Boeing Commercial Airplane Group
P.O. Box 3707
Seattle, WA 98124-2207

96-6925

ROUTE	NOTE	ACTION
ANM-100S		
ANM-101S		
ANM-103S		✓
ANM-120S		
ANM-130S		
ANM-140S		
ANM-160S		
ANM-190S		
FILE		

OCT 3 1 1996

B-T113-96-3442

RECEIVED
NOV 5 - 1996
ANM-100S
FAA SACO

Mr. D. L. Riggin
Manager, ANM-100S
Department of Transportation
Federal Aviation Administration
Seattle Aircraft Certification Office
1601 Lind Avenue Southwest
Renton, WA 98055-4056

BOEING

Dear Mr. Riggin:

Subject: **RA164 Center Wing Tank Wire Bundle Analysis - TWA Flight 800 Accident Investigation**

The purpose of this analysis was to identify all voltage carrying wires routed together with the center wing tank fuel quantity wire bundle. This information is tabulated in the enclosed pages.

A review of the airplane production illustration drawings showed that no other system wires are routed with the center tank fuel quantity bundle from the flight engineer's panel to the center tank. The only location that other system wires are routed with the center tank bundle is internal to the flight engineer's panel. Thus, the subject analysis was isolated to identifying the voltage carrying wires in the bundle internal to the flight engineer's instrument panel, W186.

A wire bundle list was generated for the W186 wire bundle showing all affected ATA chapters which have wires in bundle; from that list all of the affected system wire diagrams were acquired. Each system wire diagram was analyzed and the following information was tabulated:

System	System with potential hot wires in W186 bundle
Wire Diagram	ATA reference
Threat Voltage	
Threat C/B	States the circuit breaker nomenclature and number
C/B Rating	Threat circuit breaker rating in Amperes
Wire Number	Identifies wire numbers of potential hot wires
Threat Condition	Configuration requirement for hot wires

Note that this was a worst case bundle analysis since it is assumed that all wires in the bundle are at some point physically routed with the center wing tank wires. Due to the short time flow of the analysis, the form boards for the flight engineer's panel were not immediately available (but are on order). Production Illustration drawings did not adequately show the routing of W186 (i.e. physical branches). Upon receipt of the form boards, the list of systems with potential hot wires may be reduced.

The information being forwarded to the FAA by or with this correspondence is considered proprietary to The Boeing Company, and is provided on a confidential basis.

The data provided should be returned to Boeing immediately following use by the FAA, including any copies thereof which the FAA may be required to make in the course of its review. Boeing does not authorize the FAA to retain any portion of the materials being supplied.

Very truly yours,

BOEING

for K. B. Buchanan
Manager, Certification
Delivery & Fleet Support, B-T113
Everett: M/S 02-79[redacted] (b)(6)
Renton: M/S 9U-RL[redacted]

RPH:GEB

Enclosure: TWA RA164 Center Wing Tank Bundle Analysis, P4 Flight Engineer Panel Bundle (W186)

TWA RA164 Center W. _ Tank Bundle Analysis
P4 Flight Engineer Panel Bundle (W186)

ENCLOSURE
B-T113-96-3442

SYSTEM	Wire Diagram	Threat Voltage	Threat C/B (Number)	C/B rating (A)	Wire Number	Threat Condition
Generator Drive - Oil Temperature Indicators	24-11-21	28 VDC	CSC Disc. No. 1 (C377)	5	1D1-24 1D2-24 1D3-24	Signal from N1 Oil temp Indicator to CSD generator.
Generator Drive - Oil Temperature Indicators	24-11-21	28 VDC	CSC Disc. No. 2 (C378)	5	2D1-24 2D2-24 2D3-24	Signal from N1 Oil temp Indicator to CSD generator.
Generator Drive - Oil Temperature Indicators	24-11-21	28 VDC	CSC Disc. No. 3 (C379)	5	3D1-24 3D2-24 3D3-24	Signal from N1 Oil temp Indicator to CSD generator.
Generator Drive - Oil Temperature Indicators	24-11-21	28 VDC	CSC Disc. No. 4 (C380)	5	4D1-24 4D2-24 4D3-24	Signal from N1 Oil temp Indicator to CSD generator.
Fire Detection - Master Warning and Reset	26-11-61	28 VDC	Fire Warning Test (C428)	2.5	W549-20	Fire or Loop Fault NOT detected
Fire Protection - Wheel Well Warning	26-17-11	28 VDC 28 VAC	Fire Detection Control Elec Module Fire Detection Control Elec Module	N/A	W210-20 W213-20	Loop Fault detected Loop monitoring voltage
Overheat Detection - Wing Leading Edge	26-18-11	28 VDC	Engr Ind Lights (C579)	5	W476-22R W470-22R	Overheat NOT detected in Right wing.
Overheat Detection - Wing Leading Edge	26-18-11	28 VDC	Engr Ind Lights (C579)	5	W481-22R W483-22R	Overheat NOT detected in Left wing.
Fuel Scavenge Pump	28-15-11	28 VDC	Scavenge Pump Control (C292)	1	Q533-20	Directly downstream of threat C/B

TWA RA164 Center W... Tank Bundle Analysis
P4 Flight Engineer Panel Bundle (W186)

ENCLOSURE
B-T113-96-3442

SYSTEM	Wire Diagram	Threat Voltage	Threat C/B (Number)	C/B rating (A)	Wire Number	Threat Condition
Fuel Transfer Valves	28-16-11	28 VDC	1 and 4 Fuel Reserve Transfer Valves (C82)	7.5	Q88-20 Q90-20	No. 1 reserve valve commanded open No. 1 reserve valve commanded closed
Fuel Transfer Valves	28-16-11	28 VDC	1 Main Fuel Transfer Valves (C83)	2.5	Q97-20 Q98-20	No. 1 main transfer valve commanded open No. 1 main transfer valve commanded closed
Fuel Quantity - AC and DC Power	28-21-11	115 VAC	Fueling Gauges (C94)	2.5	Q242-22	C685 C/B primary power open
Fuel Quantity - AC and DC Power	28-21-11	115 VAC	Fueling Gauges (C685)	2.5	Q242-22	C685 C/B primary power Closed
Engine Fuel Shut Off Control	28-22-11	28 VDC	Engine 1 Fuel Shut Off Valve (C35)	5	Q1Q2-20 Q1Q3-20	Engine 1 fuel shut off valve commanded open Engine 1 fuel shut off valve commanded closed or Fire switch to "Fire"
Engine Fuel Shut Off Control	28-22-11	28 VDC	Engine 2 Fuel Shut Off Valve (C36)	5	Q2Q2-20 Q2Q3-20	Engine 2 fuel shut off valve commanded open Engine 2 fuel shut off valve commanded closed or Fire switch to "Fire"
Fuel Crossfeed Valves	28-22-21	28 VDC	No. 1 Crossfeed Valve (C76)	5	1Q28-20 1Q29-20	No. 1 crossfeed valve commanded open No. 1 crossfeed valve commanded closed

TWA RA164 Center W Tank Bundle Analysis
P4 Flight Engineer Panel Bundle (W186)

ENCLOSURE
B-T113-96-3442

SYSTEM	Wire Diagram	Threat Voltage	Threat C/B (Number)	C/B rating (A)	Wire Number	Threat Condition
Fuel Crossfeed Valves	28-22-21	28 VDC	No. 1 Crossfeed Valve (C77)	5	2Q28-20 2Q29-20	No. 2 crossfeed valve commanded open No. 2 crossfeed valve commanded closed
Fuel Boost Pumps 1 & 2 AFT, 3 & 4 FWD	22-28-31	28 VDC	No. 1 AFT and No. 4 FWD Boost Pump Control (C454)	2.5	Q482-22 Q483-22 Q486-22	Directly downstream of threat C/B No. 1 Main Aft Boost Pump commanded on No. 4 main Fwd Boost Pump commanded on
Fuel Boost Pumps 1 & 2 AFT, 3 & 4 FWD	22-28-31	28 VDC	No. 2 AFT and No. 3 FWD Boost Pump Control (C560)	2.5	Q484-22 Q495-22 Q485-22	Directly downstream of threat C/B No. 2 Main Aft Boost Pump commanded on No. 3 main Fwd Boost Pump commanded on
Fuel Boost Pumps 1 & 2 AFT, 3 & 4 FWD	22-28-31	28 VDC	No. 2 Main AFT Boost Pump Control (C561)	2	Q495-22 Q485-22	Ground handling bus on, and No. 2 Main Aft Boost Pump commanded on Ground handling bus on, and No. 3 Main Fwd Boost Pump commanded on

TWA RA164 Center Wing Tank Bundle Analysis
P4 Flight Engineer Panel Bundle (W186)

ENCLOSURE
B-T113-96-3442

SYSTEM	Wire Diagram	Threat Voltage	Threat C/B (Number)	C/B rating (A)	Wire Number	Threat Condition
Fuel Jettison Valves	28-31-11	28 VDC	Jettison and Nozzle Valves - L - Ctr (C85)	7.5	Q531-20	Directly downstream of threat C/B
					Q93-20	L Center Wing Jettison valve commanded open
					Q94-20	L Center Wing Jettison valve commanded closed
					Q304-20	L Jettison Nozzle valve commanded open
					Q305-20	L Jettison Nozzle valve commanded closed
Fuel Jettison Pumps	28-31-21	28 VDC	Ctr left Jett-Ovrd Pump Control (1071)	2.5	Q475-22	Directly downstream of threat C/B
					Q476-22	Ctr Wing Ovrd/Jett Pump Left commanded on
Fuel Jettison Pumps	28-31-21	28 VDC	No. 2 & No. 3 Outbd Jett Pump Control (C19)	5	Q472-20	Directly downstream of threat C/B
					Q473-20	No. 2 outbd Jett pump commanded on
					Q474-22	No. 3 outbd Jett Pump commanded on

TWA RA164 Center Wing Tank Bundle Analysis
P4 Flight Engineer Panel Bundle (W186)

ENCLOSURE
B-T113-96-3442

SYSTEM	Wire Diagram	Threat Voltage	Threat C/B (Number)	C/B rating (A)	Wire Number	Threat Condition
Fuel Quantity Gages - Power	28-41-13	115 VAC	Fueling Gauges (C685) or Fueling Gauges (C94)	2.5 2.5	Q243-22 Q753-22 Q752-22 Q750-22 Q749-22 Q748-22 Q748-22 Q747-22 Q746-22 Q745-22	Either Primary (C685) or Alternate (C94) Connect directly downstream.
Hyd Fluid Shut Off and Pump Depress - Sys 1 and 2	29-11-11	28 VDC	Depressurization Valve - EDP 1 (C15)	5	1M16-20 1M17-20	Engine 1 fire switch in "Normal" position Engine 1 fire switch in "Normal" position and Sys 1 Hydraulic Control in "Depress" position
Hyd Fluid Shut Off and Pump Depress - Sys 1 and 2	29-11-11	28 VDC	Depressurization Valve - EDP 2 (C16)	5	1M18-20 1M17-20 1M19-20	Engine 1 fire switch in "Normal" position Engine 1 fire switch in "Normal" position and Sys 1 Hydraulic Control in "Normal" position Engine 1 fire switch in "Normal" position and Sys 1 Hydraulic Control in "Off" position

TWA RA164 Center W. . Tank Bundle Analysis
P4 Flight Engineer Panel Bundle (W186)

ENCLOSURE
B-T113-96-3442

SYSTEM	Wire Diagram	Threat Voltage	Threat C/B (Number)	C/B rating (A)	Wire Number	Threat Condition
Pneumatic Drive - Hydraulic Control	29-11-21	28 VDC	ADP No. 1 Control (C489)	5	1M292-20 1M252 1M253	Directly downstream of threat C/B Sys 1 Hydraulic control switch in "AUTO" position Sys 1 Hydraulic control switch in "CONT" position
Hydraulic Fluid Pressure Indicators	29-31-11	28 VAC	Hydraulic Pressure Ind 1 (C5)	5	D1037-20 1D136-20 1D30-20	Directly downstream of threat C/B
Hydraulic Fluid quantity Indicators - System 1 and 2	29-33-11	115 VAC	Hyd Fluid Qty Ind (C1114)	2.5	D214-22 1D211-22 2D211-22	Ground handling bus on, Directly downstream of threat C/B
Hydraulic Fluid Low Pressure Lights - System 1 and 2	29-34-11	28 VDC	EDP 1 Low Press Cont (C271)	2.5	1M269-20	Directly downstream of threat C/B
Landing Gear - Primary Display	32-61-11	28 VDC	Landing Gear Lever Lock (C1435)	2	G710-20	Directly downstream of threat C/B
Master Dim and Test Indicator Lights - Distr & Cont Stand	33-11-71	28 VDC	Lt Capt Ann Warn (C614)	5	LA1641-20 L490-22 L494-22 L491-22	
Background and Floodlights - Flight Engr Panel	33-13-21	115 VAC	Engineers Fluorescent Background Lt (C110)	2.5	L1307-22 L1322-22	Directly downstream of threat C/B

TWA RA164 Center Wing Tank Bundle Analysis
P4 Flight Engineer Panel Bundle (W186)

ENCLOSURE
B-T113-96-3442

SYSTEM	Wire Diagram	Threat Voltage	Threat C/B (Number)	C/B rating (A)	Wire Number	Threat Condition
Instrument Panel Lights - Engr Lower Console P4	33-12-31	5 VAC	T164 Secondary (C1178)	5	L962-20 L968-20 L970-20 L972-20 L974-20 L976-20 L978-20 L980-20 L990-20 L992-20 L962-20 L966-20 L962-20 L966-20	Directly downstream of threat C/B
Instrument Panel Lights - Engr Lower Console P4	33-12-31	5 VAC	T164 Secondary (C1168)	5	L996-20 L998-20 L1000-20 L1002-20 L1004-20 L1006-20 L935-20 L938-20 L940-20 L942-20 L960-20	Directly downstream of threat C/B
Instrument Panel Lights - Engr Lower Console P4	33-12-31	5 VAC	T164 Secondary (C1176)	5	L952-20 L901-20 L944-20 L853-20 L851-20	Directly downstream of threat C/B

TWA RA164 Center W...g Tank Bundle Analysis
P4 Flight Engineer Panel Bundle (W186)

ENCLOSURE
B-T113-96-3442

SYSTEM	Wire Diagram	Threat Voltage	Threat C/B (Number)	C/B rating (A)	Wire Number	Threat Condition
Instrument Panel Lights - Engr Lower Console P4	33-12-31	5 VAC	T164 Secondary (C1167)	5	L1009-20 L906-20 L909-20 L911-20 L913-20 L915-20 L917-20 L919-20 L921-20 L923-20 L925-20 L927-20 L929-20 L931-20	Directly downstream of threat C/B
Master Dim and Test Indicator Lights - Engr Lower Pnl	33-12-41	28 VDC	Flight Engineers Warning Lights A (C348)	2.5	L1056-22 L1070-22	Directly downstream of threat C/B
Master Dim and Test Indicator Lights - Engr Lower Pnl	33-12-41	28 VDC	Flight Engineers Warning Lights B (C27)	2.5	L1055-22 L1071-22 L1078-22 L5665-22	Directly downstream of threat C/B Engineer panel Master Dim and Test Switch in TEST mode
Master Dim and Test Indicator Lights - Engr Lower Pnl	33-12-41	28 VDC	Flight Engineers Warning Lights C (C1064)	2.5	L1079-22 L1058-22 L1079-22	Directly downstream of threat C/B
Master Dim and Test Indicator Lights - Engr Lower Pnl	33-12-41	28 VDC	Flight Engineers Warning Lights C (C1065)	2.5	L1083-22	Directly downstream of threat C/B
Master Dim and Test Indicator Lights - Engr Lower Pnl	33-12-41	28 VDC	Engr Dim & Test Cont (C578)	5	L1066-22	Engineer panel lights NOT in DIM mode

TWA RA164 Center Wing Tank Bundle Analysis
P4 Flight Engineer Panel Bundle (W186)

ENCLOSURE
B-T113-96-3442

SYSTEM	Wire Diagram	Threat Voltage	Threat C/B (Number)	C/B rating (A)	Wire Number	Threat Condition
Master Dim and Test Indicator Lights - Engr Lower Pnl	33-12-41	28 VDC	Engr Ind Lights (C1117)	5	L1074-22	Engineer panel Master Dim and Test Switch in TEST mode
Master Dim and Test Indicator Lights - Engr Lower Pnl	33-12-41	28 VDC	Engr Ind Lights (C310)	5	L1123-22 L1081-22	Engineer panel Master Dim and Test Switch in TEST mode Engineer panel lights NOT in DIM mode
Master Dim and Test Indicator Lights - Engr Lower Pnl	33-12-41	12 VDC	Dimmer Assy	N/A	L6019-22 1065-22 1080-22 L5556-22	Engineer panel lights in DIM mode
Master Dim and Test Indicator Lights - Engr Lower Pnl	33-12-41	28 VDC	Engr Ind Lts (C579)	5	L1064-22 L1075-22	Directly downstream of threat C/B, and Engineer panel lights NOT in DIM mode
Master Dim and Test Indicator Lights - Engr Upper Pnl	33-12-42	28 VDC	Engr Ind Lts (C579)	5	L1099-22	Directly downstream of threat C/B
Master Dim and Test Indicator Lights - Engr Ctr Pnl (Cont)	33-12-45	28 VDC	Engr Dim & Test Cont (C578)	5	L1089-22 L1066-22	Engineer panel lights NOT in DIM mode
Master Dim and Test Indicator Lights - Engr Ctr Pnl (Cont)	33-12-45	28 VDC	Engr Ind Lights (C1117)	5	L6681-22 L1074-22	Engineer panel Master Dim and Test Switch in TEST mode
Master Dim and Test Indicator Lights - Engr Ctr Pnl (Cont)	33-12-45	28 VDC	Flight Engineers Warning Lights A (C348)	5	L1171-22 L1169-22	Directly downstream of threat C/B

TWA RA164 Center W...g Tank Bundle Analysis
P4 Flight Engineer Panel Bundle (W186)

ENCLOSURE
B-T113-96-3442

SYSTEM	Wire Diagram	Threat Voltage	Threat C/B (Number)	C/B rating (A)	Wire Number	Threat Condition
Master Dim and Test Indicator Lights - Engr	33-12-46	28 VDC	Engr Ind Lts (C1065)	5	L5876-22	Directly downstream of threat C/B
Accessory Lights - Upper Deck - Lavatory and Crew	33-13-41	28 VAC	Map And Utility Lights (C116)	5	L1821-22 L1822-22 L1823-22	Directly downstream of threat C/B
Pushbutton Switches - Lighted P4 Panel	33-13-61	12 VDC	Dimmer Assy	N/A	L4945-22 L5980-22 L4943-22	Engineer panel lights in DIM mode
Valve Control - Pylon Shut off and Pressure Regulating	36-11-11	28 VDC	Bleed Air Valve Engine 1 (C508)	2.5	1H11-20 1H1002-20	Directly downstream of threat C/B No. 1 Bleed Air switch in "CLOSE" position
Valve Control - Pylon Shut off and Pressure Regulating	36-11-11	28 VDC	Bleed Air Valve Engine 2 (C509)	2.5	2H11-20 2H1002-20	Directly downstream of threat C/B No. 2 Bleed Air switch in "CLOSE" position
Valve Control - Pylon Shut off and Pressure Regulating	36-11-11	28 VDC	Bleed Air Valve Engine 3 (C510)	2.5	3H11-20 3H1002-20	Directly downstream of threat C/B No. 3 Bleed Air switch in "CLOSE" position
Valve Control - Pylon Shut off and Pressure Regulating	36-11-11	28 VDC	Bleed Air Valve Engine 4 (C511)	2.5	4H11-20 4H1002-20	Directly downstream of threat C/B No. 4 Bleed Air switch in "CLOSE" position
Valve Control - Pylon Shut off and Pressure Regulating	36-11-11	28 VDC	Engr Ind Lights (C579)	5	1H1451-22	Valve 1 Pylon PRSOV closed

TWA RA164 Center Wing Tank Bundle Analysis
P4 Flight Engineer Panel Bundle (W186)

SYSTEM	Wire Diagram	Threat Voltage	Threat C/B (Number)	C/B rating (A)	Wire Number	Threat Condition
Valve Control - Pylon Shut off and Pressure Regulating	36-11-11	28 VDC	Engr Ind Lights (C579)	5	2H1451-22	Valve 2 Pylon PRSOV closed
Valve Control - Pylon Shut off and Pressure Regulating	36-11-11	28 VDC	Engr Ind Lights (C579)	5	3H1451-22	Valve 3 Pylon PRSOV closed
Valve Control - Pylon Shut off and Pressure Regulating	36-11-11	28 VDC	Engr Ind Lights (C579)	5	4H1451-22	Valve 4 Pylon PRSOV closed
Valve Control - Wing Isolation	36-11-21	115 VAC	Isolation Valve - Left Hand (C518)	2.5	H672-20	Directly downstream of threat C/B
					H427-20	Isolation Valve Switch S13 in "CLOSE" position
					H426-2-	Isolation Valve Switch S13 in "OPEN" position
Valve Control - Wing Isolation	36-11-21	115 VAC	Isolation Valve - Right Hand (C519)	2.5	H673-20	Directly downstream of threat C/B
					H425-20	Isolation Valve Switch S14 in "CLOSE" position
					H424-2-	Isolation Valve Switch S14 in "OPEN" position
Valve Control - High Stage Bleed	36-11-41	28 VDC	Bleed Air Valve Engine 1 (C508)	2.5	1H1953-20 1H207-20	No. 1 Bleed Air switch in "CLOSE" position
Valve Control - High Stage Bleed	36-11-41	28 VDC	Bleed Air Valve Engine 2 (C509)	2.5	2H1953-20 2H207-20	No. 2 Bleed Air switch in "CLOSE" position
Valve Control - High Stage Bleed	36-11-41	28 VDC	Bleed Air Valve Engine 3 (C510)	2.5	3H1953-20 3H207-20	No. 3 Bleed Air switch in "CLOSE" position

TWA RA164 Center W Tank Bundle Analysis
P4 Flight Engineer Panel Bundle (W186)

ENCLOSURE
B-T113-96-3442

SYSTEM	Wire Diagram	Threat Voltage	Threat C/B (Number)	C/B rating (A)	Wire Number	Threat Condition
Valve Control - High Stage Bleed	36-11-41	28 VDC	Bleed Air Valve Engine 4 (C511)	2.5	4H1953-20 4H207-20	No. 4 Bleed Air switch in "CLOSE" position
Indicator System - Bleed Air Pressure Relief	36-13-11	28 VDC	Engr Ind Lights (C579)	5	1H208-22	Engine 1 Bleed Air Pressure Relief valve closed
Indicator System - Bleed Air Pressure Relief	36-13-11	28 VDC	Engr Ind Lights (C579)	5	2H208-22	Engine 2 Bleed Air Pressure Relief valve closed
Indicator System - Bleed Air Pressure Relief	36-13-11	28 VDC	Engr Ind Lights (C579)	5	3H208-22	Engine 3 Bleed Air Pressure Relief valve closed
Indicator System - Bleed Air Pressure Relief	36-13-11	28 VDC	Engr Ind Lights (C579)	5	4H208-22	Engine 4 Bleed Air Pressure Relief valve closed
Fuel De-Ice	73-14-11	28 VDC	Eng No. 1 Fuel Heat Valve (C415)	2.5	1H1105-20 1H92-20	Directly downstream of threat C/B Eng 1 Fuel Heat Valve commanded open
Fuel De-Ice	73-14-11	28 VDC	Eng No. 2 Fuel Heat Valve (C417)	2.5	2H1105-20 2H92-20	Directly downstream of threat C/B Eng 2 Fuel Heat Valve commanded open
Fuel De-Ice	73-14-11	28 VDC	Eng No. 3 Fuel Heat Valve (C418)	2.5	3H92-20	Eng 3 Fuel Heat Valve commanded open
Fuel De-Ice	73-14-11	28 VDC	Eng No. 4 Fuel Heat Valve (C419)	2.5	4H92-20	Eng 4 Fuel Heat Valve commanded open

TWA RA164 Center W... Tank Bundle Analysis
P4 Flight Engineer Panel Bundle (W186)

SYSTEM	Wire Diagram	Threat Voltage	Threat C/B (Number)	C/B rating (A)	Wire Number	Threat Condition
Fuel Flow Meter - Engine 1 and 2	73-31-11	115 VAC	Eng 1 Fuel Flow (C1278)	1	1E221-22 1E69-22	Directly downstream of threat C/B
Fuel Flow Meter - Engine 1 and 2	73-31-11	115 VAC	Eng 2 Fuel Flow (C1279)	1	2E221-22 2E69-22	Directly downstream of threat C/B
Fuel Flow Meter - Engine 3 and 4	73-31-12	115 VAC	Eng 3 Fuel Flow (C1280)	1	3E221-22 3E69-22	Directly downstream of threat C/B
Fuel Flow Meter - Engine 3 and 4	73-31-12	115 VAC	Eng 3 Fuel Flow (C1281)	1	4E221-22 4E69-22	Directly downstream of threat C/B
Engine Ignition - Engine 1 and 2	74-31-11	28 VDC (lamp pwr seeking gnd)	Engr Ind Lights (CXXX)	5	J-38-20	Eng 1 or 2 engine ignition lamp on
Vibration Monitor Engine 1 and 2	77-31-11	Not available	Output from AVM	500 micro Ampers DC	2E62-11B 2E61-22-R 1E62-22B 1E61-22R	Direct output from AVM module
Vibration Monitor Engine 3 and 4	77-31-12	115 VAC	Engine Vibration (C101)	2.5	E66-22	Directly downstream of threat C/B
Oil Quantity Indicator	79-31-11	115 VAC	Engine 1 EPR and Oil Quantity (C41)	2.5	1E192-20	Directly downstream of threat C/B
Oil Quantity Indicator	79-31-11	115 VAC	Engine 2 EPR and Oil Quantity (C42)	2.5	2E192-20	Directly downstream of threat C/B

TWA RA164 Center V. .g Tank Bundle Analysis
P4 Flight Engineer Panel Bundle (W186)

ENCLOSURE
B-T113-96-3442

SYSTEM	Wire Diagram	Threat Voltage	Threat C/B (Number)	C/B rating (A)	Wire Number	Threat Condition
Oil Quantity Indicator	79-31-11	115 VAC	Engine 3 EPR and Oil Quantity (C43)	2.5	3E192-20	Directly downstream of threat C/B
Oil Quantity Indicator	79-31-11	115 VAC	Engine 4 EPR and Oil Quantity (C44)	2.5	4E192-20	Directly downstream of threat C/B
Dual Oil Pressure Indicators - Engine	79-32-11	26 VAC	Engine No. 1 Oil Temp & Press (C49)	1	1E22-22 1E25-22 1E136-22	Directly downstream of threat C/B
Dual Oil Pressure Indicators - Engine	79-32-11	26 VAC	Engine No. 2 Oil Temp & Press (C50)	1	2E22-22 2E25-22 2E136-22	Directly downstream of threat C/B
Dual Oil Pressure Indicators - Engine	79-32-11	26 VAC	Engine No. 3 Oil Temp & Press (C51)	1	3E22-22 3E25-22 3E136-22	Directly downstream of threat C/B
Dual Oil Pressure Indicators - Engine	79-32-11	26 VAC	Engine No. 4 Oil Temp & Press (C52)	1	4E22-22 4E25-22 4E136-22	Directly downstream of threat C/B
Oil Temperature Indicator - Engine	79-34-11	28 VAC	Engine 1 Oil Temp and Press (C49)	1	1E178-22	Directly downstream of threat C/B
Oil Temperature Indicator - Engine	79-34-11	28 VAC	Engine 2 Oil Temp and Press (C50)	1	2E178-22	Directly downstream of threat C/B
Oil Temperature Indicator - Engine	79-34-11	28 VAC	Engine 3 Oil Temp and Press (C51)	1	3E178-22	Directly downstream of threat C/B
Oil Temperature Indicator - Engine	79-34-11	28 VAC	Engine 4 Oil Temp and Press (C52)	1	4E178-22	Directly downstream of threat C/B

TWA RA164 Center W...g Tank Bundle Analysis
P4 Flight Engineer Panel Bundle (W186)

SYSTEM	Wire Diagram	Threat Voltage	Threat C/B (Number)	C/B rating (A)	Wire Number	Threat Condition
Oil Filter Bypass Warning Indicator	79-35-11	28 VDC	Engr Ind Lights (C1065)	5	L5876-22	Lights not in Dim Position
Pressure Indicator - Engine Breather	79-36-11	28 VAC	Eng 1 Breather Pressure	1	1E16-20 1E19-22 1E20-22	Directly downstream of threat C/B
Pressure Indicator - Engine Breather	79-36-11	28 VAC	Eng 2 Breather Pressure	1	2E16-20 2E19-22 2E20-22	Directly downstream of threat C/B
Pressure Indicator - Engine Breather	79-36-11	28 VAC	Eng 3 Breather Pressure	1	3E16-20 3E19-22 3E20-22	Directly downstream of threat C/B
Pressure Indicator - Engine Breather	79-36-11	28 VAC	Eng 4 Breather Pressure	1	4E16-20 4E19-22 4E20-22	Directly downstream of threat C/B

ENCLOSURE
B-T113-96-3442