPLE PROBE;
For the left control valve, do the steps that follow:
1) Attach the bracket to the cover (15) with two bolts (14).
a) Tighten the bolts (14) with your hand.

(k) ENGINES POST-PW-SB 73-164;
For the right control valve, do the steps that follow:
1) Install the bracket (22) to the cover (15) with two bolts (14) and washers (23).
a) Tighten the bolts (14) with your hand.

(l) Tighten the bolts (14, 19) to 85-95 pound-inches (9.6-10.7 newton-meters).
1) Safety the bolts (14, 19) with lockwire or safety cable and safety cable ferrule.

(m) Tighten the bolt (25) to 36-40 pound-inches (4.1-4.5 newton-meters).

(n) Connect the cooling air tube (1) to the control valve (3).

(o) Attach the cooling air tube (1) with the hose clamp (2).
1) Tighten the hose clamp (2) to 15-18 pound-inches (1.7-2.0 newton-meters).

(p) ENGINES POST-PW-SB 75-91;
Connect the air signal tube to the adapter (17) with the steps that follow:
1) Lubricate the threads of the adapter (17) with anti-seize paste.
2) Connect the air signal tube to the adapter (17).
3) Hold the adapter (17) and tighten the nut of the air signal tube to 200-225 pound-inches (22.6-25.4 newton-meters).
4) Safety the nut of the air signal tube with lockwire or safety cable and safety cable ferrule.

(q) Remove the protection caps from the electrical connector (11) and the receptacle on the control valve (3).

CAUTION: USE THE CORRECT ASSEMBLY PROCEDURE AND TOOLS FOR THE HARNESS CONNECTOR INSTALLATION (AMM 70-24-05/201). IF YOU USE THE INCORRECT ASSEMBLY PROCEDURE, OR TOOLS, A DAMAGED OR LOOSE CONNECTOR CAN OCCUR. A LOOSE CONNECTOR PERMITS VIBRATION, WHICH CAUSES THE CONTACTS TO WEAR AND DECREASES THE LIGHTNING PROTECTION.

(r) Connect the electrical connector (11) to the receptacle on the control valve (3) (AMM 70-24-05/201).
1) Tighten the electrical connector (11) to 21-26 pound-inches (2.4-2.9 newton-meters).
2) Safety the electrical connector (11) with lockwire.

(s) For the left control valve, install the 2.9 bleed valve (AMM 75-32-03/401).

H. Return the Aircraft to Its Usual condition

S 414-030-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Close the thrust reversers (AMM 78-31-00/201).

S 414-031-N00

(2) Close the core cowl panels (AMM 71-11-06/201).

S 444-032-N00

(3) Do the activation procedure for the thrust reversers (AMM 78-31-00/201).

S 414-033-N00

(4) Close the fan cowl panels (AMM 71-11-04/201).

S 714-034-N00

(5) Do the test of the HPC Secondary Flow Control Valve that is shown in the Power Plant Test Reference Table (AMM 71-00-00/501).

HPC SECONDARY FLOW CONTROL VALVE, TURBINE VANE AND BLADE COOLING AIR VALVE SOLENOID - REMOVAL/INSTALLATION

1. General
   A. This procedure is for engines without the Phase 3 changes. For engines with the Phase 3 changes, do this procedure: Turbine Vane Cooling Air Valve and Turbine Vane and Blade Cooling Air Valve Solenoid (AMM 75-24-17/401).
   B. This procedure gives the instructions for the removal and the installation of the solenoid for the cooling air valve.

TASK 75-33-03-004-001-N00

2. Remove the HPC Secondary Control Valve, Turbine Vane and Blade Cooling Air Valve Solenoid
   A. References
      (1) AMM 71-11-04/201, Fan Cowl Panels
      (2) AMM 71-11-06/201, Core Cowl Panels
      (3) AMM 72-34-03/401, Fan Exit Liner Segments
      (4) AMM 78-31-00/201, Thrust Reverser System
   B. Access
      (1) Location Zones
          411 Left Engine
          421 Right Engine

      (2) Access Panels
          413AL Fan Cowl Panel (Left), Left Engine
          415AL Thrust Reverser (Left), Left Engine
          417AL Core Cowl Panel (Left), Left Engine
          423AL Fan Cowl Panel (Left), Right Engine
          425AL Thrust Reverser (Left), Right Engine
          427AL Core Cowl Panel (Left), Right Engine

   C. Prepare to Remove the Solenoid for the Cooling Air Valve.

      S 864-002-N00
      (1) For the left engine, open these circuit breakers on the overhead circuit breaker panel, P11, and attach the DO-NOT-CLOSE tags:
          (a) 11L3, L ENG PERF SOL CHAN A
          (b) 11L4, L ENG PERF SOL CHAN B

      S 864-003-N00
      (2) For the right engine, open these circuit breakers on the overhead circuit breaker panel, P11, and attach the DO-NOT-CLOSE tags:
          (a) 11L30, R ENG PERF SOL CHAN A
          (b) 11L31, R ENG PERF SOL CHAN B

      S 014-004-N00
      (3) Open the left fan cowl panel (AMM 71-11-04/201).

S 044-005-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

(4) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 014-006-N00

(5) Open the left core cowl panel (AMM 71-11-06/201).

S 014-007-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(6) Open the left thrust reverser (AMM 78-31-00/201).

S 014-036-N00

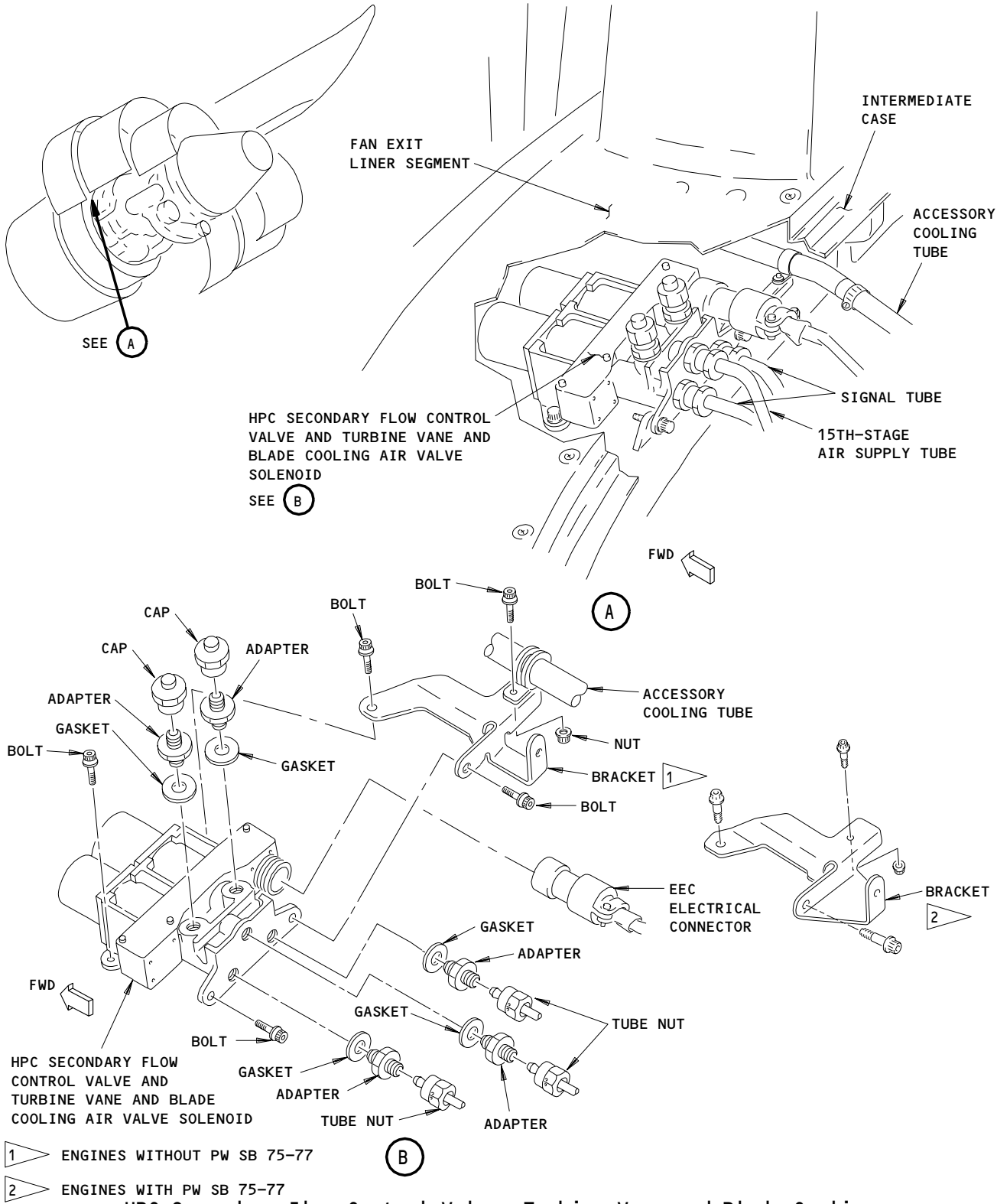
(7) Remove the fan exit liner segment at the 10 o'clock position (AMM 72-34-03/401).

D. Procedure

S 024-037-N00

(1) Remove the solenoid for the cooling air valve (Fig. 401):
  (a) Disconnect the electrical connector from the solenoid.
    1) Install a protection cap to the electrical connector.
  (b) Disconnect the tube nuts from the rear of the solenoid.
  (c) Remove the bolts which attach the solenoid and the bracket to the intermediate case.
  (d) Remove the solenoid from below the bracket and from the engine.

    NOTE: If necessary, loosen the clamp bolt and nut which attach the tube to the bracket to get sufficient clearance for the removal of the solenoid.



HPC Secondary Flow Control Valve, Turbine Vane and Blade Cooling Air Valve Solenoid Installation
Figure 401

(e) Install protection covers to the PS3 tubes.

S 024-038-N00

(2) If it is necessary to replace the solenoid, do the steps that follow:
(a) Remove the adapters and the gaskets from the rear of the solenoid.
(b) Remove the caps from the adapters on the top of the solenoid.
(c) Remove the adapters and the gaskets from the ports on the top of the solenoid.
(d) Install protection covers to all openings in the solenoid.

TASK 75-33-03-404-015-N00

3. Install the HPC Secondary Flow Control Valve, Turbine Vane and Blade Cooling Air Valve Solenoid

A. Equipment
(1) M303, M305, or M307 Bergen Mechanical Crimper
Bergen Cable Technologies Inc
170 Gregg St
P.O. Box 1300
Lodi, NJ 07644-9982

B. Consumable Materials
(1) D00137 Engine Oil - PWA 521
(2) D50124 Paste Anti-seize -PWA 36246
(3) G02334 Lockwire - AS3214-02
(4) G02332 Ferrule - P05-292 (Optional)
(5) G02335 Cable - Safety - P05-291 (Optional)

C. References
(1) AMM 70-24-05/201, Electrical Harnesses
(2) AMM 71-00-00/501, Power Plant
(3) AMM 71-11-04/201, Fan Cowl Panels
(4) AMM 71-11-06/201, Core Cowl Panels
(5) AMM 72-34-03/401, Fan Exit Liner Segments
(6) AMM 78-31-00/201, Thrust Reverser System

D. Access
(1) Location Zones
411 Left Engine
421 Right Engine

(2) Access Panels

413AL	Fan Cowl Panel (Left), Left Engine
415AL	Thrust Reverser (Left), Left Engine
417AL	Core Cowl Panel (Left), Left Engine
423AL	Fan Cowl Panel (Left), Right Engine
425AL	Thrust Reverser (Left), Right Engine
427AL	Core Cowl Panel (Left), Right Engine

E. Prepare to Install the Solenoid for the Cooling Air Valve (Fig. 401)

S 424-040-N00

(1) If it is necessary to install a new solenoid, do the steps that follow:
   (a) Remove all protection covers from the solenoid.
   (b) Lubricate the threads of the adapters, which are installed on the top of the solenoid, with oil.
   (c) Install the adapters with the gaskets in the ports on the top of the solenoid.
      1) Tighten the adapters to 65-75 pound-inches (7.3-8.5 newton-meters).
   (d) Lubricate the threads of the caps with oil.
   (e) Install the caps to adapters on the top of the solenoid.
      1) Tighten the caps to 90-100 pound-inches (10.2-11.3 newton-meters).
      2) Safety the caps with lockwire or safety cable and safety cable ferrule.
   (f) Lubricate the threads of the adapters, which are installed on the rear of the solenoid, with oil.
   (g) Install the adapters with the gaskets in the ports on the rear of the solenoid.

      NOTE: Install the larger adapter in the center port.

      1) Tighten the outer adapters to 110-120 pound-inches (12.4-13.6 newton-meters).
      2) Tighten the center adapter to 150-170 pound-inches (16.9-19.2 newton-meters).

F. Procedure

S 424-039-N00

(1) Install the solenoid for the cooling air valve.
   (a) Remove the protection covers from the PS3 tubes.

(b) Lubricate the threads of the bolts, which attach the solenoid, with oil.
(c) Install the solenoid on the intermediate case at the approximately 10:00 o'clock position with the bolts.
1) Tighten the bolts to 85-95 pound-inches (9.6-10.7 newton-meters).
(d) If the clamp bolt was loosened to remove the solenoid, tighten the clamp bolt to 36-40 pound-inches (4.1-4.5 newton-meters).
(e) Lubricate the threads of the center adapter on the rear of the solenoid with the antigalling compound.
(f) Connect the PS3 supply tube to the center adapter on the rear of the solenoid.
1) Tighten the tube nut to 225-250 pound-inches (25.4-28.2 newton-meters).
(g) Lubricate the threads of the outer adapters on the rear of the solenoid with oil.
(h) Connect the PS3 signal tubes to the outer adapters on the rear of the solenoid.
1) Tighten the tube nuts to 270-300 pound-inches (30.5-33.9 newton-meters).
(i) Safety the three PS3 tube nuts with lockwire or safety cable and safety cable ferrule.
(j) Remove the protection cap from the electrical connector.

CAUTION: USE THE CORRECT ASSEMBLY PROCEDURE, AND TOOLS, FOR THE HARNESS CONNECTOR INSTALLATION (AMM 70-24-05/201). IF YOU USE THE INCORRECT ASSEMBLY PROCEDURE, OR TOOLS, A DAMAGED OR LOOSE CONNECTOR CAN OCCUR. A LOOSE CONNECTOR PERMITS VIBRATION, WHICH CAUSES THE CONTACTS TO WEAR AND DECREASES THE LIGHTNING PROTECTION.

(k) Connect the electrical connector to the solenoid (AMM 70-24-05/201).

G. Return the Aircraft to Its Usual Condition

S 414-041-N00
(1) Install the fan exit liner segment at the 10 o'clock position (AMM 72-34-03/401).

S 414-027-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Close the left thrust reverser (AMM 78-31-00/201).

S 414-028-N00

(3) Close the left core cowl panel (AMM 71-11-06/201).

S 414-029-N00

(4) Close the left fan cowl panel (AMM 71-11-04/201).

S 444-030-N00

(5) Do the activation procedure for the thrust reversers (AMM 78-31-00/201).

S 864-031-N00

(6) For the left engine, remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:
(a) 11L3, L ENG PERF SOL CHAN A
(b) 11L4, L ENG PERF SOL CHAN B

S 864-032-N00

(7) For the right engine, remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:
(a) 11L30, R ENG PERF SOL CHAN A
(b) 11L31, R ENG PERF SOL CHAN B

S 714-033-N00

(8) Do the test of the HPC Secondary Flow Control Valve, Turbine Vane and Blade Cooling Air Valve Solenoid that is shown in the Power Plant Test Reference Table (AMM 71-00-00/501).

HPC SECONDARY FLOW CONTROL VALVE, IDG AIR/OIL HEAT EXCHANGER OVERRIDE SOLENOID - REMOVAL/INSTALLATION

1. General
   A. This procedure is for engines without the Phase 3 changes. For engines with the Phase 3 changes, do this procedure: Turbine Vane and Blade Cooling Air Valve and IDG Air/Oil Heat Exchanger Valve Override Solenoid (AMM 75-24-15/401).
   B. This procedure gives the instructions for the removal and the installation of the override solenoid.

TASK 75-33-04-004-001-N00

2. Remove the HPC Secondary Flow Control Valve, IDG Air/Oil Heat Exchanger Override Solenoid
   A. References
      (1) AMM 71-11-04/201, Fan Cowl Panels
      (2) AMM 71-11-06/201, Core Cowl Panels
      (3) AMM 72-34-03/401, Fan Exit Liner Segment
      (4) AMM 78-31-00/201, Thrust Reverser System
   B. Access
      (1) Location Zones
          411 Left Engine
          421 Right Engine

      (2) Access Panels
          414AR Fan Cowl Panel (Right), Left Engine
          416AR Thrust Reverser (Right), Left Engine
          418AR Core Cowl Panel (Right), Left Engine
          424AR Fan Cowl Panel (Right), Right Engine
          426AR Thrust Reverser (Right), Right Engine
          428AR Core Cowl Panel (Right), Right Engine

   C. Prepare to Remove the Override Solenoid

      S 864-002-N00
      (1) For the left engine, open these circuit breakers on the overhead circuit breaker panel, P11, and attach the DO-NOT-CLOSE tags:
          (a) 11L3, L ENG PERF SOL CHAN A
          (b) 11L4, L ENG PERF SOL CHAN B

      S 864-003-N00
      (2) For the right engine, open these circuit breakers on the overhead circuit breaker panel, P11, and attach the DO-NOT-CLOSE tags:
          (a) 11L30, R ENG PERF SOL CHAN A
          (b) 11L31, R ENG PERF SOL CHAN B

      S 014-004-N00
      (3) Open the right fan cowl panel (AMM 71-11-04/201).

S 044-005-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

(4) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 014-006-N00

(5) Open the right core cowl panel (AMM 71-11-06/201).

S 014-007-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(6) Open the right thrust reverser (AMM 78-31-00/201).

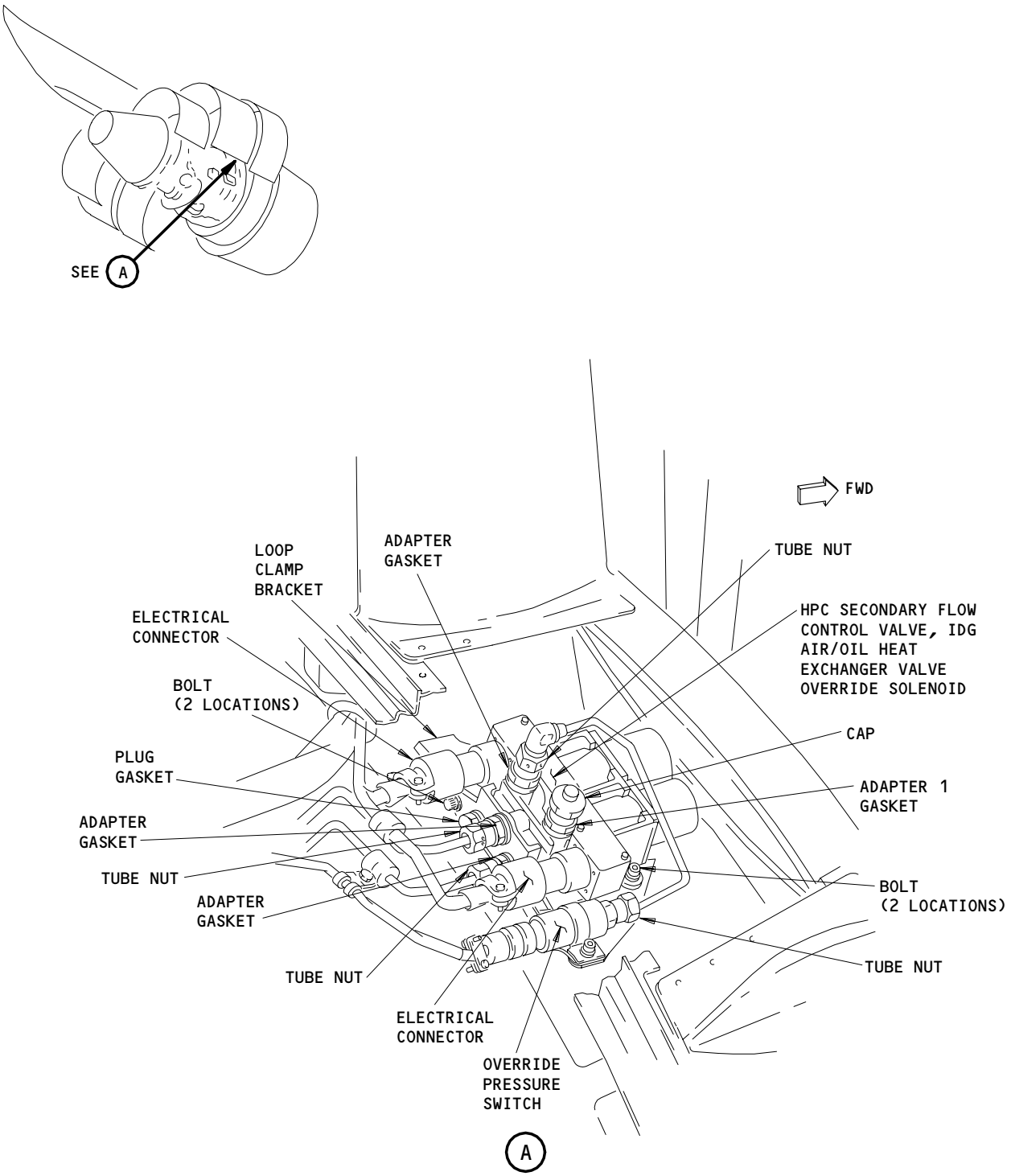
S 014-043-N00

(7) Remove the section of the fan exit liner at the 1 o'clock position (AMM 72-34-03/401).

D. Procedure

S 024-045-N00

(1) Remove the override solenoid (Fig. 401):
  (a) Disconnect the electrical connectors from the override solenoid.
    1) Install protection caps to the electrical connectors.
  (b) Disconnect the two tube nuts from the rear of the override solenoid.
  (c) Disconnect the tube nut for the override pressure switch sense-line from the top of the override solenoid.



HPC Secondary Flow Control Valve IDG Air/Oil Heat Exchanger
Valve Override Solenoid
Figure 401

(d) Disconnect the tube nut of the override pressure switch sense-line from the override pressure switch.
(e) Remove the override pressure switch sense-line from the engine.
(f) Remove the four bolts which attach the solenoid, the loop clamp bracket and the bracket for the override pressure switch to the intermediate case.
(g) Move the bracket with the override pressure switch away from the work area.
(h) Remove the override solenoid from below the loop clamp bracket.
(i) Install protection covers on the PS3 tubes.

S 024-046-N00

(2) If it is necessary to replace the override solenoid, do the steps that follow:
(a) Remove the two adapters and the plug from the rear of the override solenoid.
1) Discard the gaskets.
(b) Remove the cap from the adapter on the top of the override solenoid.
(c) Remove the two adapters from the top of the override solenoid.
1) Discard the gaskets.
(d) Install protection covers to all openings in the override solenoid.

TASK 75-33-04-404-019-N00

3. Install the HPC Secondary Flow Control Valve, IDG Air/Oil Heat Exchanger Valve Override Solenoid

A. Equipment
(1) M303, M305, or M307 Bergen Mechanical Crimper
Bergen Cable Technologies Inc
170 Gregg St
P.O. Box 1300
Lodi, NJ 07644-9982

B. Consumable Materials
(1) D00137 Engine Oil - PWA 521

(2) D50124 Anti-seize paste - PWA 36246
(3) G02334 Lockwire - AS3214-02
(4) G02332 Ferrule - P05-292 (Optional)
(5) G02335 Cable - Safety - P05-291 (Optional)

C. References
(1) AMM 70-24-05/201, Electrical Harnesses
(2) AMM 71-00-00/501, Power Plant
(3) AMM 71-11-04/201, Fan Cowl Panels
(4) AMM 71-11-06/201, Core Cowl Panels
(5) AMM 72-34-03/401, Fan Exit Liner Segment
(6) AMM 78-31-00/201, Thrust Reverser System

D. Access
(1) Location Zones
411 Left Engine
421 Right Engine

(2) Access Panels
414AR Fan Cowl Panel (Right), Left Engine
416AR Thrust Reverser (Right), Left Engine
418AR Core Cowl Panel (Right), Left Engine
424AR Fan Cowl Panel (Right), Right Engine
426AR Thrust Reverser (Right), Right Engine
428AR Core Cowl Panel (Right), Right Engine

E. Prepare to Install the Override Solenoid (Fig. 401)

S 424-048-N00
(1) If it is necessary to install a new override solenoid, do the steps that follow:
(a) Remove all protection covers from the override solenoid.
(b) Lubricate the threads of the two adapters, which are installed on the top of the override solenoid, with oil.
(c) Install the two adapters with the gaskets in the ports on the top of the override solenoid.
1) Tighten the two adapters to 65-75 pound-inches (7.3-8.5 newton-meters).
(d) Lubricate the threads of the cap with oil.
(e) Install the cap to the right adapter on the top of the override solenoid.
1) Hold the adapter and tighten the cap to 90-100 pound-inches (10.2-11.3 newton-meters).
(f) Lubricate the threads of the two adapters, which are installed on the rear of the override solenoid, with oil.

(g) Install the larger adapter with the gasket in the center port on the rear of the override solenoid.
1) Tighten the adapter to 150-170 pound-inches (16.9-19.2 newton-meters).
(h) Install the smaller adapter with the gasket to the right port on the rear of the override solenoid.
1) Tighten the adapter to 110-120 pound-inches (12.4 -13.6 newton-meters).
(i) Lubricate the threads of the plug, which is installed in the left port on the rear of the override solenoid, with oil.
(j) Install the plug with the gasket in the left port on the rear of the override solenoid.
1) Tighten the plug to 110-120 pound-inches (12.4-13.6 newton-meters).

F. Procedure

S 424-047-N00

(1) Install the override solenoid:
(a) Remove the protection covers from the PS3 tubes.
(b) Install the override solenoid below the loop clamp bracket on the intermediate case at approximately the 1:00 o'clock position.
(c) Put the bracket with the override pressure switch in position.
(d) Lubricate the threads of the bolts, which attach the override solenoid and the brackets, with oil.
(e) Attach the override solenoid and the brackets with the bolts.
1) Tighten the bolts to 85-95 pound-inches (9.6-10.7 newton-meters).
(f) Lubricate the threads of the center adapter on the rear of the override solenoid with anti-seize paste.
(g) Install the PS3 supply tube to the center adapter on the rear of the override solenoid.
1) Tighten the tube nut to 225-250 pound-inches (25.4-28.2 newton-meters).
(h) Lubricate the threads of the lower adapter on the rear of the override solenoid with oil.

(i) Install the PS3 signal tube to the lower adapter on the rear of the override solenoid.
1) Tighten the tube nut to 270-300 pound-inches (30.5-33.9 newton-meters).
(j) Safety the two tube nuts and the plug with lockwire or safety cable and safety cable ferrule.
(k) Do the steps that follow to install the override pressure switch sense-line.
1) Lubricate the threads of the tube nut at the elbow end of the sense-line with oil.
2) Lubricate the threads of the tube nut at the straight end of the sense-line with the anti-seize paste.
3) Install the sense-line with the elbow end at the override solenoid and the straight end at the override pressure switch.
4) Tighten the tube nut at the elbow end of the sense-line to 90-100 pound-inches (10.7-11.3 newton-meters).
5) Tighten the tube nut at the straight end of the sense-line to 65-75 pound-inches (7.3-8.5 newton-meters).
6) Safety the two tube nuts and the cap with lockwire or safety cable and safety cable ferrule.
(l) Remove the protection caps from the electrical connectors.

CAUTION: USE THE CORRECT ASSEMBLY PROCEDURE, AND TOOLS, FOR THE HARNESS CONNECTOR INSTALLATION (AMM 70-24-05/201). IF YOU USE THE INCORRECT ASSEMBLY PROCEDURE, OR TOOLS, A DAMAGED OR LOOSE CONNECTOR CAN OCCUR. A LOOSE CONNECTOR PERMITS VIBRATION, WHICH CAUSES THE CONTACTS TO WEAR AND DECREASES THE LIGHTNING PROTECTION.

(m) Connect the electrical connectors to the override solenoid (AMM 70-24-05/201).

G. Return the Aircraft to Its Usual Condition

S 414-044-N00
(1) Install the section of the fan exit liner at the 1 o'clock position (AMM 72-34-03/401).

S 414-034-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Close the right thrust reverser (AMM 78-31-00/201).

S 414-035-N00
(3) Close the right core cowl panel (AMM 71-11-06/201).

S 414-036-N00
(4) Close the right fan cowl panel (AMM 71-11-06/201).

S 444-037-N00
(5) Do the activation procedure for the thrust reversers (AMM 78-31-00/201).

S 864-038-N00
(6) For the left engine, remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:
(a) 11L3, L ENG PERF SOL CHAN A
(b) 11L4, L ENG PERF SOL CHAN B

S 864-039-N00
(7) For the right engine, remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:
(a) 11L30, R ENG PERF SOL CHAN A
(b) 11L31, R ENG PERF SOL CHAN B

S 714-040-N00
(8) Do the test of the HPC Secondary Flow Control Valve, IDG Air/Oil Heat Exchanger Override Solenoid that is shown in the Power Plant Test Reference Table (AMM 71-00-00/501).

PS3 AIR FILTER ASSEMBLY - MAINTENANCE PRACTICES

1. General
   A. Tihs procedure has four tasks. The first task removes the filter element for the PS3 air. The second task does an inspection of the filter element. The third task cleans the filter element. The fourth task installs the filter element.
   B. The filter element is a part of an assembly of the PS3 air filter. You do not have to remove the assembly to remove the filter element. The two (top and bottom) filters are found on each side of the HPC forward case at the 1:30 and 11 o'clock positions. The top right filter cleans the 15th-stage (muscle) air supply to the control valve for HPC secondary flow and the override solenoid for the IDG air/oil heat exchanger valve, the 2.9 bleed valve solenoid, and the stability pneumatic relay valve. The bottom right filter cleans the muscle air supply to the right control valve for HPC secondary flow. The top left filter cleans the muscle air supply to the cooling air valves for the turbine vane and blade. The bottom left filter cleans the muscle air supply to the left control valve for the HPC secondary flow.
   C. You can get access to the filter element through the right or left thrust reverser for the filter element found at the 1:30 or 11 o'clock position.

TASK 75-33-05-002-001-N00

2. Remove the PS3 Air Filter Element
   A. References
      (1) AMM 71-11-04/201, Fan Cowl Panels
      (2) AMM 71-11-06/201, Core Cowl Panels
      (3) AMM 78-31-00/201, Thrust Reverser System
   B. Access
      (1) Location Zones
          411 Left Engine
          421 Right Engine

      (2) Access Panels
          415AL Fan Reverser (Left)
          416AR Fan Reverser (Right)
          425AL Fan Reverser (Left)
          426AR Fan Reverser (Right)

C. Prepare to Remove the Filter Element for the PS3 Air

S 012-002-N00
(1) Open the fan cowl panel (AMM 71-11-04/201).

S 042-003-N00

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

(2) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 012-004-N00
(3) Open the core cowl panel (AMM 71-11-06/201).

S 012-005-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

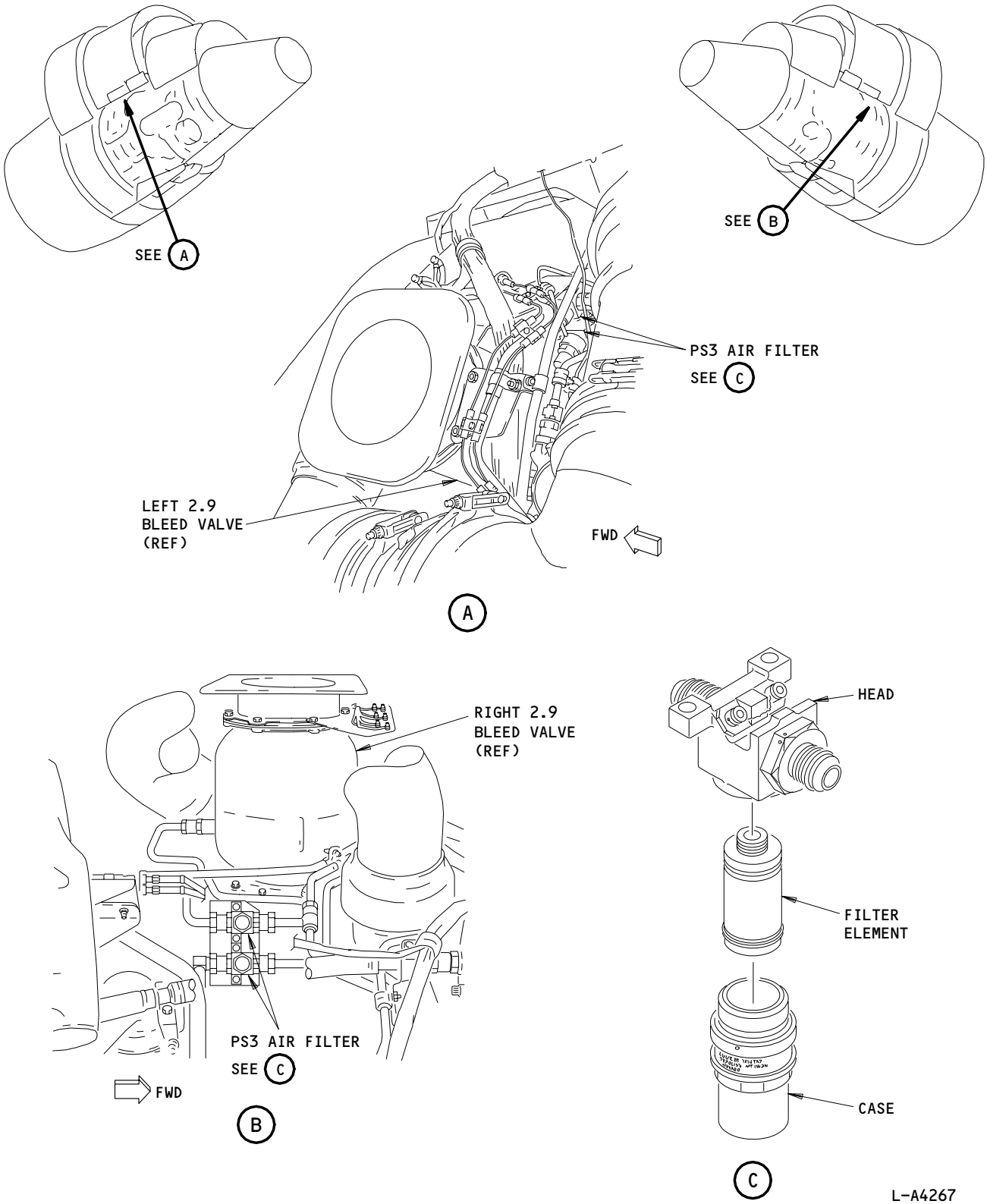
(4) Open the thrust reverser (AMM 78-31-00/201).

D. Remove the Filter Element of the PS3 Air (Fig. 201)

S 032-006-N00
(1) Remove the case for the filter element from the head.

S 022-007-N00
(2) Turn the filter element counterclockwise to remove it from the head assembly.

S 032-008-N00
(3) Install the protection covers on the head.



PS3 Air Filter Element Installation
Figure 201

TASK 75-33-05-202-009-N00

3. Do the Inspection of the PS3 Air Filter Element

A. Access

(1) Location Zones

411 Left Engine
421 Right Engine

(2) Access Panels

415AL Fan Reverser (Left)
416AR Fan Reverser (Right)
425AL Fan Reverser (Left)
426AR Fan Reverser (Right)

B. Do the Inspection of the Filter Element for the PS3 Air

S 022-010-N00

(1) If the filter element is not removed, do the task to remove the filter element.

S 212-011-N00

(2) Examine the filter element for signs of contamination which has collected.

S 112-012-N00

(3) If contamination was found, do the task to clean the filter element.

S 422-013-N00

(4) Do the task to install the filter element.

TASK 75-33-05-112-014-N00

4. Clean the PS3 Air Filter Element

A. Equipment

(1) Air Source - Compressed, Clean, Filtered, Dry - 20 psi (138 kPa)
(2) Brush - Stiff Bristle, nonmetallic, commercially available

B. Consumable Materials

(1) G00834 Cloth - Cotton, Lint-free
(2) B00534 Solvent - PD 680 (AMSCO 460)

C. Access

(1) Location Zones

411 Left Engine
421 Right Engine

(2) Access Panels

415AL Fan Reverser (Left)
416AR Fan Reverser (Right)
425AL Fan Reverser (Left)
426AR Fan Reverser (Right)

D. Clean the Filter Element of the PS3 Air

S 022-015-N00

(1) If the filter element is not removed, do the task to remove the filter element.

S 112-016-N00

(2) Soak the filter element in the solvent.
(a) Clean the filter element with the bristle brush.

S 112-017-N00

(3) Make the filter element dry with a clean, lint-free cloth or compressed air, which is filtered and free of water, at a maximum pressure you can release it at of 20 psi (138 kPa).

S 212-018-N00

(4) Examine the filter element for contamination.
(a) If you find contamination, do the task to clean the filter element again.

S 962-019-N00

(5) If the you cannot remove the contamination from the filter element, replace the filter element.

S 422-020-N00

(6) Do the task to install the filter element.

TASK 75-33-05-402-021-N00

5. Install PS3 Air Filter Element (Fig. 201)

A. References

(1) AMM 71-11-04/201, Fan Cowl Panels
(2) AMM 71-11-06/201, Core Cowl Panels
(3) AMM 78-31-00/201, Thrust Reverser System

B. Access

(1) Location Zones

411 Left Engine
421 Right Engine

(2) Access Panels

415AL Fan Reverser (Left)
416AR Fan Reverser (Right)
425AL Fan Reverser (Left)
426AR Fan Reverser (Right)

C. Install the Filter Element for the PS3 Air

S 432-022-N00

(1) Remove the protection covers from the head.

S 422-023-N00

(2) Install the filter element into the head.
(a) Tighten the filter element with your hand.

S 432-024-N00

(3) Install the case on the head.
(a) Tighten the case to 20 - 25 pound-inches (2.3 - 2.8 newton-meters).

D. Put the Airplane Back to Its Usual Condition

S 412-025-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Close the thrust reverser (AMM 78-31-00/201).

S 412-026-N00
(2) Close the core cowl panel (AMM 71-11-06/201).

S 412-027-N00
(3) Close the fan cowl panels (AMM 71-11-04/201).

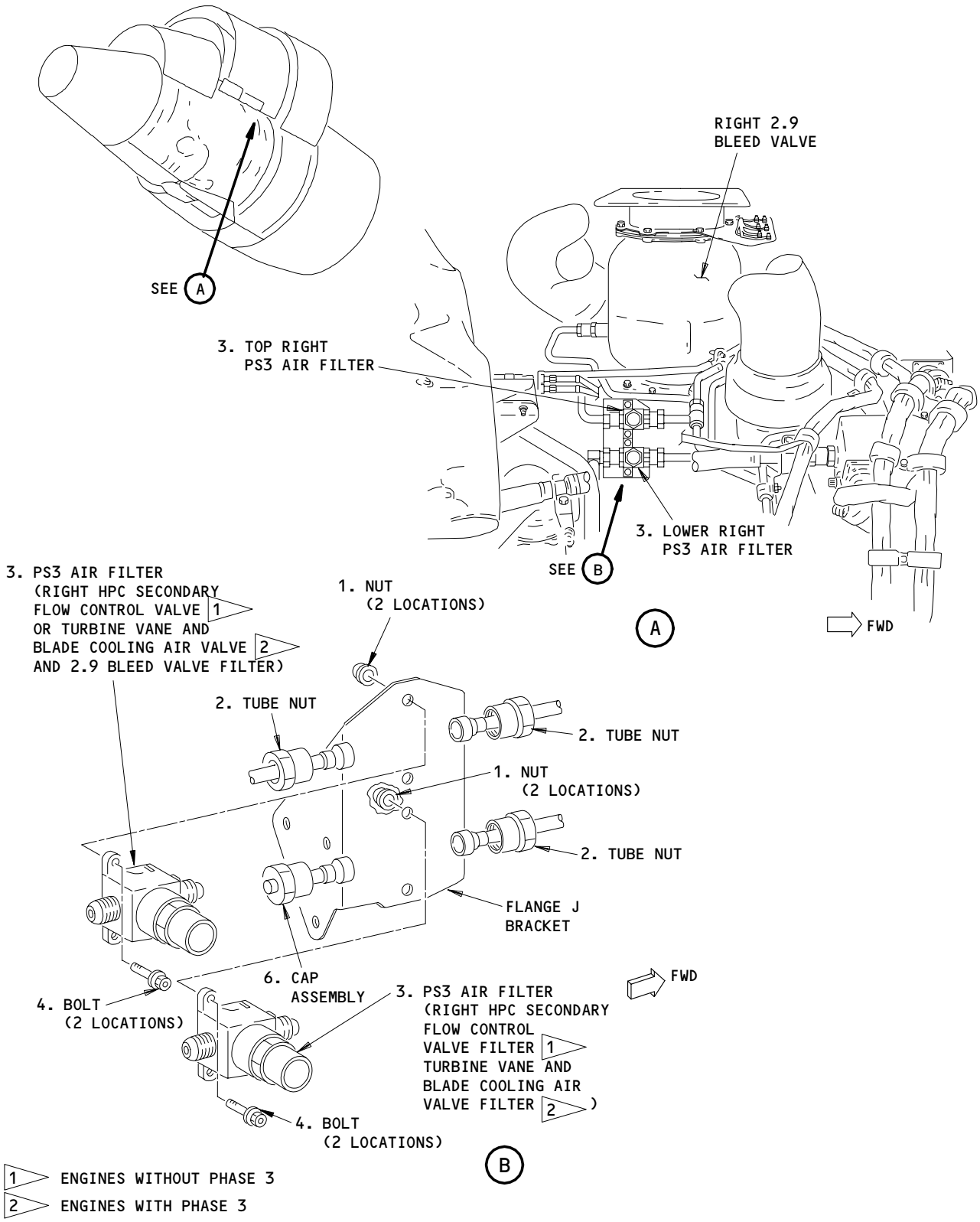
S 442-028-N00
(4) Do the activation procedure for the thrust reversers (AMM 78-31-00/201).

PS3 AIR FILTER ASSEMBLY - REMOVAL/INSTALLATION

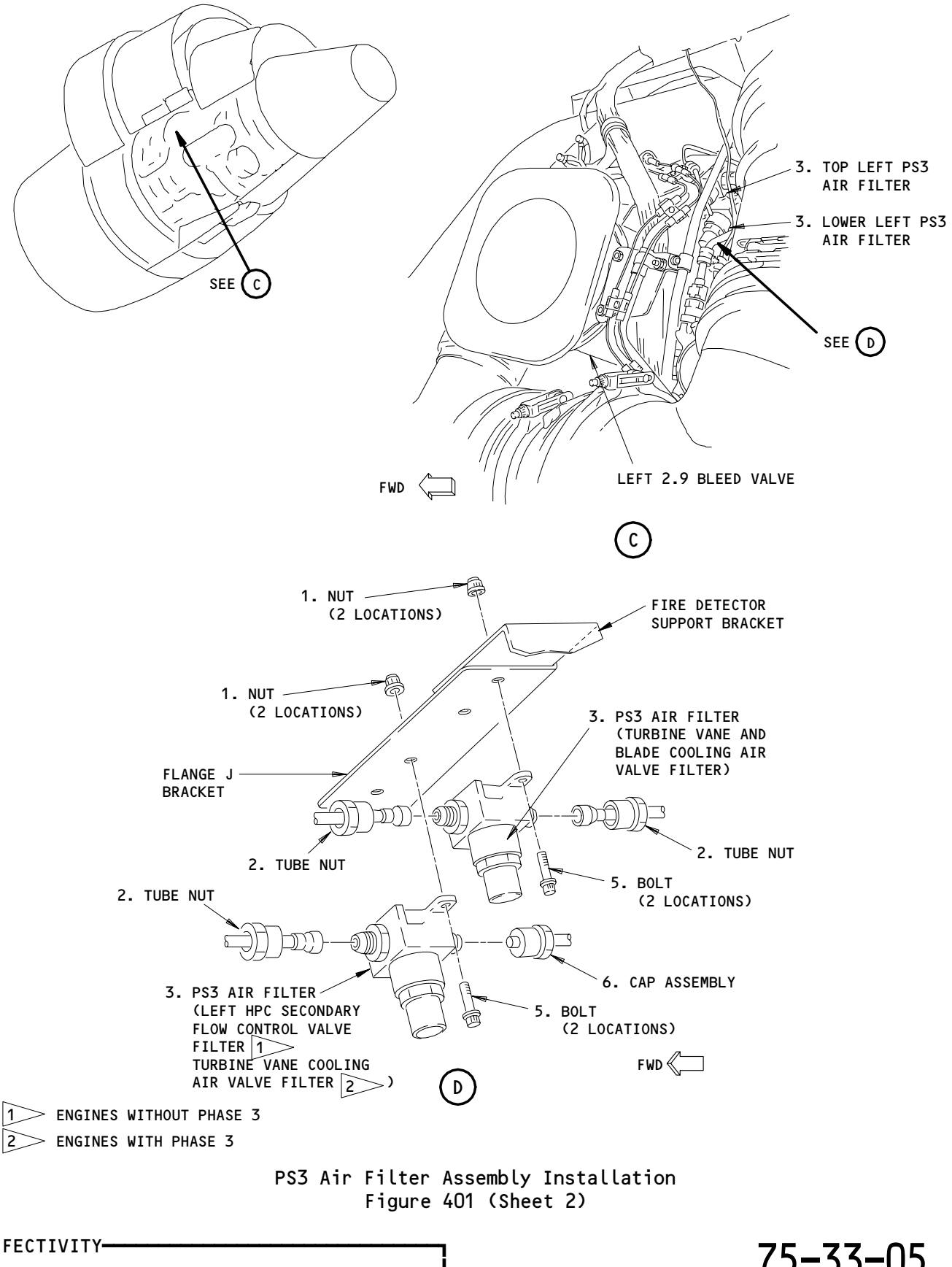
1. General
   A. This procedure gives the instructions for the removal and the installation of the PS3 air filter assembly. For the removal and the installation of the filter element for the PS3 air filter, refer to AMM 75-33-05/201.
   B. Two (top and lower) filters are installed on each side of the HPC forward case at the 1:30 and 11 o'clock positions. The filters on engines without Phase 3 changes clean the Ps3 air as follows:
      (1) The top right filter cleans the 15th-stage (muscle) air supply to the solenoids for the control valve for the HPC secondary flow and the IDG air/oil heat exchanger valve, the solenoid for the 2.9 bleed valve, and the stability pneumatic relay valve.
      (2) The lower right filter cleans the muscle air supply to the right control valve for the HPC secondary flow.
      (3) The top left filter cleans the muscle air supply to the solenoid for the control valves for the TVBCA on the HPC rear case.
      (4) The lower left filter cleans the muscle air supply to the left control valve for the HPC secondary flow.
   C. The filters on engines with Phase 3 changes clean the Ps3 air as follows:
      (1) The top right filter cleans the 15th-stage (muscle) air supply to solenoids for the Turbine Vane and Blade Cooling Air (TVBCA) valve and the IDG air/oil heat exchanger valve, the solenoid for the 2.9 bleed valve, and the stability pneumatic relay valve.
      (2) The lower right filter cleans the muscle air supply to the right control valve for the TVBCA.
      (3) The top left filter cleans the muscle air supply to the solenoid for the control valves for the TVBCA.
      (4) The lower left filter cleans the muscle air supply to the left control valve for the Turbine Vane Cooling Air.
   D. You can get access to the PS3 air filter assembly through the applicable thrust reverser half.

TASK 75-33-05-004-053-N00

2. Remove the PS3 Air Filter Assembly (Fig. 401)
   A. References
      (1) AMM 71-11-04/201, Fan Cowl Panels
      (2) AMM 71-11-06/201, Core Cowl Panels
      (3) AMM 78-31-00/201, Thrust Reverser System
   B. Access
      (1) Location Zones
          411 Left Engine
          421 Right Engine



PS3 Air Filter Assembly Installation
Figure 401 (Sheet 1)



PS3 Air Filter Assembly Installation
Figure 401 (Sheet 2)

(2) Access Panels

414AR	Fan Cowl Panel (Right), Left Engine
416AR	Thrust Reverser (Right), Left Engine
418AR	Core Cowl Panel (Right), Left Engine
424AR	Fan Cowl Panel (Right), Right Engine
426AR	Thrust Reverser (Right), Right Engine
428AR	Core Cowl Panel (Right), Right Engine

C. Prepare to Remove the PS3 Air Filter

S 014-052-N00

(1) Open the fan cowl panels (AMM 71-11-04/201).

S 044-030-N00

WARNING: DO THE DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

(2) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).

S 014-051-N00

(3) Open the core cowl panel (AMM 71-11-06/201).

S 014-054-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 TO OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(4) Open the thrust reverser (AMM 78-31-00/201).

D. Procedure

S 024-074-N00

(1) Remove the PS3 air filter:
   (a) Disconnect the tube nuts (2) from the PS3 air filter (3).
   (b) Remove the cap assembly (6) from the PS3 air filter (3).
   (c) For the right PS3 air filter (3), remove the bolts (4) and nuts (1) which attach the PS3 air filter (3) to the flange J bracket.
   (d) For the left PS3 air filter (3), remove the bolts (5) and nuts (1) which attach the PS3 air filter (3) to the flange J bracket.
   (e) Remove the PS3 air filter (3) from the engine.
   (f) Install protection caps to the openings on the PS3 air filter and the tubes.

TASK 75-33-05-404-061-N00

3. Install the PS3 Air Filter Assembly (Fig. 401)

A. Equipment

(1) M303, M305, or M307 Bergen Mechanical Crimper
Bergen Cable Technologies Inc
170 Gregg St
P.O. Box 1300
Lodi, NJ 07644-9982

B. Consumable Materials

(1) D00390 Oil - Engine
(2) D50124 Paste - Anti-seize - P06-054
(3) G02334 Lockwire - AS3214-02
(4) G02332 Ferrule - P05-292 (Optional)
(5) G02335 Cable - Safety - P05-291 (Optional)

C. Parts

AMM			AIPC		
FIG	ITEM	NOMENCLATURE	SUBJECT	FIG	ITEM
401	3	PS3 Air Filter Assembly	75-33-02	01	20,23

D. References

(1) AMM 71-00-00/501, Power Plant
(2) AMM 71-11-04/201, Fan Cowl Panels
(3) AMM 71-11-06/201, Core Cowl Panels
(4) AMM 78-31-00/201, Thrust Reverser System

E. Access

(1) Location Zones
411 Left Engine
421 Right Engine

(2) Access Panels

414AR	Fan Cowl Panel (Right), Left Engine
416AR	Thrust Reverser (Right), Left Engine
418AR	Core Cowl Panel (Right), Left Engine
424AR	Fan Cowl Panel (Right), Right Engine
426AR	Thrust Reverser (Right), Right Engine
428AR	Core Cowl Panel (Right), Right Engine

F. Procedure

S 424-075-N00

(1) Install the PS3 air filter:
   (a) Remove the protection caps from the PS3 air filter (3) and the tubes.
   (b) For the right PS3 air filter (3), do the steps that follow:
      1) Lubricate the threads of the bolts (4) with engine oil.
      2) Attach the PS3 air filter (3) to the flange J bracket with the bolts (4).
      3) Tighten the bolts (4) to 36-40 pound-inches (4.1-4.5 newton-meters).
   (c) For the left PS3 air filter (3), do the steps that follow:
      1) Lubricate the threads of the bolts (5) with engine oil.
      2) Attach the PS3 air filter (3) to the flange J bracket with the bolts (5).
      3) Tighten the bolts (5) to 36-40 pound-inches (4.1-4.5 newton-meters).
   (d) Lubricate the tube nuts (2) with the anti-seize paste.
   (e) Connect the tube nuts (2) to the PS3 air filter (3).
      1) Tighten the tube nuts (2) to 200-225 pound-inches (22.6-25.4 newton-meters).
      2) Safety the forward tube to the adapter with lockwire or safety cable and safety cable ferrule.
      3) Safety the aft tube to the head of the PS3 air filter (3) with lockwire or safety cable and safety cable ferrule.
   (f) Lubricate the threads of the cap assembly (6) with engine oil.
   (g) Install the cap assembly (6) to the PS3 air filter (3).
      1) Tighten the cap assembly (6) to 270-300 pound-inches (30.5-33.9 newton-meters).
      2) Safety the cap assembly (6) with lockwire or safety cable and safety cable ferrule.

G. Return the Aircraft to Its Usual Condition

S 414-068-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 TO CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Close the thrust reverser (AMM 78-31-00/201).

S 414-072-N00
(2) Close the core cowl panels (AMM 71-11-06/201).

S 414-071-N00
(3) Close the fan cowl panels (AMM 71-11-04/201).

S 444-069-N00
(4) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

S 714-070-N00
(5) Do the test of the PS3 air filter assembly that is shown in the Power Plant Test Reference Table (AMM 71-00-00/501).

HIGH PRESSURE COMPRESSOR 5TH-STAGE SYNCHRONIZING RING ASSEMBLY - APPROVED REPAIRS

1. General
   A. This procedure gives the steps to repair the HPC 5th-stage synchronizing ring assembly vane arm rivet pin cracked tack welds.

TASK 75-33-06-308-001-N00

2. Repair the HPC 5th-Stage Synchronizing Ring Assembly
   A. Consumable Materials
      (1) Sealant - Silicone Rubber (P09-014) (PWA 36003)
      (2) Isopropyl - Alcohol (P11-014A)
   B. Access
      (1) Location Zones
      (2) Access Panels
   C. Procedure

S 048-002-N00

WARNING: DO THE DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT.

(1) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).

S 018-003-N00

(2) Open the right fan cowl panel (AMM 71-11-04/201).

S 018-004-N00

(3) Open the right core cowl panel (AMM 71-11-06/201).

S 018-005-N00

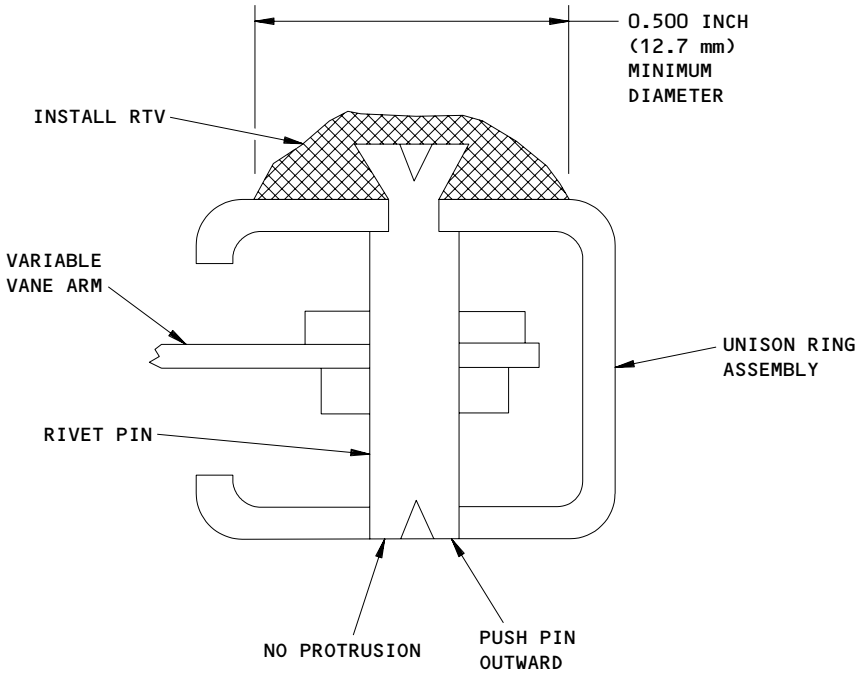
WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 TO OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(4) Open the right thrust reverser (AMM 78-31-00/201).

   D. Repair The HPC 5th-Stage Synchronizing Ring Assembly.

S 028-006-N00

(1) Apply a large amount of sealant (P09-014) to the vane arm rivet pin (Fig. 801).
   (a) Clean the rivet pin area with alcohol (P11-014A).
   (b) Push the rivet pin outward.



L-D2695(0505)

Synchronizing Ring Vane Arm Rivet Pin Sealant Repair
Figure 801

(c) Apply sealant (P09-014).
(d) Wait for one hour before you perform the engine operation.

E. Put The Airplane In Its Usual Condition.

S 418-007-N00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 TO CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Close the right thrust reverser (AMM 78-31-00/201).

S 418-008-N00
(2) Close the right core cowl panel (AMM 71-11-06/201).

S 418-009-N00
(3) Close the right fan cowl panel (AMM 71-11-04/201).

S 448-010-N00
(4) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).