

PRATT & WHITNEY CANADA
MAINTENANCE MANUAL
MANUAL PART NO. 3013242

LIST OF EFFECTIVE PAGES

<u>CHAPTER SECTION</u>	<u>PAGE</u>	<u>DATE</u>	<u>CHAPTER SECTION</u>	<u>PAGE</u>	<u>DATE</u>
LEP	1	Jun 16/2006		220 blank	Dec 06/2001
	2 blank	Jun 16/2006			
Contents	1	Jun 16/2006			
	2	Jun 16/2006			
77-20-00	1	Jun 16/2006			
Description and	2	Jun 16/2006			
Operation	3	Jun 16/2006			
	4	Jun 16/2006			
77-20-00	201	Aug 27/2004			
Maintenance	202	Aug 27/2004			
Practices					
77-20-01	1	Feb 11/2000			
Description and	2 blank	Feb 11/2000			
Operation					
77-20-01	201	Jun 10/2005			
Maintenance	202	Dec 06/2001			
Practices	203	Dec 06/2001			
	204	Dec 06/2001			
	205	Dec 06/2001			
	206	Dec 06/2001			
	207	Dec 06/2001			
	208	Dec 06/2001			
	209	Jun 10/2005			
	210	Jun 10/2005			
	211	Jun 10/2005			
	212	Jun 16/2006			
	212 A	Dec 02/2005			
	212 B blank	Aug 16/2002			
	213	Feb 15/2002			
	214	Dec 06/2001			
	215	Dec 06/2001			
	216	Dec 06/2001			
	217	Dec 06/2001			
	218	Feb 15/2002			
	219	Dec 06/2001			

PRATT & WHITNEY CANADA
MAINTENANCE MANUAL
MANUAL PART NO. 3013242

TABLE OF CONTENTS

<u>SUBJECT</u>	<u>PAGE</u>
ENGINE INDICATING - DESCRIPTION AND OPERATION	77-20-00
1. General	1
2. Description and Operation	1
3. Fault Isolation	4
ENGINE INDICATING - MAINTENANCE PRACTICES	77-20-00
1. General	201
2. Consumable Materials	201
3. Special Tools	201
4. Fixtures, Equipment and Supplier Tools	201
5. Adjustment/Test	201
A. General	201
B. Operational/Functional Test	201
T5 INDICATING SYSTEM - DESCRIPTION AND OPERATION	77-20-01
1. Description and Operation	1
T5 INDICATING SYSTEM - MAINTENANCE PRACTICES	77-20-01
1. General	201
2. Consumable Materials	201
3. Special Tools	201
4. Fixtures, Equipment and Supplier Tools	201
5. Removal/Installation	201
A. Removal of Bus-bar and Probe Assembly	201
B. Removal of Wiring Harness	204
C. Removal of Trim Thermocouple	204
D. Installation of Bus-bar and Probe Assembly	204
E. Installation of Wiring Harness	207
F. Installation of Trim Thermocouple	209

**PRATT & WHITNEY CANADA
MAINTENANCE MANUAL
MANUAL PART NO. 3013242**

TABLE OF CONTENTS

<u>SUBJECT</u>	<u>PAGE</u>
T5 INDICATING SYSTEM - MAINTENANCE PRACTICES (Cont'd)	77-20-01
6. Adjustment/Test	210
A. Bus-bar and Probe Assembly	210
B. Wiring Harness	210
C. Trim Thermocouple	211
7. Inspection/Check	212
A. Inspection	212
8. Cleaning/Painting	213
A. Cleaning	213
9. Approved Repairs	213
A. Replacement of Harness Terminal Lugs	213
B. Replace Terminal Straps and Lugs on Bus-bar Assembly	213
C. Repair Missing Insulation on Terminal Block and Probes	215
D. Repair of Loose Terminals in Terminal Block and Probe Housing	215
E. Replacement of Damaged or Broken Harness Terminal Lugs	215
F. Repair of Harness Braiding	218

PRATT & WHITNEY CANADA
MAINTENANCE MANUAL
MANUAL PART NO. 3013242

ENGINE INDICATING - DESCRIPTION AND OPERATION

1. General

The interturbine temperature (T5) sensing system provides the pilot with an indication of the engine operating temperature occurring in the zone between the compressor turbine and the power turbine stator. The system consists of a bus-bar assembly, eight individual thermocouple probes connected in parallel, a wiring harness incorporating a terminal block, and a trim harness incorporating a T1 probe. The T1 thermocouple is connected in parallel with the T5 wiring harness to bias the interturbine temperature (ITT) signal, such that the indicated ITT bears a fixed relationship with the compressor inlet temperature and has been derived from measured exhaust temperature and other parameters. This calculated temperature is the true representative of the critical component temperatures in the engine hot section; that is, the biased indicated temperature relates to the critical component temperatures and the biasing T1 probe compensates for sampling error in ITT indication.

2. Description and Operation (Ref. Figs. 1 and 2)

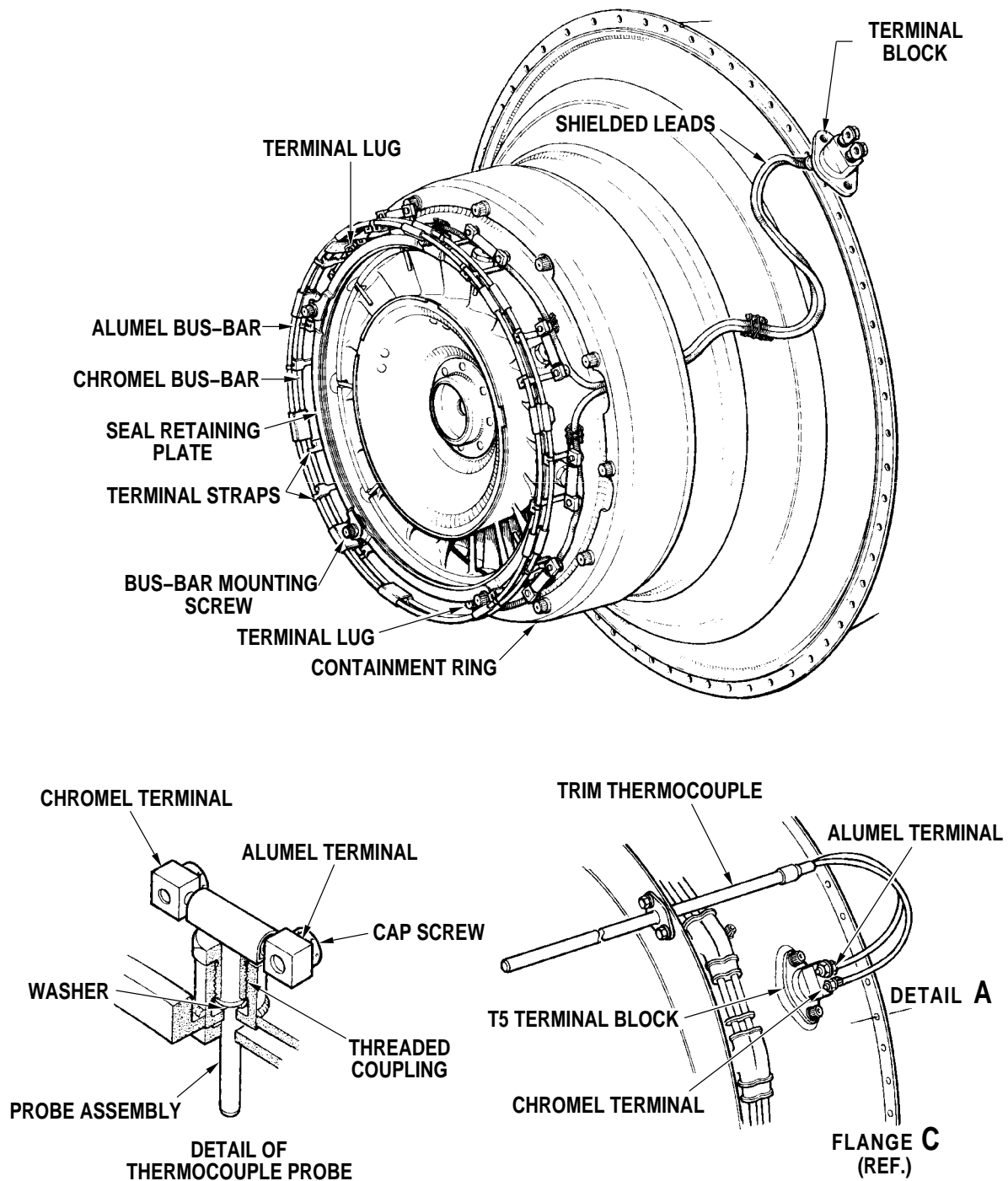
The thermocouple probes consist of eight alumel/chromel assemblies connected in parallel by a bus-bar arrangement. The probes protrude through individual threaded bosses in the power turbine stator housing and into the compressor turbine discharge airstream. Probe locations are at the 1, 2, 3, 4, 8, 9, 10 and 11 o'clock positions on the housing. The probes are secured to their respective bosses by a floating, threaded fitting which forms an integral part of the assembly, each probe being installed in conjunction with a copper gasket.

The bus-bar (Ref. Chap 77-20-01) consists of alumel and chromel rings, isolated and bracketed together to form an assembly; eight straps of respective material are welded to each ring for connection to respective alumel and chromel terminals of the thermocouple probes. Terminal points at the 10 and 5 o'clock positions are provided for connection of the T5 wiring harness. To ensure correct connection of bus-bar straps to probes, alumel terminals of probe are identifiable as having larger screws than the chromel terminals. Likewise, the terminal point at the 10 o'clock position on the alumel ring of the bus-bar is threaded to a larger diameter than the one at the 5 o'clock position on the chromel ring. Also, alumel is slightly magnetic.

The T5 wiring harness (Chap. 77-20-01) consists of a terminal block with two braze-connected leads, the long lead being alumel and the short lead chromel. The terminal lug on the alumel lead has a larger diameter hole than the lug on the chromel lead. The individual leads of the harness are secured to clips welded to the stator housing. The leads are routed forward and secured together to similar clips on the exhaust duct. Prior to mating engine sections at flange C, the wiring harness is routed to the 2 o'clock position within the gas generator case, at which location the terminal block is inserted into a boss and bolted from outside.

The T1 trim thermocouple (Chap. 77-20-01) consists of alumel/chromel leads encased in a stainless steel tube; the chromel lead having an in-line resistor. The required resistance value is determined during final engine acceptance checks when the proper harness resistance is selected. The unit may only be replaced in the field with a trim harness of the same resistance. The trim harness is mounted on the right-hand side of the engine; a mounting flange on the probe casing are connected to their respective terminals on the T5 terminal block.

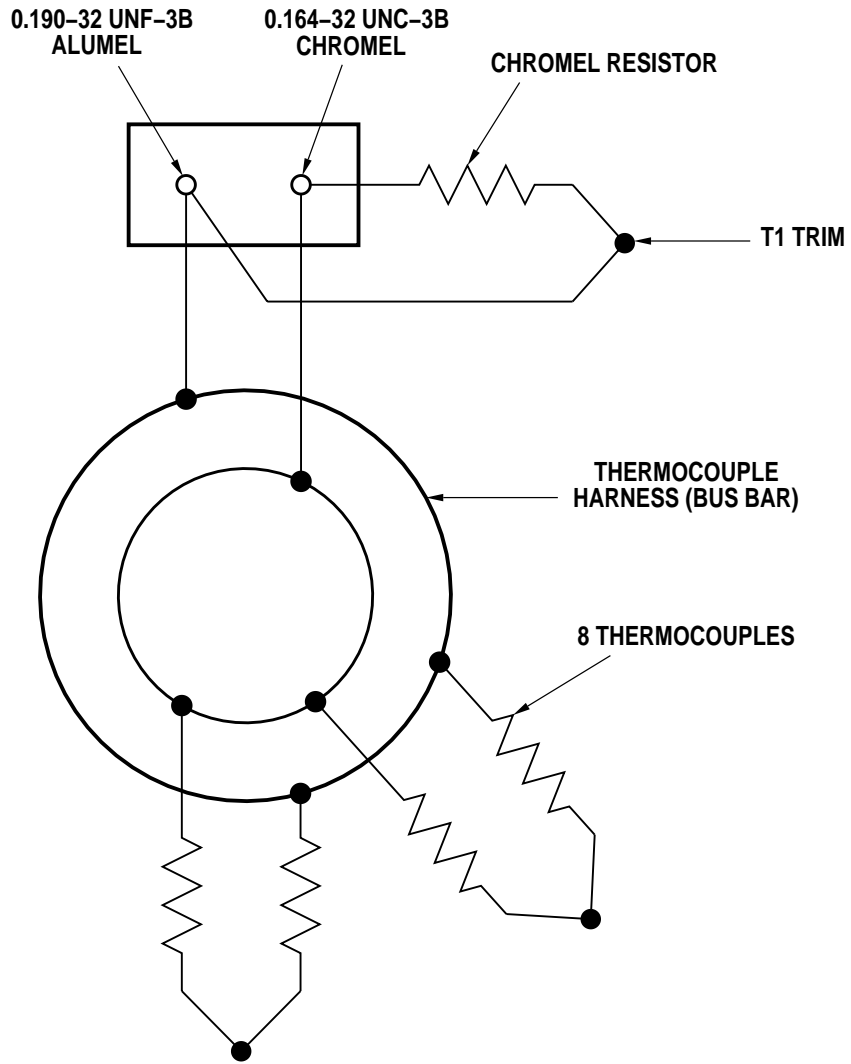
PRATT & WHITNEY CANADA
 MAINTENANCE MANUAL
 MANUAL PART NO. 3013242



C571D

T5 Interturbine Temperature Sensing System
 Figure 1

PRATT & WHITNEY CANADA
MAINTENANCE MANUAL
MANUAL PART NO. 3013242



C6976B

T5 Schematic Wiring Diagram
Figure 2

PRATT & WHITNEY CANADA
MAINTENANCE MANUAL
MANUAL PART NO. 3013242

3. Fault Isolation

- For detailed troubleshooting of the engine indicating system, refer to Chapter 72-00-00, FAULT ISOLATION.

PRATT & WHITNEY CANADA
MAINTENANCE MANUAL
MANUAL PART NO. 3013242

ENGINE INDICATING - MAINTENANCE PRACTICES

1. General

- A. Maintenance personnel should make reference to the INTRODUCTION section and Chapter 70-00-00 STANDARD PRACTICES of this manual to familiarize themselves with general procedures.
- B. Install suitable protective caps/covers over all disconnected tubes/lines and component openings.
- C. Lockwire shall comply with specification AMS 5687, heat and corrosion resistant steel wire MS9226-03, 0.025 inch diameter, and will not be specified in instructions.

2. Consumable Materials

The consumable materials listed below are used in the following procedures.

<u>Item No.</u>	<u>Name</u>
PWC05-101	Cloth, Abrasive

3. Special Tools

Not Applicable

4. Fixtures, Equipment and Supplier Tools

The fixtures, equipment and supplier tools listed below are used in the following procedures.

<u>Name</u>	<u>Remarks</u>
Test Set	Barfield, TT1000A

5. Adjustment/Test

A. General

Since the bus-bar, probes and wiring harness essentially constitute a single unit, consisting of eight thermocouple probes averaged by means of an alumel/chromel bus-bar, the probes cannot be checked individually. The following tests will therefore only reveal circuit malfunctions such as an internal short circuit, or an open circuit. For individual component checks, refer to Chapter 77-20-01.

B. Operational/Functional Test

NOTE: This test is recommended to be carried out with the engine gas path component temperature close to OAT. Allow at least two hours cooling down period after engine shutdown.

- (1) Remove the aircraft external leads and T1 trim thermocouple leads from the terminal block on the gas generator case.

PRATT & WHITNEY CANADA
MAINTENANCE MANUAL
MANUAL PART NO. 3013242

- (2) Connect the test set to the alumel and chromel terminals on the gas generator case terminal block and measure the loop resistance of the T5 system.
- (3) Switch the test set leads to the opposite terminals on the terminal block and measure and record the loop resistance.

NOTE: The two readings must be taken in quick succession so that the temperature variation at the thermocouple level will be minimal.

- (4) Add the two recorded values and divide by two to find the correct loop resistance.
- (5) Measured resistance should be 0.58 to 0.74 ohm.

NOTE: If several probes are broken or damaged, the loop resistance would not necessarily fall outside the allowable tolerance. However, erroneous temperature indications could occur due to reduced sampling.

- (6) To check for defective probes or harness lead, remove the engine power section assembly (Ref. 72-00-00).
- (7) Connect the test set leads between either alumel or chromel terminal on the terminal block and ground (on the power section) and measure the insulation resistance. The measured insulation resistance must not be less than 50,000 ohms.
- (8) Reconnect the external leads and block the trim thermocouple leads to the appropriate AL and CR terminal posts on the terminal. Tighten the bolts and torque the alumel terminal bolt 10 to 15 lb.in. and chromel terminal bolt 8 to 12 lb.in.

NOTE: Always clean all contact surfaces immediately prior to assembly with No. 400 grit abrasive cloth (PWC05-101).

PRATT & WHITNEY CANADA
MAINTENANCE MANUAL
MANUAL PART NO. 3013242

T5 INDICATING SYSTEM - DESCRIPTION AND OPERATION

1. Description and Operation

The interturbine temperature (T5) system consists of the bus-bar, probes, wiring harness, T1 trim thermocouple , and related parts.

The T5 bus-bar and probe assembly is located on the outer section of the power turbine stator housing with the probes passing through ports in the housing. The probes are individually fastened to their respective bosses with coupling nuts, while the bus-bar is bolted to the rear flange of the stator housing.

The T5 wiring harness provides the electrical interconnection between the bus-bar and probes and the electrical wiring for airframe instrumentation via the harness terminal block mounted on the gas generator case. The alumel and chromel terminal lugs at the inner ends of the twin-lead harness are connected to their respective terminals on the bus-bar assembly. The leads are welded to internal connections within the terminal block.

The T1 trim thermocouple is located at the 2 o'clock position immediately above the air inlet screen on the gas generator case. It is attached by an integral flange to the center fireseal at its front end, and supported by a loop clamp at the rear. The leads at the front of the thermocouple are connected to the T5 terminal block on the gas generator case.

PRATT & WHITNEY CANADA
MAINTENANCE MANUAL
MANUAL PART NO. 3013242

T5 INDICATING SYSTEM - MAINTENANCE PRACTICES

1. General

- A. Maintenance personnel should make reference to the INTRODUCTION section and Chapter 70-00-00 STANDARD PRACTICES of this manual to familiarize themselves with general procedures.
- B. Install suitable protective caps/covers over all disconnected tubes/lines and component openings.
- C. Lockwire shall comply with specification AMS 5687, heat and corrosion resistant steel wire MS9226-03, 0.025 inch diameter, and will not be specified in instructions.

2. Consumable Materials

The consumable materials listed below are used in the following procedures.

<u>Item No.</u>	<u>Name</u>
PWC05-066	Tape
PWC05-089	Lockwire
PWC05-101	Cloth, Abrasive
PWC05-164	Welding Material, Alumel
PWC05-353	Welding Material, Chromel
PWC06-023	Compound, Anti-seize
PWC08-009	Cement, Filler and Binder

3. Special Tools

The special tools listed below are used in the following procedures.

<u>Tool No.</u>	<u>Name</u>
PWC30114-08	Wrench
PWC30425	Pliers, Crimping

4. Fixtures, Equipment and Supplier Tools

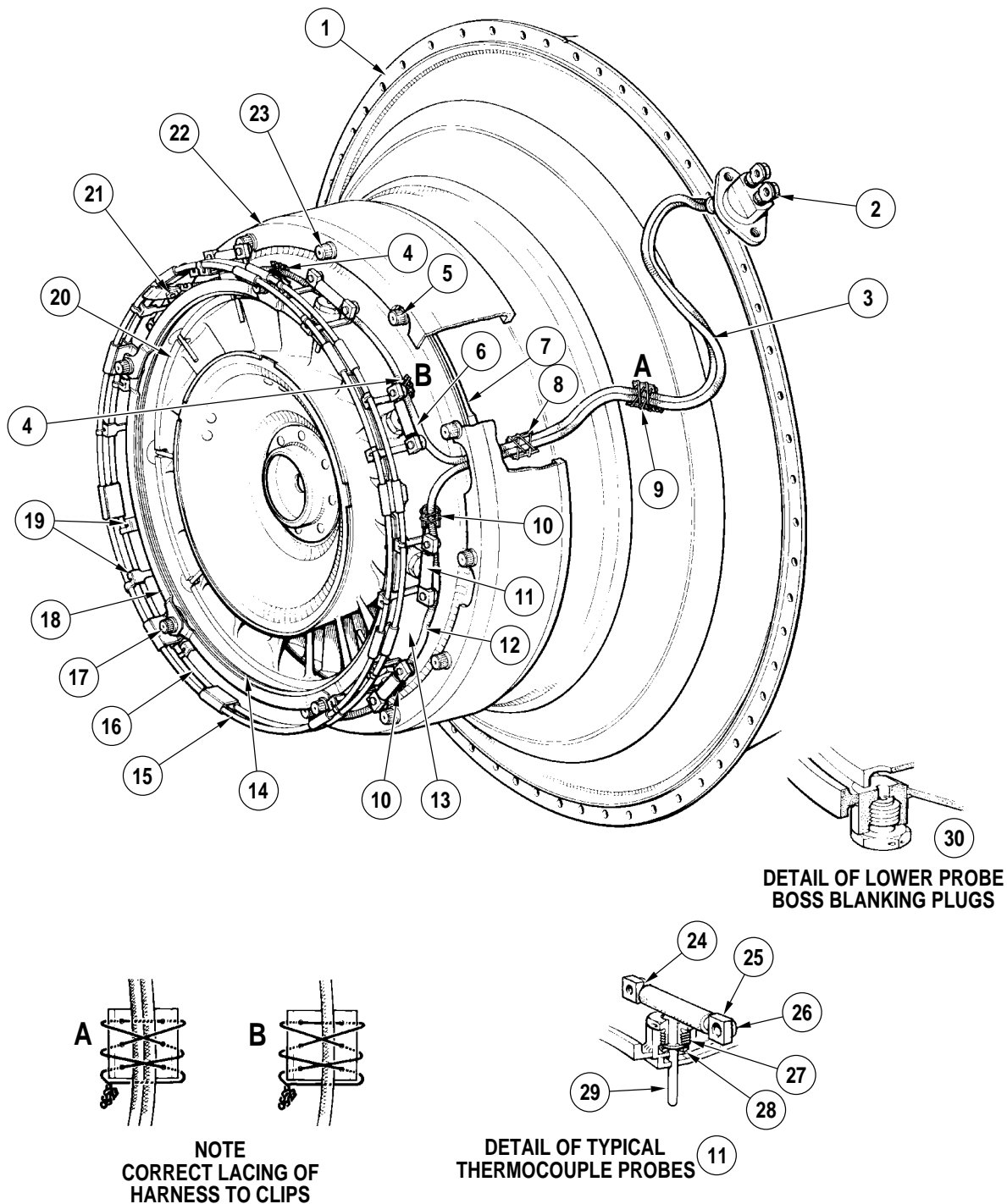
The fixtures, equipment and supplier tools listed below are used in the following procedures.

<u>Name</u>	<u>Remarks</u>
Test Set	Barfield, TT1000A

5. Removal/Installation

- A. Removal of Bus-bar and Probe Assembly (Ref. Fig. 201)
 - (1) Remove power section (Ref. 72-00-00).

PRATT & WHITNEY CANADA
MAINTENANCE MANUAL
MANUAL PART NO. 3013242



C3991A

Removal/Installation of Bus-Bar Assembly and Thermocouple Probes
 Figure 201

PRATT & WHITNEY CANADA
MAINTENANCE MANUAL
MANUAL PART NO. 3013242

Key to Figure 201

1. Exhaust Duct
2. T5 Terminal Block
3. T5 Thermocouple Harness
4. Clip
5. Bolt (Half Ring Retaining)
6. Long Lead
7. Half Rings
8. Clip
9. Clip
10. Clip
11. Thermocouple Probe
12. Short Lead
13. Stator Housing
14. Interstage Sealing Ring
15. Alumel Bus-bar
16. Chromel Bus-bar
17. Screws
18. Retaining Plates
19. Bus-bar Straps
20. Power Turbine Vane Ring
21. Socket Head Screw
22. Containment Ring
23. Bolt
24. Alumel Terminal
25. Chromel Terminal
26. Capscrew
27. Coupling Nut
28. Copper Washer
29. Thermocouple Probe
30. Plugs (2 of)

CAUTION: USE CARE WHEN THE TERMINAL SCREWS ARE REMOVED FROM PROBES. INSULATION MATERIAL IS EXTREMELY FRAGILE.

- (2) Disconnect wiring harness (3):
 - (a) Remove screws (21) which connect leads of harness to respective terminal (15 and 16) on bus-bar assembly.
 - (b) Detach long lead (alumel) (6) of harness from clips (4), and short lead (chromel) (12) from clips (10) on stator housing (13).
 - (c) Fold leads forward and tape to containment ring (22) to prevent damage to leads.

PRATT & WHITNEY CANADA
MAINTENANCE MANUAL
MANUAL PART NO. 3013242

- (3) Remove capscrews (26, Pre-SB1503) or bolts (26, Post-SB1503) which connect the respective bus-bar straps (19) to terminals of each probe (11).
- (4) Remove five screws (17), the retaining plates (18) and the bus-bar assembly from the stator housing (13).
- (5) Use wrench (PWC30114-08) to loosen coupling nut (27) of each probe (11). Remove probes. Discard washers (28).

B. Removal of Wiring Harness (Ref. Fig. 202)

- (1) Disconnect airframe leads and T1 trim harness leads from terminal block (13) at 2 o'clock position on gas generator case.
- (2) Remove power section (Ref. 72-00-00). When the terminal block of wiring harness is detached, discard gasket (12).
- (3) Remove capscrews (10) and disconnect leads (11 and 14) of wiring harness from respective terminal on bus-bar assembly (9).
- (4) Detach long lead (11) of harness from clips (4), and short lead (14) from clips (8) on stator housing.
- (5) Remove eight bolts (1) which secure containment ring (3) to Flange D of exhaust duct.

NOTE: Do not remove bolts (2) at 1 and 7 o'clock positions on flange of exhaust duct. These bolts secure the stator housing to the duct.

- (6) Move the containment ring (3) rearward (use care to prevent damage to thermocouple probes) sufficiently to clear clip (5) on exhaust duct.
- (7) Detach harness (7) from clips (5 and 6) on exhaust duct. Carefully withdraw harness clear of containment ring (3).

C. Removal of Trim Thermocouple (Ref. Fig. 203)

- (1) Remove the bolts (4 and 5) securing the leads of the trim thermocouple (3) and the airframe leads to the posts on the terminal block mounted on the gas generator case.
- (2) Remove the self-locking nut, washer and bolt securing the clamp (2) to the clamp (1) on the wire rope casing. Remove the clamp (2).
- (3) Remove the two self-locking nuts and bolts securing the flange of the trim thermocouple to the center fireseal mount ring.
- (4) Remove the trim thermocouple by withdrawing rearward through the center fireseal mount ring. Exercise care not to chafe the leads or damage the terminal lugs.

D. Installation of Bus-bar and Probe Assembly (Ref. Fig. 201)

- (1) Install new copper washer (28) on each thermocouple probe (11).

PRATT & WHITNEY CANADA
MAINTENANCE MANUAL
MANUAL PART NO. 3013242

CAUTION: APPLY ANTISEIZE COMPOUND TO THERMOCOUPLE PROBE THREADS ONLY.

- (2) Apply anti-seize compound (PWC06-023) to the T5 thermocouple probe threads only with a small paintbrush.

NOTE: Do not use engine oil for a lubricant in this area.

- (3) Install probes (11) in bosses on stator housing (13). Use wrench to tighten coupling nuts (27) and torque 40 to 50 lb.in. Make sure terminal bar of each probe is parallel to rear flange of stator housing and lockwire coupling nuts

NOTE: Before the bus-bar is installed, clean contact surfaces of straps and terminals, and mating surfaces on probes and wiring harness.

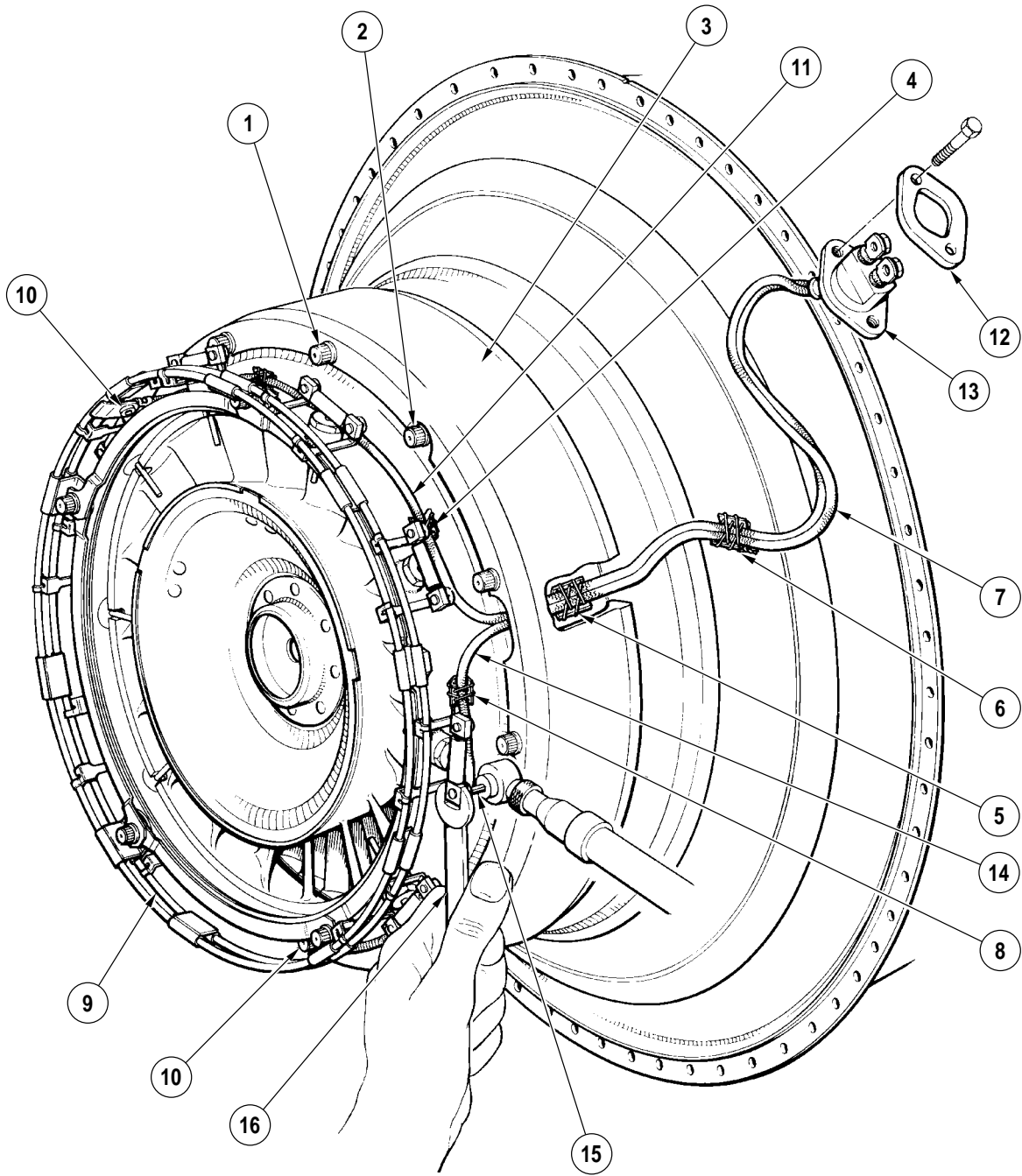
- (4) Position five retaining plates (18) on top of the bus-bar mounting brackets so that the ends overlap the bracket and each other.
- (5) Locate the bus-bar assembly on the front flange of the stator housing (13) and align the mounting holes. Secure the bus-bar assembly and the retaining plates (18) to the stator housing with five screws (17). Tighten the screws and torque to 22 to 24 lb.in. Secure with lockwire.

NOTE: Use care when the straps (19) are positioned against the respective terminals (24 and 25) of the probes.

CAUTION: USE CARE WHEN THE TERMINAL SCREWS OF PROBES ARE INSTALLED. INSULATION MATERIAL IS EXTREMELY FRAGILE.

- (6) Secure straps (19) of bus-bar assembly to terminals (24 and 25) of probes with respective capscrews (26, Pre-SB1503). or bolts (26, Post-SB1503).
 - (a) For Pre-SB1503 Engines: Use a 9/64 inch Allen wrench to capscrews at AL terminals and a 7/64 inch Allen wrench at CR terminals. Torque AL and CR terminal capscrews 9 to 12 lb.in. and lockwire.
 - (b) For Post-SB1503 Engines: Torque AL terminal bolts 8 to 12 lb.in. and lockwire. Torque CR terminal bolts 8 to 10 lb.in. and lockwire.
- (7) Route long lead (alumel) (6) of T5 wiring harness along top of stator housing and connect to bus-bar terminal at approximately the 10 o'clock position with screw (21, Pre-SB1503) or bolt (21, Post-SB1503). Route short lead (chromel) (12) along lower side of housing and connect to bus-bar terminal at approximately the 5 o'clock position with screw (21, Pre-SB1503) or bolt (21, Post-SB1503).
 - (a) For Pre-SB1503 Engines: Torque AL and CR terminal screws 9 to 12 lb.in. and lockwire .
 - (b) For Post-SB1503 Engines: Torque AL terminal bolt 8 to 12 lb.in. and lockwire. Torque CR terminal bolt 8 to 10 lb.in. and lockwire .
- (8) Lockwire leads of harness to clips (4 and 10).

PRATT & WHITNEY CANADA
MAINTENANCE MANUAL
MANUAL PART NO. 3013242



C8904

Removal/Installation of T5 Wiring Harness
Figure 202

PRATT & WHITNEY CANADA
MAINTENANCE MANUAL
MANUAL PART NO. 3013242

Key to Figure 202

1. Bolt
2. Bolt
3. Containment Ring
4. Clip (Stator Housing - Alumel Lead)
5. Clip (Exhaust Duct)
6. Clip (Exhaust Duct)
7. T5 Wiring Harness
8. Clip (Stator Housing -Chromel Lead)
9. Bus-bar Assembly
10. Capscrews
11. Long Lead (Alumel)
12. Gasket
13. Terminal Block
14. Short Lead (Chromel)
15. Allen Wrench (Pre-SB1503) or Socket (Post-SB1503)
16. Open-ended Wrench

(9) Do a functional test (Ref. 77-20-00).

(10) Install the power section (Ref. 72-00-00).

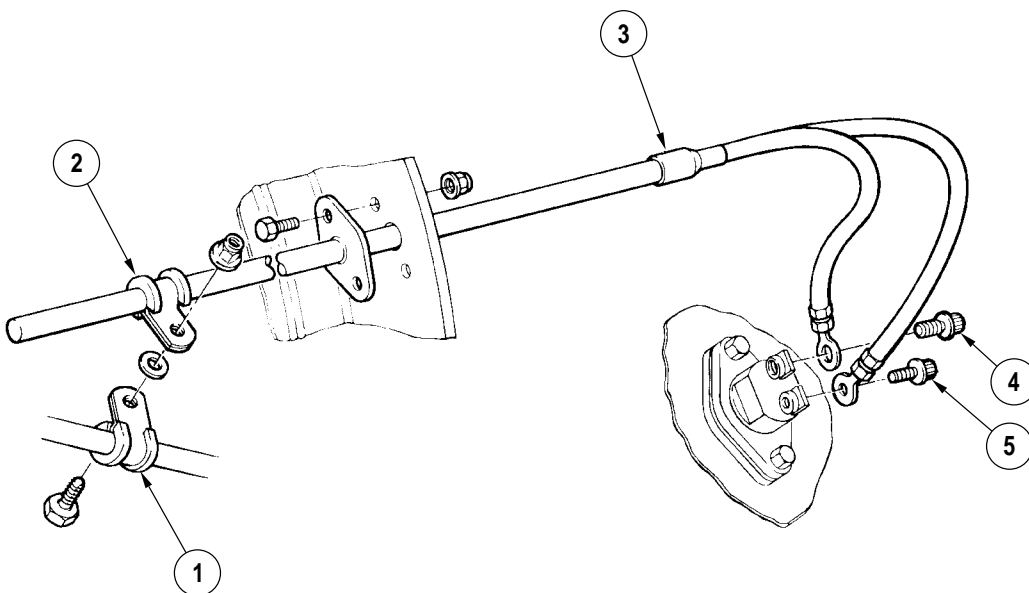
NOTE: A performance check will be done at engine test (Ref. 71-00-00).

E. Installation of Wiring Harness (Ref. Fig. 202)

NOTE: Clean terminal lug contact surfaces before installation.

- (1) Carefully pass leads of harness (7) under containment ring (3) and pull rearward. Use care to not chafe leads.
- (2) Secure containment ring to Flange D of exhaust duct with one bolt at 12 o'clock position. Fingertighten bolt.
- (3) Route long lead (11) of harness along top of stator housing and connect to alumel terminal of bus-bar assembly (9) with capscrews (10, Pre-SB1503) or bolts (10, Post-SB1503). Route short lead (14) of harness along lower side of housing and connect to chromel terminal of bus-bar with capscrew (10, Pre-SB1503) or bolt (10, Post-SB1503).
 - (a) For Pre-SB1503 Engines: Use a 9/64 inch Allen wrench for capscrew at AL terminal and a 7/64 inch Allen wrench at CR terminal. Torque AL and CR terminal capscrews 9 to 12 lb.in. and lockwire.
 - (b) For Post-SB1503 Engines: Torque AL terminal bolt 8 to 12 lb.in. and lockwire. Torque CR terminal bolt 9 to 10 lb.in. and lockwire.

PRATT & WHITNEY CANADA
MAINTENANCE MANUAL
MANUAL PART NO. 3013242



C6979A

Removal/Installation of Trim Thermocouple
Figure 203

PRATT & WHITNEY CANADA
MAINTENANCE MANUAL
MANUAL PART NO. 3013242

Key to Figure 203

1. Clamp
2. Clamp
3. Trim Thermocouple
4. Bolt (Alumel Terminal)
5. Bolt (Chromel Terminal)

(4) Secure leads (11 and 14) to respective clips (4 and 8) on stator housing with lockwire.

CAUTION: USE CARE TO NOT DAMAGE THERMOCOUPLE PROBES OR CHAFE HARNESS LEADS.

(5) Remove slave bolt at 12 o'clock position and move containment ring rearward sufficiently to clear clip (5) on exhaust duct.

(6) Secure both leads of harness to clips (5 and 6) on exhaust duct with lockwire.

(7) Secure containment ring (3) to flange of exhaust duct with bolts (1). Tighten bolts and torque 32 to 36 lb.in. Lockwire bolts (1 and 2).

(8) Install power section (Ref. 72-00-00). Use new gasket (12) when terminal block of wiring harness is attached to gas generator case.

(9) Do a functional test (Ref. 77-20-00).

(10) Connect T1 trim harness leads and airframe leads to terminal block.

(11) Performance check T5 sensing system at engine test (Ref. 71-00-00).

F. Installation of Trim Thermocouple (Ref. Fig. 203)

NOTE: 1. Prior to installation, make sure that the terminal lug contact surfaces are cleaned (Ref. Para. 8.).

NOTE: 2. Should the T5 trim harness require replacement in the field, it must be replaced with one having identical resistance. Careful note should be made of the part number of the unit removed, and the part number of the unit to be installed (Ref. IPC).

(1) Install the trim thermocouple (3) by passing the leads through the center fireseal mount ring from the rear. Secure the flange of the trim thermocouple to the fireseal mount ring with two bolts (heads on the rear face of the fireseal mount ring) and self-locking nuts. Tighten the nuts 36 to 40 lb.in.

(2) Install the clamp (2) on the probe of the thermocouple and fasten to the clamp (1) on the wire rope casing with a bolt, washer (between the clamps) and self-locking nut. Tighten the nut 36 to 40 lb.in.

NOTE: Align the clamps without exerting bending pressure on the probe.

PRATT & WHITNEY CANADA
MAINTENANCE MANUAL
MANUAL PART NO. 3013242

- (3) Connect the leads of the trim thermocouple and the airframe leads to the respective AL and CR posts on the terminal block with the bolts (4 and 5). Tighten bolts and torque bolt (4) 10 to 15 lb.in., and bolt (5) 8 to 10 lb.in.

6. Adjustment/Test

A. Bus-bar and Probe Assembly

NOTE: This test is done with the thermocouple at room temperature. The probe being tested must be removed from the bus-bar.

- (1) Using the test set, measure the insulation resistance across either the alumel or chromel terminal of the probe and ground (vane housing). The resistance measured must be not less than 50,000 ohms.
- (2) Measure and record the continuity resistance of the probe loop by connecting the leads of the test set to the thermocouple terminals.
- (3) Switch the test set leads to the opposite terminals on the thermocouple probe, measure and record the continuity and loop resistance.

NOTE: Readings must be taken in quick succession to keep the temperature variation to a minimum.

- (4) Add the two recorded values and divide by two to find the average loop resistance.
- (5) Acceptable resistance is 0.24 to 0.46 ohm.

CAUTION: DO NOT ALLOW THE PROBE TEMPERATURE TO EXCEED TO 538°C (1000°F) DURING THE FOLLOWING TEST.

- (6) When performing the heat response check of the probe, confirm that the output signal is of the same polarity as that of other the probes. Connect the test set to the AL and CR terminals, apply heat to each probe in turn and check for a positive indication of temperature change. A heat source, such as a 100 watt soldering iron, capable of heating the individual probes to 94°C (200°F) can be used.

NOTE: A heat response check of probes installed and connected to the bus-bar assembly, may be performed provided the previously heated probe is allowed to cool before applying heat to the next probe.

B. Wiring Harness

NOTE: Make sure the harness is dry and free of moisture before proceeding with the test.

- (1) Use the test set and with busbar and probe assembly disconnected from the wiring harness, measure the insulation resistance between the alumel and chromel lugs and between individual lugs and wiring harness shield. Resistance measured should not be less than 25,000 ohms.

PRATT & WHITNEY CANADA
MAINTENANCE MANUAL
MANUAL PART NO. 3013242

- (2) Check for continuity of the alumel and chromel lead of the wiring harness. Continuity must prevail for both leads. If the leads fail the test, or are found shorted, proceed as follows:
 - (a) Remove any moisture and heat the T5 terminal block for five minutes using a heat gun having a maximum heat range of 538°C (1000°F).
 - (b) Let the terminal block cool to room temperature.
 - (c) Repeat the continuity test.
- (3) If test in steps (1) or (2) is not satisfactory, replace the wiring harness.

C. Trim Thermocouple

- (1) Using the test set, with the thermocouple disconnected, measure the insulation resistance between either the alumel or chromel lug and the thermocouple outer casing. The resistance measured must be not less than 50 000 ohms.
- (2) Measure the resistance of the probe at room temperature; the resistance must be within plus or minus five percent of the value for the relevant class (Ref. Table 201).

TABLE 201, Trim Thermocouple Conversion Table

P/N 3013604 and class	Resistance Value (Ohms at 70 °F)	P/N 3031417 and class
	3.75 to 3.95	10
	3.95 to 4.20	11
	4.20 to 4.45	12
	4.45 to 4.75	13
	4.75 to 5.10	14
	5.10 to 5.50	15
	5.50 to 5.90	16
	5.90 to 6.40	17
	6.40 to 6.90	18
	6.90 to 7.60	19
	8	20
1	9	25
2	10.5	30
3	12	35
5	14	40
7	16	45
10	19	50

PRATT & WHITNEY CANADA
MAINTENANCE MANUAL
MANUAL PART NO. 3013242

TABLE 201, Trim Thermocouple Conversion Table (Cont'd)

P/N 3013604 and class	Resistance Value (Ohms at 70 °F)	P/N 3031417 and class
20	24	55
30	30	60
40	43	65
50	72	70
60	110	75

7. Inspection/Check

A. Inspection

- (1) Inspect the installed bus-bar probe assembly for security and signs of damage. Damaged probes will necessitate individual replacement. Loose terminal posts and missing insulation may be repaired (Ref. Para. 9.).
- (2) T5 wiring harness inspection:
 - (a) Examine the harness for broken or damaged braiding and/or insulation. Stainless braiding that is lifted or broken may be cut away, provided insulation remains intact.
 - (b) Examine the terminal block for security to the harness leads, loose terminals and missing insulation. Replace missing insulation and secure loose terminals (Ref. Repair).
 - (c) Examine terminal lugs for condition. Replace loose or damaged lugs (Ref. Repair).
- (3) Trim thermocouple inspection:
 - (a) Inspect the trim thermocouple leads for damage to the outer covering and loose or damaged terminal lugs. Check the probe outer casing for damage and corrosion, and the flange for security.
- (4) Bus-bar inspection:
 - (a) Bus-bar insulation resistance must not be less than 50 000 ohms.
 - (b) Check bus-bar for breaks, kinks, damage or loose bracket.
 - (c) Return defective bus-bar for possible repair to the following P&WC facility:

PRATT & WHITNEY CANADA
MAINTENANCE MANUAL
MANUAL PART NO. 3013242

P&WC Accessories Services
333 Rue D'Auvergne (Area 2K)
Longueuil, Quebec
Canada J4H 3Y3

77-20-01

T5 INDICATING SYSTEM - MAINTENANCE PRACTICES

Page 212A/212B
Dec 02/2005

PRATT & WHITNEY CANADA
MAINTENANCE MANUAL
MANUAL PART NO. 3013242

8. Cleaning/Painting

A. Cleaning

- (1) Clean the probes that exhibit carbon deposits with a fine brass wire brush.
- (2) Clean the contact surfaces of the AL and CR terminals and all harness lugs with No. 400 grit abrasive cloth (PWC05-101) .
- (3) Clean the terminal block and contact surfaces of the harness lugs with No. 400 grit abrasive cloth (PWC05-101).
- (4) Remove corrosion on the outer casing of the thermocouple with crocus cloth . Clean the trim harness lug contact surfaces with No. 400 grit abrasive cloth (PWC05-101).

9. Approved Repairs

A. Replacement of Harness Terminal Lugs (Ref. Fig. 204)

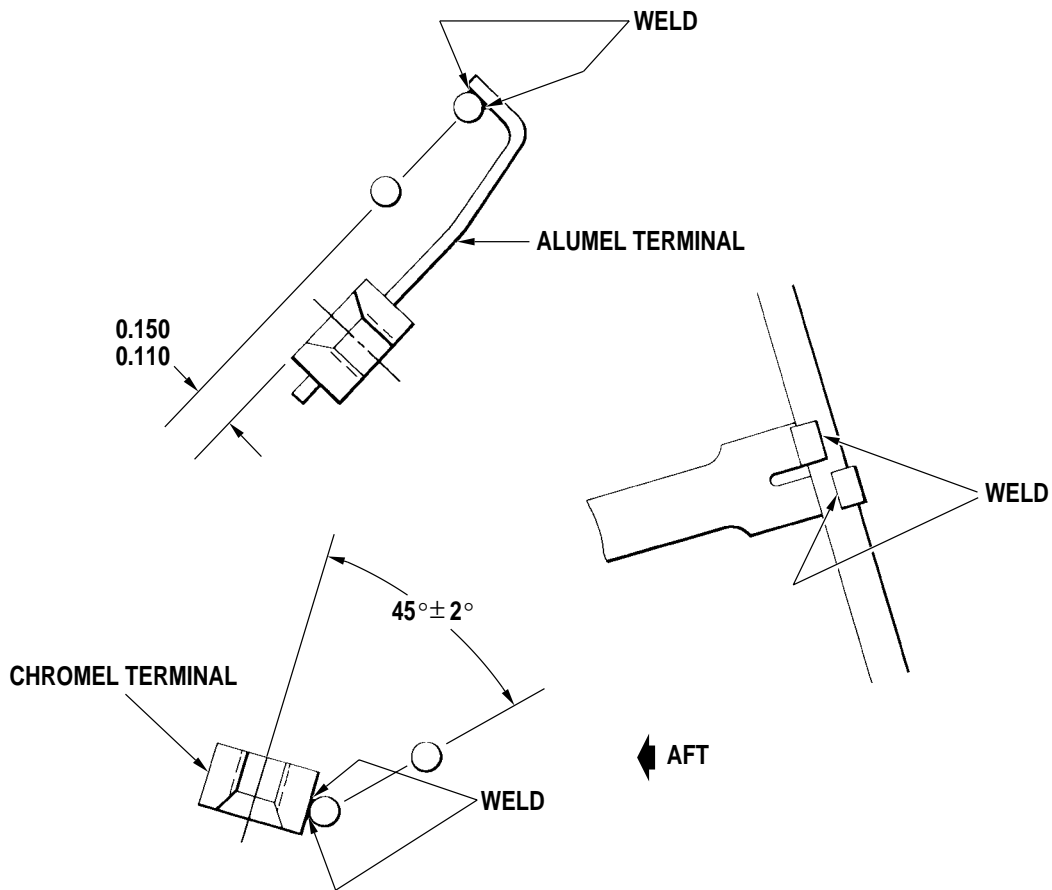
- (1) Repair of the components of the interturbine temperature sensing system is limited to the replacement of missing insulation, the repair of loose or damaged terminal lugs and the repair of broken or deteriorated braid on the thermocouple wiring harness.

B. Replace Terminal Straps and Lugs on Bus-bar Assembly

- (1) Suitably mark the position of the damaged terminal strap or lug on the bus-bar.
- (2) Dress the bus-bar to remove the old weldment.
- (3) Locate the replacement terminal strap on the bus-bar and, using the TIG method, fusion-weld the strap to the bus-bar. No filler rod is required.
- (4) Locate the terminal lug on the bus-bar, making sure that the large chamfer on the threaded portion is facing outward (Ref. Fig. 204). Using the TIG method, fusion-weld the lug to the bus-bar. Use alugel (PWC05-164) or chromel (PWC05-353) welding filler rod as applicable.

NOTE: Regular "Type K" thermocouple wire (alugel or chromel), or suitable parts from rejected T5 bus-bar assemblies, may be used as an alternative filler material. Stress relief is not required.

PRATT & WHITNEY CANADA
MAINTENANCE MANUAL
MANUAL PART NO. 3013242



C1319A

Terminal Straps and Lug Replacement
Figure 204

PRATT & WHITNEY CANADA
MAINTENANCE MANUAL
MANUAL PART NO. 3013242

C. Repair Missing Insulation on Terminal Block and Probes

WARNING: CARE MUST BE EXERCISED WHILE MIXING SYNTHETIC CERAMIC BINDER NO. 29 WITH FILLER NO. 29, OTHERWISE SPLASHES MIGHT CAUSE DISCOMFORT OF THE EYES. IN THE EVENT OF CONTACT WITH EYES, IMMEDIATELY WASH WITH WATER AND CONSULT A PHYSICIAN.

- (1) Prepare the cement filler and binder (PWC08-009) to the desired consistency and in accordance with the manufacturer's instructions.

NOTE: The cement used for repair is supplied in two parts; a filler in powder form and a binder in liquid form.

- (2) Clean the repair areas to make sure that all surfaces are free of grease and other contaminants. The presence of any contaminants will adversely affect the physical and electrical insulating properties of the cement mixture.
- (3) Apply the cement mixture to replace the missing insulation.
- (4) Allow the cement mixture to set. Initial setting should take place within 30 minutes. Do not handle or disturb the repair area during this time.
- (5) Cure the cement mixture by allowing to air dry for 24 hours or, if a more rapid curing is desired, heat in the oven at 65°C (150°F) for three hours.

D. Repair of Loose Terminals in Terminal Block and Probe Housing

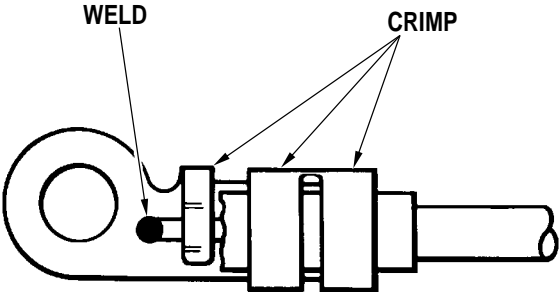
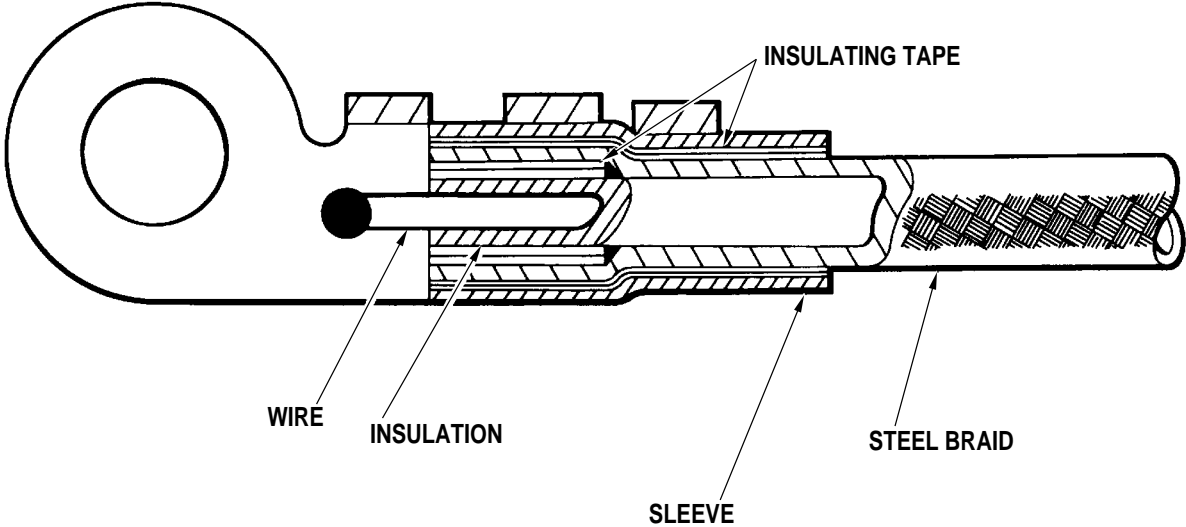
- (1) Apply a few drops of the cement binder only (PWC08-009) at the junction of the loose terminal, and allow to set.
- (2) Cure the assembly by allowing to air dry for 24 hours or, if a more rapid curing is desired, heat in the oven at 65 to 93°C (150 - 200°F) for 30 minutes.
- (3) Check the security of the terminal in the terminal block or probe housing; if the terminal is still loose, repeat the procedure.

E. Replacement of Damaged or Broken Harness Terminal Lugs (Ref. Figs. 205 and 206)

NOTE: Harness leads must not be shortened by more than is absolutely necessary to carry out lug replacement in order to maintain harness resistance value within the acceptable limits.

- (1) Open the ears of the terminal lug and cut the wire as close as possible to the weld. Remove the lug from the lead.
- (2) Work the stainless steel braid back approximately 0.5 inch, taking care not to damage the underlying insulation.
- (3) Wrap two complete turns of high-temperature insulating tape (PWC05-066) around the exposed harness insulation, and trim the frayed insulation back to 0.1875 inch from the end of the wire.

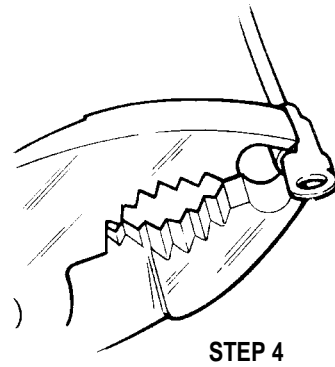
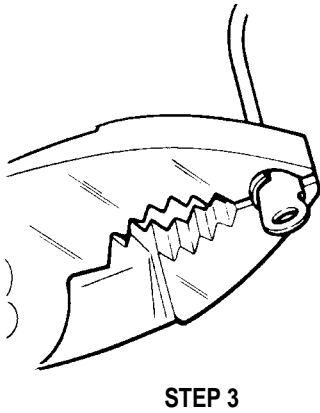
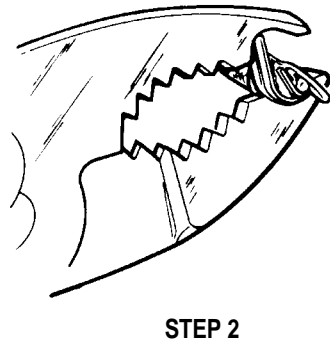
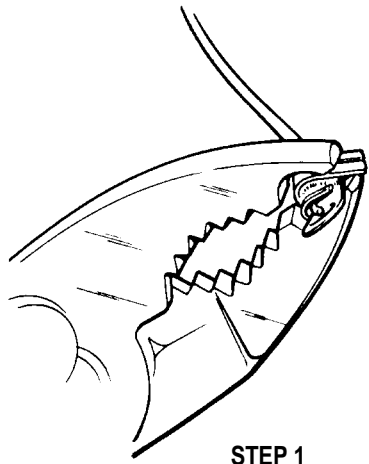
PRATT & WHITNEY CANADA
MAINTENANCE MANUAL
MANUAL PART NO. 3013242



C1184A

Wiring Harness Lug Replacement
Figure 205

PRATT & WHITNEY CANADA
MAINTENANCE MANUAL
MANUAL PART NO. 3013242



C1185

Harness Lug Replacement - Crimping
Figure 206

PRATT & WHITNEY CANADA
MAINTENANCE MANUAL
MANUAL PART NO. 3013242

- (4) Trim the stainless steel braid back to 0.3125 inch from the end of the wire, and wrap two complete turns of high-temperature insulating tape around the end of the braid.
- (5) Slide the chafing sleeve (0.3125 inch long) over the insulating tape on the braid until the outer end of the sleeve is 0.0250 inch from the end of the wire. Use a twisting motion when fitting the sleeve to prevent the tape from unraveling.
- (6) Secure a chromel or alumel terminal lug, as applicable, to the wire by crimping the small ear of the lug around the wire, leaving approximately 0.0625 inch of wire exposed.
- (7) Use the TIG method (Ref. 70-00-00, REPAIR) to fusion-weld the wire to the terminal lug. Use alumel (PWC05-164) or chromel (PWC05-353) welding filler rod as applicable. Inspect and check the security of the weld by gently pulling the lug with pliers.
- (8) Crimp the large ears of the terminal lug around the chafing sleeve (Ref. Fig. 205) on the braid using crimping pliers (PWC30425).
- (9) Clean the contact surfaces of the terminal lug with abrasive cloth (PWC05-101), or a stainless steel wire brush.
- (10) Do a loop resistance and continuity check (Ref. 77-20-00).

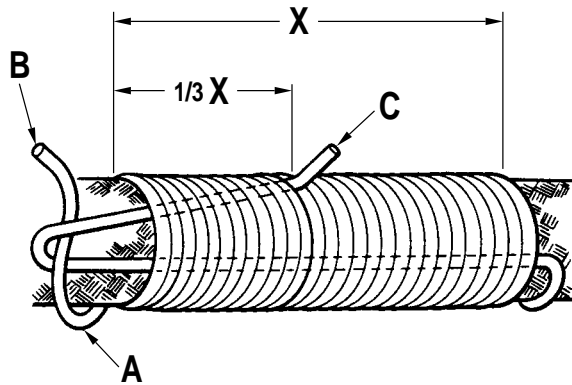
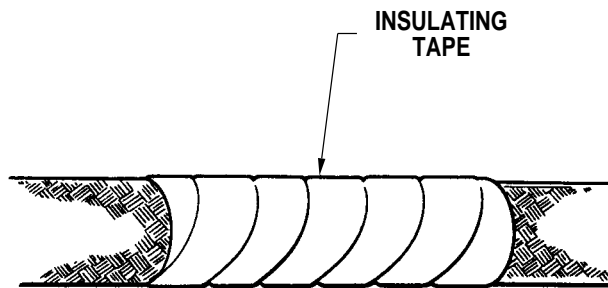
F. Repair of Harness Braiding (Ref. Fig. 207)

- (1) Remove all loose strands of braiding around the damaged area.
- (2) Wrap insulating tape (PWC05-066) around the harness, covering all the damaged area as shown.
- (3) Wrap the repaired area with steel wire (PWC05-089) as shown. Hold the wrapping wire snugly along the length of the harness braid beginning from the left. Starting at the opposite end, wrap the wire tightly and uniformly over the harness braid and repaired area.

NOTE: Make sure the wire overlaps the tape and contacts the harness braid at each end of the repair.

- (4) When approximately two-thirds of the wrapping length is completed, allow the short end of loop to remain exposed. Continue wrapping wire to complete the remaining distance, shown as " $\frac{1}{3} X$ ".
- (5) After the final turn of the wrapping, insert wire A through the loop as shown. Remove the surplus end of the wire B so the length is approximately $\frac{1}{3}$ of the repair length. Pull the loop end C until the wire at A is snug and the end of the wire B has just disappeared underneath the final turn of the wrappings. Cut the wire end C flush.

PRATT & WHITNEY CANADA
MAINTENANCE MANUAL
MANUAL PART NO. 3013242



C4960B

Wiring Harness Braid Repair
Figure 207

