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Document Title: **Safety Report for: Azimuth/Altitude Power Drive Unit**

Document Number: **VIS-PRO-VER-01001-9011**

Issue: **1.0**

Date: **11 March 2005**

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CEI/IEC 60950-1:2001

INFORMATION TECHNOLOGY EQUIPMENT-SAFETY

TEST REPORT

MEASUREMENT/TECHNICAL REPORT
TEST REPORT: VIS-PRO-VER-01001-9011
Number of pages in Test Document: 31

On the

AZ/ALT Power Drive Unit (PDU)
99-343-2000-01

Manufactured by

Vertex RSI
Controls and Structures Division
1219 Digital Drive
Richardson, TX 75081
(972) 907-9599 telephone
(972) 972-0027 fax

Prepared: March 09, 2005

Prepared by:	Approved by:
Steve Seiter	Juan Delgadillo
Control Systems	Control Systems
Technician	Manager

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SECTION 1.0 MANAGEMENT SUMMARY

An initial safety assessment of the Vertex RSI Controls and Structures Division, AZ/ALT Power Drive Unit (PDU) was performed from February 7, 2005 through February 11, 2005 and documented by VIS-PRO-VER-01001-9011. This review was performed using the criteria established by safety of information technology equipment-Safety, CEI/IEC 60950-1:2001.

SECTION 2.0 SCOPE

Vertex RSI Controls and Structure Division performed the safety assessment of the AZ/ALT Power Drive Unit (PDU), according to CEI/IEC 60950-1:2001.

2.1 STANDARDS USED

The assessment was conducted in accordance with the applicable portions of the following codes, guidelines and standards:

- CEI/IEC 60950-1:2001 Information Technology Equipment, Safety.

2.2 TESTS PERFORMED

In order to verify compliance with CEI/IEC 60950-1:2001, the following tests were performed:

- Input Current
- Discharge of Capacitors in Equipment
- Maximum Temperatures
- Touch Current and Protective Conductor Current
- Electric Strength

SECTION 3.0 EUT DESCRIPTION

The Azimuth/Altitude Power Drive Unit provides main and secondary power distribution and control functions to and from the telescope positioning motors and other auxiliary units within the Mount Control System. It also adjusts acceleration and deceleration of telescope positioning motors and provides for emergency stop deceleration functions. The telescope status information is sent continuously to the Mount Control Unit via a serial link and to the Local Control Units via a discrete I/O interface.

Dimensions (in mm): 1600 W X 2000 H X 500 D

Weight: 455 Kg

Power
Requirements: 230Vac, 3ϕ, 50/60 Hz, 5 Wire (3 phases, neutral and ground)
126 Amps Max per phase, 37 A typical

230Vac, 1ϕ, 50/60 Hz, UPS Power
6.5 A max

SECTION 4.0 ASSESSMENT & TESTING PROCEDURES

The criteria for this evaluation were based upon CEI/IEC 60950-1:2001, Information Technology Equipment, Safety. EN60950-1:2001 are performance-based guidelines designed to identify potential hazards during the operation and maintenance of equipment so the effectiveness of the engineering controls and fail-safe systems can be maximized.

This assessment was performed on a single unit that the Vertex RSI Controls and Structures Division presented as representative of the product covered by this report.

Product Tested:

AZ/ALT Power Drive Unit (PDU), Vertex RSI part number 99-343-2000-01, Rev -, S/N 001

TEST REPORT

CEI/IEC 60950-1:2001

Information Technology Equipment, Safety

Report reference No.	VIS-PR0-VER-01001-9011
Compiled by (+ signature)	Steve Seiter
Approved by (+ signature)	Juan Delgadillo
Date of issue	2/07/2005
Testing laboratory	VertexRSI Controls and Structures Division
Address	1219 Digital Drive, Suite 101
Testing location	Richardson, TX 75081
Standard	CEI/IEC 60950-1:2001
Test procedure	Self-Declaration
Procedure deviation	None
Non-standard test method	N.A.
Type of test object	AZ/ALT Power Drive Unit
Trademark	N.A.
Model/type reference	99-343-2000-01 REV -
Manufacturer	VertexRSI Controls and Structures Division
Equipment electrical ratings:	
Rated voltage (V)	230 VAC 3 phase / 230 VAC 1 phase
Rated current (A)	80 Amps/phase 3 phase / 5 Amps 1 phase
Rated frequency (Hz)	(47-63) Hz
Operating conditions:	
Rated operating time	Continuous Duty
Connection to the mains	Permanently connected equipment
Equipment mobility	Stationary equipment
Class of equipment	Class I
Mass of equipment (kg)	455
Enclosure Type	Fire enclosure

Possible test case verdicts:

- Test case does not apply to the test object: N/A
- Test object does meet the requirement ----: Pass
- Test object does not meet the requirement : Fail

General remarks:

"(see remark #)" refers to a remark appended to the report.

"(see appended table)" refers to a table appended to the report.

Throughout this report a point is used as the decimal separator.

The test results presented in this report relate only to the object tested.

This report shall not be reproduced except in full without the written approval of VertexRSI Controls and Structures Division.

Comments:

This test report includes the following documents:

(1) Input Current

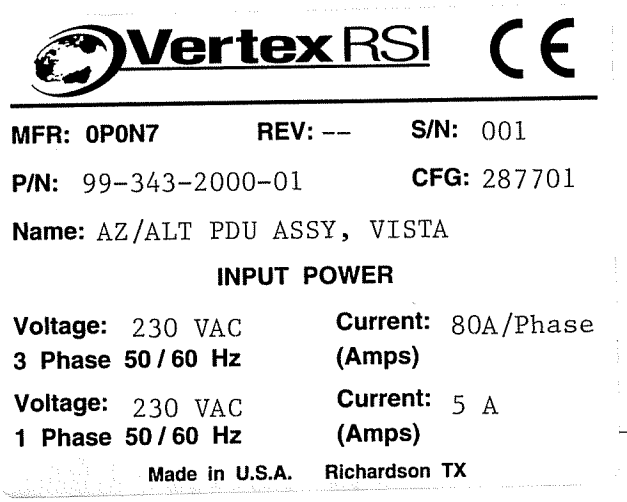
(2) Discharge of Capacitors in Equipment

(3) Maximum Temperatures

(4) Touch Current and Protective Conductor Current

(5) Electric Strength

Copy of the rating plates:



Para Number	Paragraph Description	Comments	Case Verdicts
1.5	**Components**		
1.5.1	Where safety is involved, components shall comply either with the requirements of this standard or with the safety aspects of the relevant IEC component standards ---------- ----------	All components are covered by relevant certifications and approvals	Pass
1.5.2	Evaluation and testing of components shall be ----------	All components are covered by relevant certifications and approvals and components are used in the right applications	Pass
1.5.3	Thermal controls ---------- ----------	No thermal controls are used	N/A
1.5.4	Transformers shall comply with the relevant requirements of this standard ---------- ----------	No transformers are used	N/A
1.5.5	Interconnecting cables provided as part of the equipment ----------	Proper cables are used for relevant voltages and currents	Pass
1.5.6	A capacitor connected between two line conductors of the PRIMARY CIRCUIT ---------- ----------	Capacitors are not used between primary circuit line conductors	N/A
1.5.7	**Double insulation or reinforced insulation bridged by components**		
1.5.7.1	General ---------- ----------	Double or reinforced insulation not used	N/A
1.5.7.2	Bridging capacitors ---------- ----------	Double or reinforced insulation not used	N/A
1.5.7.3	Bridging resistors ---------- ----------	Double or reinforced insulation not used	N/A
1.5.7.4	Accessible parts ---------- ----------	Double or reinforced insulation not used	N/A
1.5.8	Components in equipment for IT power distribution systems---------- ---	Equipment not connected to IT power systems.	N/A
1.6	**Power interface**		
1.6.1	**AC Power distribution systems**		
1.6.2	The steady state input current of the equipment shall not exceed ----------	Refer to Test Data Section (Input Current)	Pass
1.6.3	The RATED VOLTAGE of hand-held equipment ---------- ----------	Equipment is not hand-held	N/A
1.6.4	The neutral conductor, if any, shall be insulated from earth ---------- ----------	Equivalent insulation used on neutral conductor as for line conductor	Pass
1.7	**Marking and instructions**		

SECTION 4.0 ASSESSMENT & TESTING PROCEDURES (Continued)

Para Number	Paragraph Description	Comments	Case Verdicts
1.7.1	Rated voltage (V) ---------- Rated frequency (Hz) ---------- Rated current (A) ---------- Manufacturer ---------- Trademark ---------- Type/model ---------- Symbol of Class II ----------	See label No trademark Class I equipment	Pass Pass Pass Pass N/A Pass N/A
1.7.2	Safety instructions ----------	Provided	Pass
1.7.3	Short duty cycles ----------	The equipment is continuous operation	N/A
1.7.4	Supply voltage adjustment ----------	No voltage adjustment possible	N/A
1.7.5	Power outlets on the equipment ----------	No outlets are installed	N/A
1.7.6	Fuse identification ----------	Fuses are identified in supplied documentation	Pass
1.7.7	**Wiring Terminals**		
1.7.7.1	Protective earthing and bonding terminals ----------	Terminals properly marked	Pass
1.7.7.2	Terminals for a.c. mains supply conductors ----------	No a.c. terminals	N/A
1.7.7.3	Terminals for d.c. mains supply conductors	No d.c. mains supply	N/A
1.7.8	**Controls and Indicators**		
1.7.8.1	Identification, location and marking ----------	Controls are clearly marked	Pass
1.7.8.2	Colours ----------	Color of controls and indicators is proper	Pass
1.7.8.3	Symbols ----------	All symbols meet specifications	Pass
1.7.8.4	Markings using figures ----------	All symbols meet specifications	Pass
1.7.9	Isolation of multiple power sources----------	Warning label for multiple power source is provided	Pass
1.7.10	IT power distribution systems ----------	Equipment not connected to IT power systems.	N/A
1.7.11	Thermostats and other regulating devices----------	Equipment doesn't have any adjustable thermostats	N/A

Para Number	Paragraph Description	Comments	Case Verdicts
1.7.12	Language ----------	English language is used on installation instructions (intended for SERVICE PERSONNEL)	N/A
1.7.13	Durability ----------	Label is of a proven durability	Pass
1.7.14	Removable parts----------	Markings are placed on stationary parts	Pass
1.7.15	Replaceable batteries ----------	No batteries are used in equipment	N/A
1.7.16	Operator access with a tool ----------	No tool is necessary to gain access to an OPERATOR ACCESS AREA	N/A
1.7.17	Equipment for restricted access locations ----------	There's no equipment for restricted access location	N/A
2	**Protection from hazards**		
2.1	**Protection against electric shock and energy hazards**		
2.1.1	Protection in operator access areas ----------	No operator access to energized areas	N/A
2.1.1.1	Access to energized parts ----------	No operator access to energized parts	N/A
2.1.1.2	Battery compartments----------	Equipment has no battery compartments	N/A
2.1.1.3	Access to ELV wiring----------	No operator access to ELV wiring	N/A
2.1.1.4	Access to hazardous voltage circuit wiring ----------	No operator accessible hazardous voltages	N/A
2.1.1.5	Energy hazard ----------	No energy hazards exist in operator access areas.	N/A
2.1.1.6	Manual controls----------	Controls do not contact hazardous voltage nor ELV circuits.	Pass
2.1.1.7	Discharge of capacitors in equipment----------	Refer to Test Data Section (Discharge of Capacitors in Equipment)	Pass
2.1.2	Protection in service access areas----------	No unintentional contact is likely during service operations	Pass
2.1.3	Protection in restricted access locations----------	No unintentional contact is likely during operations	Pass
2.2	**SELV circuits**		
2.2.1	General requirements ----------	SELV circuits are safe to touch.	Pass
2.2.2	Voltages under normal conditions----------	Voltage in SELV circuitry does not exceed 42.4V peak or 60 V d.c. under normal operating conditions.	Pass

SECTION 4.0 ASSESSMENT & TESTING PROCEDURES (Continued)

Para Number	Paragraph Description	Comments	Case Verdicts
2.2.3	Voltage under fault conditions----------	Voltage in SELV circuitry does not exceed 42.4V peak or 60 V d.c. under fault conditions.	Pass
2.2.3.1	Separation by double insulation or reinforced insulation (Method 1)----------	Permanent separation by barriers and routing used	Pass
2.2.3.2	Separation by earthed screen (Method 2)----------	This method is not used	N/A
2.2.3.3	Protection by of the earthing of SELV circuit (Method 3)----------	This method is not used	N/A
2.2.4	Connection of SELV circuits to other circuits----------	All conditions are met	Pass
2.3	**TNV circuits**		
2.3.1	Limits----------	This equipment does not contain TNV circuits	N/A
2.3.2	Separation from other circuits and from accessible parts----------	This equipment does not contain TNV circuits	N/A
2.3.3	Separation from hazardous voltages----------	This equipment does not contain TNV circuits	N/A
2.3.4	Connection of TNV circuits to other circuits----------	This equipment does not contain TNV circuits	N/A
2.3.5	Test for operating voltages generated externally----------	This equipment does not contain TNV circuits	N/A
2.4	**Limited current circuits**		
2.4.1	General requirements----------	No limited current circuits used in equipment	N/A
2.4.2	Limit values----------	No limited current circuits used in equipment	N/A
2.4.3	Connection of limited current circuits to other circuits----------	No limited current circuits used in equipment	N/A
2.5	Limited power sources ----------	No limited power sources in equipment	N/A
2.6	**Provisions for earthing and bonding**		
2.6.1	Protective earthing ----------	All conductive parts are reliably connected to a protective earthing terminal	Pass
2.6.2	Functional earthing----------	No functional earthing in equipment	N/A
2.6.3	**Protective earthing and protective bonding conductors**		
2.6.3.1	General ----------	Protective earthing and bonding conductors of correct current capacity	Pass
2.6.3.2	Size of protective earthing conductors----------	Size of protective conductors correct for current	Pass

Para Number	Paragraph Description	Comments	Case Verdicts
2.6.3.3	Size of protective bonding conductors----------	Size of bonding conductors correct for current	Pass
2.6.3.4	Resistance of earthing conductors and their terminations----------	Resistance complies by conductor size	Pass
2.6.3.5	Colour of insulation ----------	Insulated earthing conductors are yellow/green.	Pass
2.6.4	**Terminals**		
2.6.4.1	**General**		
2.6.4.2	Protective earthing and bonding terminals----------	Protective earthing and bonding terminal part of power connector	Pass
2.6.4.3	Separation of the protective earthing conductor from protective bonding conductors----------	Protective earthing and bonding conductors are separated	Pass
2.6.5	**Integrity of protective earthing**		
2.6.5.1	Interconnection of equipment----------	Protective earthing connection is assured for all necessary interconnecting equipment	Pass
2.6.5.2	Components in protective earthing conductors and protective bonding conductors----------	No switches or overcurrent protection devices are used in the protective earthing or bonding conductors	Pass
2.6.5.3	Disconnection of protective earth----------	Protective earthing conductor can not be disconnected without disconnecting a.c. mains	Pass
2.6.5.4	Parts that can be removed by an operator----------	No operator access	N/A
2.6.5.5	Parts removed during servicing----------	Protective earthing conductor does not need to be disconnected to service a.c. mains	Pass
2.6.5.6	Corrosion resistance----------	All conductive parts are plated or coated for corrosion resistance	Pass
2.6.5.7	Screws for protective bonding----------	No self tapping or sheet metal screws used	N/A
2.6.5.8	Reliance on telecommunication network or cable distribution system----------	Not connected to telecommunication network or cable distribution system	N/A
2.7	**Overcurrent and earth fault protection in primary circuits**		
2.7.1	**Basic requirements**		
2.7.2	Faults not covered in 5.3----------		N/A
2.7.3	Short-circuit backup protection----------	Short-circuit backup protection in building installation	Pass
2.7.4	Number and location of protective devices----------	Proper number and location of protective devices	Pass

Para Number	Paragraph Description	Comments	Case Verdicts
2.7.5	Protection by several devices----------	Protection devices protect both poles of same load	Pass
2.7.6	Warning to service persons----------	Conditions do not apply	N/A
2.8	**Safety interlocks**		
2.8.1	General principals ----------	No operator access	N/A
2.8.2	Protection requirements ----------	No operator access	N/A
2.8.3	Inadvertent reactivation ----------	No operator access	N/A
2.8.4	Fail-safe operation ----------	No operator access	N/A
2.8.5	Moving parts ----------	No operator access	N/A
2.8.6	Overriding ----------	No safety interlocks provided	N/A
2.8.7	Switches and relays ----------	No safety interlocks provided	N/A
2.8.7.1	Contact gaps ----------	No safety interlocks provided	N/A
2.8.7.2	Overload test ----------	No safety interlocks provided	N/A
2.8.7.3	Endurance test ----------	No safety interlocks provided	N/A
2.8.7.4	Electric strength test ----------	No safety interlocks provided	N/A
2.8.8	Mechanical actuators ----------	No safety interlocks provided	N/A
2.9	**Electrical insulation**		
2.9.1	Properties of insulation materials ----------	Proper insulating materials are used for the applications and conditions	Pass
2.9.2	Humidity conditioning ----------	Not required by 2.9.1, 2.10.6.5 or 2.10.7	N/A
2.9.3	Grade of insulation ----------	Proper grade of insulation is used	Pass
2.10	**Clearances, creepage distances and distances through insulation**		
2.10.1	**General**		
2.10.2	**Determination of working voltage**		
2.10.3	**Clearances**		
2.10.3.1	**General**		
2.10.3.2	Clearances in primary circuits ----------	All clearances exceed requirements	Pass
2.10.3.3	Clearances in secondary circuits ----------	All clearances exceed requirements	Pass
2.10.3.4	Measurement of transient voltage levels ----------	Does not apply	N/A
2.10.4	Creepage distances ----------	All clearances exceed requirements	Pass

SECTION 4.0 ASSESSMENT & TESTING PROCEDURES (Continued)

Para Number	Paragraph Description	Comments	Case Verdicts
2.10.5	**Solid insulation**		
2.10.5.1	Minimum distance through insulation -	Solid insulation not used	N/A
2.10.5.2	Thin sheet material	Thin sheet material not used	N/A
2.10.5.3	Printed boards	Peak working voltage does not exceed ± 1v	N/A
2.10.5.4	Wound components	Wound components not used	N/A
2.10.6	**Coated printed boards**		
2.10.6.1	General	Coated printed boards built to required specifications	Pass
2.10.6.2	Sample preparation and preliminary inspection	Coated printed boards built to required specifications	Pass
2.10.6.3	Thermal cycling	Coated printed boards built to required specifications	Pass
2.10.6.4	Thermal ageing	Coated printed boards built to required specifications	Pass
2.10.6.5	Electric strength test	Coated printed boards built to required specifications	Pass
2.10.6.6	Abrasion resistance test	Coated printed boards built to required specifications	Pass
2.10.7	Enclosed and sealed parts	Coated printed boards built to required specifications	Pass
2.10.8	Spacings filled by insulating compound	Coated printed boards built to required specifications	Pass
2.10.9	Component external terminations	Coated printed boards built to required specifications	Pass
2.10.10	Insulation with varying dimensions --	Coated printed boards built to required specifications	Pass
3	**WIRING, CONNECTIONS AND SUPPLY**		
3.1	**General**		
3.1.1	Current rating and overcurrent protection	- Wiring is rated for the currents they carry. - Wiring used in the distribution of primary power is protected against overcurrent/short circuit	Pass
3.1.2	Wire ways shall be smooth and free from sharp edges	Wire ways and runs are properly protected.	Pass
3.1.3	Internal wiring shall be routed, supported, clamped or secured	Internal wiring is properly clamped, routed, supported and secured.	Pass
3.1.4	Insulation of conductors	Refer to Test Data Section (Electric Strength)	Pass

Para Number	Paragraph Description	Comments	Case Verdicts
3.1.5	Fixing of beads and similar insulators ----------	Ceramic insulators are not used.	N/A
3.1.6	Screws for electrical contact pressure---------- ----------	Recognized terminal blocks used.	Pass
3.1.7	Insulating materials in electrical connections---------- ----------	Insulating materials do not have contact pressure transmitted through them	Pass
3.1.8	Self-tapping and spaced thread screws ----------	Sheet metal/thread-cutting screws are not used for electrical connection of current-carrying parts.	N/A
3.1.9	Termination of conductors---------- ----------	All conductors are terminated so as to prevent movement	Pass
3.1.10	Sleeving on wiring---------- ----------	All sleeving is retained in place by one or more of the methods listed	Pass
3.2	**Connection to an a.c. mains supply or d.c. mains supply**		
3.2.1	Means of connection		
3.2.1.1	For safe and reliable connection to an a.c. mains power supply ---------- ------	Connection to a.c. mains is provided by means of a recognized plug	Pass
3.2.1.2	For safe and reliable connection to a d.c. mains power supply ---------- ---	No connection to a d.c. mains power supply	N/A
3.2.2	Multiple supply connections---------- ----------	All conditions apply	Pass
3.2.3	Permanently connected equipment shall ----------	All cables secured to entry plate by connector or conduit	Pass
3.2.4	Appliance inlets ---------- ----------	No appliance inlets are provided	N/A
3.2.5	**Power supply cords**		
3.2.5.1	AC power supply cords ---------- ----------	AC power supply cord complies with all conditions	Pass
3.2.5.2	DC power supply cords---------- ----------	No d.c. power supply cords provided	N/A
3.2.6	Cord anchorages and strain relief --- ---------- -----	No cord anchorages or strain relief used	N/A
3.2.7	Power supply cord shall not be exposed to sharp points or cutting edges ----------	Power supply cord is not exposed to any conditions to cause damage	Pass
3.2.8	A cord guard shall be provided at the power supply cord inlet opening ----- ----------	The equipment is not intended to be moved while in operation.	N/A
3.2.9	The supply wiring space provided inside the equipment for ----------	All conditions apply	Pass
3.3	**Wiring terminals for connection of external conductors**		

SECTION 4.0 ASSESSMENT & TESTING PROCEDURES (Continued)

Para Number	Paragraph Description	Comments	Case Verdicts
3.3.1	Permanently connected equipment and equipment with ordinary NON-DETACHABLE POWER SUPPLY CORDS shall be provided with terminals in which connection is made by means of screws ----------	All connections secured by terminals and meet required specificatoins	Pass
3.3.2	For equipment with special NON-DETACHABLE POWER SUPPLY CORDS, ----------	All connections secured by terminals and meet required specifications	Pass
3.3.3	Screws and nuts which clamp external mains supply conductors ----------	All connections secured by terminals and meet required specifications	Pass
3.3.4	Terminals shall allow the connection of conductors having nominal cross -- ----------	All connections secured by terminals and meet required specifications	Pass
3.3.5	Wiring terminals shall have minimum sizes ----------	All connections secured by terminals and meet required specifications	Pass
3.3.6	Wiring terminals shall be so designed that they clamp the conductor ----------	All connections secured by terminals and meet required specifications	Pass
3.3.7	Grouping of wiring terminals ----------	All connections secured by terminals and meet required specifications	Pass
3.3.8	Stranded wire ----------	All connections secured by terminals and meet required specifications	Pass
3.4	**Disconnection from the mains supply**		
3.4.1	General requirement----------	Disconnect will be part of the equipment installation	N/A
3.4.2	Disconnect devices shall have----------	An approved circuit breaker will be provided to disconnect the equipment from the mains supply	Pass
3.4.3	For PERMANENTLY CONNECTED EQUIPMENT, the disconnect----------	Installation instruction state that an appropriate disconnect device shall be provided as part of the building installation	Pass
3.4.4	Parts on the supply side of a disconnect device----------	All parts on the supply side of the disconnect device are insulated	Pass
3.4.5	Isolating switches shall not be fitted in flexible cords----------	Equipment does not have isolating switches in flexible cord	Pass
3.4.6	For single-phase and d.c. equipment, the disconnect device ----------	Installation instruction specifies that a two-pole device is to be provided in the building installation	Pass
3.4.7	For three phase equipment, the disconnect device ----------	Installation instruction specifies that a three-pole device is to be provided in the building installation	Pass
3.4.8	Where the disconnect device is a switch----------	Switch is to be properly marked	Pass

Para Number	Paragraph Description	Comments	Case Verdicts
3.4.9	Where a plug on the power supply cord is used as the disconnect device ----	The plug on the power supply cord is not used as a disconnect device	N/A
3.4.10	Where a group of units having individual supply----------	Units are disconnected by means of circuit breaker	Pass
3.4.11	Where a unit receives power from more than one source----------	Multiple power source warning labels provided	Pass
3.5	**Interconnection of equipment**		
3.5.1	General requirements----------	All equipment connected conforms to 2.2 and 2.3 as needed	Pass
3.5.2	Each interconnection circuit shall---	All interconnection circuits are of the types listed	Pass
3.5.3	Where additional equipment ----------	All additional equipment meet the requirements listed	Pass
4	**PHYSICAL REQUIREMENTS**		
4.1	Under conditions of normal use, equipment shall not become physically unstable to the degree ----------	Equipment is to be secured to the building structure before operation	Pass
4.2	**Mechanical strength**		
4.2.1	Equipment shall have adequate mechanical strength ----------	Equipment is designed for adequate mechanical strength subject to the conditions in which it will be used	Pass
4.2.2	Steady force test, 10 N ----------	Equipment is designed for adequate mechanical strength subject to the conditions in which it will be used	Pass
4.2.3	Steady force test, 30 N ----------	Not located in an operator access area	N/A
4.2.4	Steady force test, 250 N ----------	Equipment is designed for adequate mechanical strength subject to the conditions in which it will be used	Pass
4.2.5	Impact test----------	Equipment is designed for adequate mechanical strength subject to the conditions in which it will be used	Pass
4.2.6	Drop test----------	Not a listed equipment	N/A
4.2.7	Stress relief test----------	Equipment is not constructed of thermoplastic materials	N/A
4.2.8	Cathode ray tubes ----------	Equipment does not contain a cathode ray tube	N/A
4.2.9	High pressure lamps----------	Equipment does not contain a high pressure lamp	N/A
4.2.10	Wall or ceiling mounted equipment----	Equipment is not wall or ceiling mounted	N/A
4.3	**Design and construction**		

Para Number	Paragraph Description	Comments	Case Verdicts
4.3.1	Where edges and corners could be hazardous----------	No operator access	N/A
4.3.2	Handles knobs, grips, levers ----------	All handles, knobs, grips, levers, etc. are reliably fixed in place	Pass
4.3.3	Adjustable controls ----------	Equipment does not have adjustable controls	N/A
4.3.4	Securing of parts----------	All parts are secured to prevent loosening during normal use	Pass
4.3.5	Connection of plugs and sockets----------	All plugs and sockets are keyed to prevent incorrect connection	Pass
4.3.6	DIRECT PLUG-IN EQUIPMENT shall not impose undue stress----------	No Direct Plug-IN Equipment used	N/A
4.3.7	Heating elements in earthed equipment----------	Equipment does not contain heating elements	N/A
4.3.8	Batteries----------	Equipment does not contain batteries	N/A
4.3.9	Oil and grease----------	Equipment is not exposed to oil and grease in normal operation	N/A
4.3.10	Dust, powders, liquids and gases ----------	No dust, powders, liquids or gases are produced or used in this equipment	N/A
4.3.11	Containers for liquids or gases----------	No dust, powders, liquids or gases are produced or used in this equipment	N/A
4.3.12	Flammable liquids----------	Equipment does not use flammable liquids	N/A
4.3.13	**Radiation**		
4.3.13.1	General ----------	Equipment does not produce radiation	N/A
4.3.13.2	Ionizing radiation ----------	Equipment does not produce ionizing radiation	N/A
4.3.13.3	Effect of ultraviolet (UV) radiation on materials----------	Equipment does not produce UV radiation	N/A
4.3.13.4	Human exposure to ultraviolet (UV) radiation ----------	Equipment does not produce UV radiation	N/A
4.3.13.5	Lasers (Including LEDs)----------	Equipment does not use lasers	N/A
4.3.13.6	Other types----------	Does not produce other types of radiation	N/A
4.4	**Protection against hazardous moving parts**		
4.4.1	General----------	Fan has guard and is only moving part	Pass

SECTION 4.0 ASSESSMENT & TESTING PROCEDURES (Continued)

Para Number	Paragraph Description	Comments	Case Verdicts
4.4.2	Protection in operator access areas ----------	No moving parts in operator access areas	N/A
4.4.3	Protection in restricted access locations ----------	No moving parts in restricted access areas	N/A
4.4.4	Protection in service access areas -- ----------	Fan has guard and is only moving part	Pass
4.5	**Thermal requirement**		
4.5.1	Maximum temperatures ---------- ----------	Refer to Test Data Section (Maximum Temperatures)	Pass
4.5.2	Resistance to abnormal heat --------- ----------	Hazardous voltages are not in contact with thermoplastic parts	N/A
4.6	**Openings in enclosures**		
4.6.1	Top and side openings ---------- ----------	All Openings do not exceed 5 mm in any direction	Pass
4.6.2	Bottoms of fire enclosures ---------- ----------	Bottom of enclosure does not contain openings and is not transportable	Pass
4.6.3	Doors or covers in fire enclosures -- ----------	No operator access is available	N/A
4.6.4	Openings in transportable equipment ----------	Limited power source used	Pass
4.6.5	Adhesives for constructional purposes ----------	Barrier not used	N/A
4.7	**Resistance to fire**		
4.7.1	Reducing the risk of ignition and spread of flame---------- ----------	Enclosures are metal and proper components are used in construction.	Pass
4.7.2	**Conditions for a fire enclosure**		
4.7.2.1	Parts requiring a fire enclosure ---- ----------	Enclosures are metal	Pass
4.7.2.2	Parts not requiring a fire enclosure ----------	Enclosures are metal	N/A
4.7.3	**Materials**		
4.7.3.1	General ---------- ----------	Enclosures are metal and proper components are used in construction.	Pass
4.7.3.2	Materials for fire enclosures ------- ----------	Enclosures are metal and proper components are used in construction.	Pass
4.7.3.3	Materials for components and other parts outside fire enclosures ------- ----------	Enclosures are metal and proper components are used in construction.	Pass
4.7.3.4	Materials for components and other parts inside fire enclosures -------- ----------	Enclosures are metal and proper components are used in construction.	Pass

Para Number	Paragraph Description	Comments	Case Verdicts
4.7.3.5	Materials for air filter assemblies ----------	Filters separated by metal screens	Pass
4.7.3.6	Materials used in high-voltage components ----------	No operating voltages exceeding 4 kV peak-to-peak	N/A
5	**Electrical requirements and simulated abnormal conditions**		
5.1	**Touch current and protective conductor current**		
5.1.1	**General**		
5.1.2	**Equipment under test (EUT)**		
5.1.3	**Test circuit**		
5.1.4	**Application of measuring instrument**		
5.1.5	**Test procedure**		
5.1.6	Test measurements ----------	Leakage current exceeds 3.5 MIU. Proper labeling provided.	N/A
5.1.7	Equipment with touch current exceeding 3.5 mA ----------	Warning labels for leakage current provided	Pass
5.1.8	Touch currents to telecommunication networks and cable distribution systems and from telecommunication networks ----------	Equipment is not connected to telecommunication networks or cable distribution systems	N/A
5.1.8.1	Limitation of the touch current to a telecommunication network and a cable distribution system ----------	Equipment is not connected to telecommunication networks or cable distribution systems	N/A
5.1.8.2	Summation of touch currents from telecommunication networks ----------	Equipment is not connected to telecommunication networks or cable distribution systems	N/A
5.2	**Electric strength**		
5.2.1	**General**		
5.2.2	Test procedure ----------	Refer to Test Data Section (Electrical Strength)	Pass
5.3	**Abnormal operating and fault conditions**		
5.3.1	Protection against overload and abnormal operation ----------	Equipment is protected from overload and abnormal operation by circuit breakers and fuses	Pass
5.3.2	Under overload, locked rotor and other abnormal conditions, motors --- ----------	Motor are protected by sensing circuits that remove power from the unit	Pass
5.3.3	Transformers shall be protected against overload, for ----------	Transformers are protected by circuit breakers	Pass
5.3.4	Functional insulation ----------	Functional insulation meets the requirements of 2.10	Pass

Para Number	Paragraph Description	Comments	Case Verdicts
5.3.5	Electromechanical components ----------	No electromechanical are used in equipment	N/A
5.3.6	Simulation of faults ----------	All possible single fault conditions were simulated to show safety for all components not covered in 5.3.2, 5.3.3 and 5.3.5	Pass
5.3.7	Unattended equipment ----------	Equipment does not contain listed components	N/A
5.3.8	**Compliance criteria for abnormal operation fault conditions**		
5.3.8.1	During the tests ----------	No conditions listed occurred during the tests	Pass
5.3.8.2	After the tests ----------	No conditions occurred that require the electrical strength test to be done	N/A
6	**CONNECTION TO TELECOMMUNICATION NETWORKS**		
6.1	**Protection of telecommunication network service persons, and users of other equipment connected to the network, from hazards in the equipment**		
6.1.1	Protection from hazardous voltages ----------	Unit is not connected to telecommunication network circuits.	N/A
6.1.2	**Separation of the telecommunication network from earth**		
6.1.2.1	Requirements ----------	Unit is not connected to telecommunication network circuits.	N/A
6.1.2.2	Exclusions ----------	Unit is not connected to telecommunication network circuits.	N/A
6.2	**Protection of the equipment users from overvoltages on the telecommunication networks**		
6.2.1	Separation requirements ----------	Unit is not connected to telecommunication network circuits.	N/A
6.2.2	Electric strength test procedure ----------	Unit is not connected to telecommunication network circuits.	N/A
6.2.2.1	Impulse test ----------	Unit is not connected to telecommunication network circuits.	N/A
6.2.2.2	Steady-state test ----------	Unit is not connected to telecommunication network circuits.	N/A
6.2.2.3	Compliance criteria ----------	Unit is not connected to telecommunication network circuits.	N/A
6.3	Protection of the telecommunication wiring system from overheating ----------	Unit is not connected to telecommunication network circuits.	N/A
7	**Connection to cable distribution systems**		
7.1	Protection of cable distribution system service persons, and users of other equipment connected to the	Unit is not connected to cable distribution systems	N/A

Para Number	Paragraph Description	Comments	Case Verdicts
	system, from hazardous voltages in the equipment ----------		
7.2	Protection of equipment users from overvoltages on the cable distribution system ----------	Unit is not connected to cable distribution systems	N/A
7.3	Insulation between primary circuits and cable distribution systems ----	Unit is not connected to cable distribution systems	N/A
7.3.1	General ----------	Unit is not connected to cable distribution systems	N/A
7.3.2	Voltage surge test ----------	Unit is not connected to cable distribution systems	N/A
7.3.3	Impulse test ----------	Unit is not connected to cable distribution systems	N/A

SECTION 5.0 TEST DATA

INPUT CURRENT

Requirements:

1.6.2 The steady state input current of the equipment shall not exceed the rated current by more than 10% under normal load.

Compliance is checked by measuring the input current of the equipment at NORMAL LOAD under the following conditions:

- Where a single value of RATED CURRENT is marked (see 1.7.1), it is compared with the higher value of input current measured in the associated voltage range.

Manufacturer Name: VertexRSI Controls and Structures Division

EUT: AZ/ALT Power Drive Unit (PDU)

Tester: Steve Seiter

Date Tests Performed: February 7, 2005

Loading Conditions for Test: Normal simulated load

Equipment Rated Voltage and Freq: 230Vac, 3ϕ, 50/60 Hz
230Vac, 1ϕ, 50/60 Hz

Equipment Rated Current: 80 Amps/phase 3ϕ,
5 Amps 1ϕ,

Test Results:

INPUT VOLTAGE (VAC)	MEASURED CURRENT (A)	VERIFICATION (√) (Measured Current < 110% Rated Current)
230 3ϕ	2.00	√
230 1ϕ	2.23	√

Test Equipment Used:

Manufacturer	Model	Serial #/Control #	Cal. Due Date
Extech	380947	04280460/T-553	12-06-05

Tester's Certification: I certify that the above tests were conducted as described.

Steve D. Seiter

DISCHARGE OF CAPACITORS IN EQUIPMENT

Requirements:

2.1.1.7 Equipment shall be so designed that, at an external point of disconnection of the AC mains supply or DC mains supply, the risk of electric shock from stored charge on capacitors connected in the equipment is reduced.

Equipment is considered to comply if any capacitor having marked or nominal capacitance exceeding 0.1uF and in circuits connected to the a.c. mains supply or d.c. mains supply has a means of discharge resulting in a time-constant not exceeding:

- 1 s for PLUGGABLE EQUIPMENT TYPE A; and
- 10 s for PERMANENTLY CONNECTED EQUIPMENT and PLUGGABLE EQUIPMENT TYPE B.

Manufacturer Name: VertexRSI Controls and Structures Division

EUT: AZ/ALT Power Drive Unit (PDU)

Tester: Steve Seiter

Date Tests Performed: February 7, 2005

Connection to Mains: Yes

EUT Rated Voltage and Freq: 230VAC, 47-63 Hz

Comments:

Test Results:

INPUT VOLTAGE (VAC)	37% OF INPUT VOLTAGE (VAC)	TIME AT 37% OF INPUT VOLTAGE (SECS)	VERIFICATION (√) (V @ 10secs < 37% of Peak V)
230	85.1	6.3 Sec	√

Test Equipment Used:

Manufacturer	Model	Serial #/Control #	Cal. Due Date
Tektronix	TDS1012	C035400/T-529	9-24-05

Tester's Certification: **I certify that the above tests were conducted as described.**

Steve D. Seiter

MAXIMUM TEMPERATURES

Requirements:

4.5.1 Materials used in components and in the construction of the equipment shall be selected so that under NORMAL LOAD, temperatures do not exceed safe values in the meaning of this standard.

Compliance is checked by inspection of material data sheets and by determining and recording the temperatures in accordance with 1.4.12 and 1.4.13.

The temperature shall not exceed the values shown in table 4B, parts 1 and 2.

Manufacturer Name: VertexRSI Controls and Structures Division

EUT: AZ/ALT Power Drive Unit (PDU)

Tester: Steve Seiter

Date Tests Performed: February 7, 2005

Type of Operation: Continuous

Period of Operation: Until temp steady-state achieved

Method of Measurement: Thermocouple

Loading Conditions for Test: Full simulated load

Test Results:

TEMPERATURE BY THERMOCOUPLE METHOD

POINT	THERMOCOUPLE LOCATION	TEMP (°C)	VERIFICATION (√) (T < 75 °C)
		T	-
1	Ambient Air	24.2	-
2	Inside Ambient Max	27.5	√
3	Central Control Unit	28.3	√
4	Power Supply (PS1)	38.0	√
5	Power Supply (PS2)	35.1	√
6	A20 Load Resistor	49.6	√
7	Motor Controller	27.6	√
8	Controller Power Supply	27.2	√
9	Status Board PLD (U11)	51.1	√
10	Surge Suppressor	28.2	√

Test Equipment Used:

Manufacturer	Model	Serial #/Control #	Cal. Due Date
Fluke	179	T-550	11-19-05
Fluke	179	T-465	4-06-05
Fluke	179	T-463	4-06-05
Fluke	189	T-545	9-02-05

Tester's Certification: I certify that the above tests were conducted as described.

Steve D. Seiter

TOUCH CURRENT AND PROTECTIVE CONDUCTOR CURRENT

Requirements:

5.1 Equipment shall be so designed and constructed that neither TOUCH CURRENT nor PROTECTIVE CONDUCTOR CURRENT is likely to create an electrical shock hazard.

Compliance is checked by testing in accordance with 5.1.2 to 5.1.7 inclusive, and, if relevant, 5.1.8 (see also 1.4.4).

However, if it is clear from a study of the circuit diagrams of either PERMANENTLY CONNECTED EQUIPMENT or PLUGGABLE EQUIPMENT TYPE B, that has a PROTECTIVE EARTHING CONDUCTOR, that the TOUCH CURRENT will exceed 3,5 mA r.m.s., but that the PROTECTIVE CONDUCTIVE CURRENT will not exceed 5% of input current, the tests of 5.1.5, 5.1.6 and 5.1.7 are not made.

Manufacturer Name: VertexRSI Controls and Structures Division

EUT: AZ/ALT Power Drive Unit (PDU)

Tester: Steve Seiter

Date Tests Performed: February 7, 2005

Safety Isolating Transformer Used: No

Input Voltage Used for Test: 230 VAC RMS

Most Unfavorable Supply Voltage For the Test: 230 VAC RMS

Test Results:

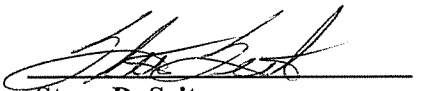
$$\text{Touch Current} = \frac{U2}{500}$$

PHASE MEASURED	MEASURED LEAKAGE CURRENT MIU	VERIFICATION (√) (Measured Current < 3.5 MIU)
Line to Ground 1ϕ	4.2	Warning labels provided. Does not exceed 5% of input current
Neutral to Ground 1ϕ	3.6	Warning labels provided. Does not exceed 5% of input current
Neutral to Ground 3ϕ	0.56	√

Test Equipment Used:

Manufacturer	Model	Serial #/Control #	Cal. Due Date
Fluke	179	T-550	11-19-05

Tester's Certification: **I certify that the above tests were conducted as described.**



Steve D. Seiter

ELECTRIC STRENGTH

Requirements:

5.2.1 The electric strength of solid insulation used in the equipment shall be adequate.

Compliance is checked accordance with 5.2.2 while the equipment is still in a well-heated condition immediately following the heating test as specified in 4.5.1.

Test Procedure: The insulation is subjected either to a voltage of substantially sine-wave form having a frequency of 50 Hz or 60 Hz or to a DC VOLTAGE equal to the peak voltage of the prescribed a.c. test voltage. Unless otherwise specified elsewhere in this standard, test voltages are as specified in table 5B for the appropriate grade of INSULATION (FUNCTIONAL, BASIC, SUPPLEMENTARY OR REINFORCED) and the WORKING VOLTAGE (U), determined in 2.10.2, across the insulation. DC values of WORKING VOLTAGE shall be used for DC VOLTAGES and peak values for other voltages.

The voltage applied to the insulation under test is gradually raised from zero to the prescribed voltage and held at that value for 60 s.

There shall be no insulation breakdown during the test.

Manufacturer Name: VertexRSI Controls and Structures Division

EUT: AZ/ALT Power Drive Unit (PDU)

Tester: Steve Seiter

Date Tests Performed: February 7, 2005

Grade of Insulation: Basic

Comments:

Test Results:

TEST VOLTAGE APPLIED	TEST VOLTAGE APPLIED BETWEEN LOCATION	VERIFICATION (√) (No Breakdown)
2200	L & N to PE	√

Test Equipment Used:

Manufacturer	Model	Serial #/Control #	Cal. Due Date
Biddle	230425	20123/T-301	12-20-05

Tester's Certification: I certify that the above tests were conducted as described.

Steve D. Seiter