APPENDIX C

DISPOSITION AND RATIONALE

(DISPLAYS & CONTROL PANEL)

FUNCTION:
THE A7A2 ENERGIA DISPLAYS AND CONTROL (D&C) PANEL HAS BEEN ACQUIRED FROM ENERGIA. THE A7A2 PANEL ISSUES CONTROL COMMANDS TO THE ANDROGYNOUS PERIPHERAL DOCKING ASSEMBLY (APDA.) IT PROVIDES POWER BUS CONTROL, DISTRIBUTION, AND PROTECTION FOR THE APDA MANUAL CONTROL SWITCHES; THE APDA LOGIC BUSES; THE APDA HEATERS; THE TELEMETRY ACQUISITION DEVICES (DCUs 1 AND 2); THE PYROTECHNICS LOGIC AND "FIRE" BUSES; AND THE EVENT INDICATORS UTILIZED THROUGHOUT THE DOCKING SEQUENCE. THE APDS SYSTEM IS DESIGNED TO COMPLETE ITS OPERATION IN AN AUTOMATED MODE. THE MANUAL COMMANDS (SWITCHES) ARE UTILIZED FOR SYSTEM INITIALIZATION AND AS BACK-UP TO THE AUTOMATED OPERATIONS. THE APDS CONTROL LOGIC BOTH FOR AUTOMATIC AND MANUAL COMMAND STIMULI IS CONFIGURED TO RESPOND TO A "TWO OF THREE" INPUT LOGIC. WITHIN THE CONTROL UNITS, AUTOMATIC AND MANUAL SIGNALS ARE DECODED AND IMPLEMENTED WHEN TWO OF THE THREE AUTOMATED OR MANUAL STIMULI ARE PRESENT.

HARDWARE DESCRIPTION:
THE CONTROL PANEL IS AN UNSEALED, DUST AND MOISTURE PROOF HOUSING THAT PROVIDES METAL-TO-METAL FASTENING USING BOLTS, BUSHING, ETC. THE PANEL CONTAINS THE FOLLOWING ENERGIA PROCURED COMPONENTS:

REFERENCE DESIGNATOR	ITEM	QUANTITY
VT1 - VT12	TRANSISTOR OPTOCOUPLE 3OT1105 OSM aAO.339.OS4TU	12
R20-R31	RESISTOR OSS2-23-1-2.1 KΩ ± 1 %-A-V-V OZhO.467.081TU OZhO.467.138TU	12
R40-R51	RESISTOR OSS2-23-0-125-1 MoM ± 1 %-A-V-V OZhO.467.081TU OZhO.467.138TU	12
SB1 - SB2	PUSH BUTTON SWITCH PK3-8 AGO.360.212 TU	2
SB3 -SB7	PUSH BUTTON SWITCH PK3-2 AGO.360.212 TU	2
SB4, SB5, SB6	PUSH BUTTON SWITCH PK3-4 AGO.360.212 TU	3
X1, X2, X3	PLUG OSONTs-BS-1-7/12-V1-1-V bRO.364.030TU bRO.364.045TU	3
X4, X10	PLUG OSONTs-BS-1-19/18-V1-1-V bRO.364.030TU bRO.364.045TU	2
X5	PLUG OSONTs-BS-1-19/18-V1-2-V bRO.364.030TU bRO.364.045TU	1
X6	PLUG OSONTs-BS-1-19/18-V1-3-V bRO.364.030TU bRO.364.045TU	1
X7	PLUG OSONTs-BS-1-32/22-V1-2-V bRO.364.030TU bRO.364.045TU	1
X8	PLUG OSONTs-BS-1-50/22-V1-2-V bRO.364.030TU bRO.364.045TU	1
X9	PLUG OSONTs-BS-1-50/27-V1-1-V bRO.364.030TU bRO.364.045TU	1
X11	PLUG OSONTs-BS-2-19/18-V1-1-V bRO.364.030TU bRO.364.045TU	1
X12	PLUG OSONTs-BS-1-32/22-V1-2-V bRO.364.030TU bRO.364.045TU	1
F1, F2, F9	CIRCUIT BREAKER Az2-5 8Yu.619.242 TU	3

REFERENCE DESIGNATOR	ITEM	QUANTITY
F2, F4, F6, F10	CIRCUIT BREAKER Az2-2 6Yu.619.242 TU	4
F3, F7, F11	CIRCUIT BREAKER Az2-1 6Yu.619.242 TU	3
F8, F12	CIRCUIT BREAKER Az2-3 6Yu.619.242 TU	2
E1, E2	CELL YaD9x1-510 SLIu648313.006	2
E10-E27	CELL Ya24B SLIu641112.006	18
E30, E31	CELL YaDP 3X2 Om 33U.5226.001	2
G1- G44	INDICATOR CONTROL UNIT (DRIVER) BUIN 17K8409-0	44
H1-H30 H33-H36 H39-H40	ITEL 3-3-2 ODO.304.002TU	36
H31-H32 H37-H38 H41-H44	ITEL 3-3-2-Zh-2 ODO.304.002TU	8

(A) DESIGN:
CIRCUIT BREAKER: Az2-X CIRCUIT BREAKERS ARE BUILT TO TECHNICAL REQUIREMENTS DOCUMENT NUMBER 8>3.619.242 TU. THEY ARE NON-HERMETIC, PROTECTED AGAINST DUST AND HUMIDITY, TWO POLE CIRCUIT BREAKERS, DIRECT CURRENT 0.5 TO 50 AMPERES. THE CIRCUIT BREAKERS ARE USED FOR PROTECTION OF ELECTRICAL CIRCUITS AGAINST CURRENT OVERLOADS. THE CIRCUIT BREAKERS CAN BE USED AS TWO POLE SWITCHES WITH MANUAL HANDLING. MOUNTED TO THE PANEL BY FASTENERS.

NO DATA HAS BEEN PROVIDED BY ENERGIA TO VERIFY THAT THE BIMETALLIC ELEMENT(S) IN THESE CIRCUIT BREAKERS WOULD EXHIBIT THE SAME CHARACTERISTICS AS ORBITER CIRCUIT BREAKERS UNDER A "FAILS TO INTERRUPT UNDER OVERLOAD" CONDITION. REFERENCE ORBITER EPD&C GENERIC ACCEPTANCE RATIONALE APPENDIX D ITEM 1. WITH THE EXCEPTION OF THE APDS "HEATERS & DCU" CIRCUIT BREAKERS, REFERENCE FMEA No. M5-6MR-B018, THE FOLLOWING PARAGRAPH PROVIDES A GENERIC CRITICALITY EFFECT SCENARIO APPLICABLE TO THE ENERGIA CIRCUIT BREAKERS FOR THE "FAILS TO INTERRUPT UNDER OVERLOAD" CONDITION.

FUNCTIONAL CRITICALITY EFFECTS: POSSIBLE LOSS OF CREW OR VEHICLE AFTER FIVE FAILURES. 1) A "SMART" DOWNSTREAM SHORT CONDITION MUST BE EXPERIENCED DOWNSTREAM IN ORDER TO CREATE AN UNSAFE SITUATION. 2, 3) CIRCUIT BREAKER(S) IN THE A7A2 PANEL FAILS TO TRIP UNDER OVERLOAD CONDITIONS. 4, 5) CIRCUIT BREAKERS IN THE A7A3 PANEL OPEN RESULTING IN LOSS OF NOMINAL AND PYROTECHNIC UNDOCKING CAPABILITY. REFER TO APPROPRIATE A7A3 PANEL CIRCUIT BREAKER FMEA(S) FOR FUNCTIONAL EFFECTS.

PUSH-BUTTON SWITCHES: PUSH-BUTTON SWITCHES ARE BUILT TO TECHNICAL REQUIREMENTS DOCUMENT NUMBER (AGO.360.212.TU.) THEY ARE TWO POLE, MOMENTARY SWITCHES. THE SWITCHES ARE MOUNTED SEPARATELY ON AN STEEL ALLOY STRUCTURE. THE MOUNTING IS IMPLEMENTED USING NUTS SECURED WITH EPOXY. THE STRUCTURE IS ATTACHED TO THE PANEL USING FASTENERS. THE SWITCHES ARE MOUNTED SIDE BY SIDE AND ARE ELECTRICALLY CONNECTED IN A REDUNDANT CONFIGURATION. THEY ARE ACTIVATED BY THE SAME PUSHING MOTION. SWITCH MOVEMENT IS SYNCHRONIZED BY THE USE OF A COMMON COVER EPOXIED TO THE MOVING HEADS.

DESIGN EVOLUTION
THE CIRCUIT BREAKERS AND PUSH-BUTTON SWITCHES ARE PART OF THE APDS CONTROL PANEL CKB>=468312=001. THE CONTROL PANEL DESIGN HAS EVOLVED THROUGH REPEATED USE AND STANDARDIZATION IN THE RUSSIAN SPACE PROGRAM. THE CONTROL PANEL HAS A LOAD-CARRYING RIGID FACE PLANE TO WHICH THE CONNECTOR AND ELECTRICAL CARRYING PLATE (BOARD) IS ATTACHED WITH BRACKETS. THE CIRCUIT BREAKERS AND PUSH-BUTTON SWITCHES, JUST AS ALL OTHER COMPONENTS USED IN THE PANEL, HAVE AN EXTENSIVE SPACE APPLICATION HISTORY. SIMILAR DESIGNS HAVE PASSED REPEATED FLIGHT DEVELOPMENT TESTS, ACCEPTANCE AND QUALIFICATION TESTS.

(B) TEST: (TESTS PERFORMED AT THE PANEL ASSEMBLY LEVEL)
THE ELECTRONIC DEVICES CONTAINED WITHIN THE ASSEMBLY ARE CONSIDERED SPACE RATED HARDWARE BASED ON ENERGIA STANDARDS (GOST) FOR PART SELECTION WITH PROVEN TECHNOLOGIES AND WITH INHERENT SPACE RATED RELIABILITY FEATURES. ENERGIA HAS STATED THAT MATERIALS ARE SELECTED TO ELIMINATE ODOR AND OFFGASSING HAZARDS; AS WELL AS FIRE AND EXPLOSIVE HAZARDS. ROCKWELL HAS VERIFIED COMPLIANCE ON THE BASIS OF ASSESSMENTS WHICH WILL BE PROVIDED AS PART OF AN ENGINEERING ANALYSIS REPORT.

COMPONENT PROCUREMENT CONTROL: THE ENERGIA DESIGN DEPARTMENT SELECTS THE SUPPLIERS FROM AN APPROVED SUPPLIER LIST (ASL) FOR A SPECIFIC PRODUCT. SELECTION IS BASED ON ASSESSMENT OF THE HISTORICAL QUALITY AND RELIABILITY DATA FOR THE PRODUCT TO BE PROCURED. ALL SUPPLIERS FROM THE ASL ARE IN COMPLIANCE WITH THE INDUSTRY'S GOST/STANDARDS AND ENERGIA QUALITY ASSURANCE, RELIABILITY, AND SAFETY PROVISIONS AND REQUIREMENTS. WHEN A PURCHASE ORDER IS PLACED FOR A NEW OR MODIFIED COMPONENT, THE CANDIDATE SUPPLIER SUBMITS AN OPERATIONS AND TECHNOLOGICAL PROCESS PLAN FOR THE MANUFACTURE OF THE REQUIRED ITEM FOR ENERGIA'S EVALUATION AND APPROVAL. THE DESIGN, QUALITY, AND RELIABILITY ENERGIA EXPERTS PERFORM TRADE ANALYSES AND MAINTAIN SUPPLIER SURVEILLANCE, BASED ON THE HISTORY AND PERFORMANCE OR REJECTION RATES OF A GIVEN COMPONENT TYPE. APPLICABLE ENERGIA STANDARDS INCLUDE: CNG351-143-84, CNG351-159-86, CNG304-667-91. QUALIFICATION AND CERTIFICATION TESTS AND ANALYSES ARE IMPLEMENTED AT THE CONTROL PANEL LEVEL. SPECIFIC DETAILS APPLICABLE TO THE CONTROL PANEL TESTING ARE INCLUDED IN THIS AND THE FOLLOWING SECTIONS.

TEST @ ASSEMBLY LEVEL	CAUSE CONTROL AT COMPONENT LEVEL					
	a	b	c	d	e	f
ACCEPTANCE	X				X	
FUNCTIONAL	X	X			X	
VIBRATION	X		X			
THERMAL VACUUM	X				X	X
MECHANICAL SHOCK	X			X		

ACCEPTANCE TEST REQUIREMENTS:

A. EXAMINATION: NO PHYSICAL DAMAGE, NO MISSING OR LOOSE HARDWARE, CORRECT WEIGHT, FINISH, DIMENSIONS, NO CONTAMINATION AND PROPER IDENTIFICATION.
B. INSULATION RESISTANCE: 20 MEGOHMS MINIMUM AT A POTENTIAL OF 100 VOLTS (DC) BETWEEN CONNECTORS AND MUTUALLY ISOLATED PINS.

C. DIELECTRIC STRENGTH: NO MORE THAN TWO MILIAMPS AT A POTENTIAL OF 200 VOLTS (AC) FOR ONE SECOND BETWEEN CONNECTORS AND MUTUALLY ISOLATED PINS.

D. FUNCTIONAL: USING SUPPLY VOLTAGES OF 23 ± 0.5 VOLTS (DC) AND 34 ± 0.5 VOLTS (DC,) VERIFY CONTINUITY, RESISTANCE, POWER CONSUMPTION, TIMING CIRCUITS AND SWITCHING LOGIC FUNCTIONS.

E. VIBRATION (AVT): RANDOM VIBRATION CONDUCTED IN EACH OF THE THREE MUTUALLY PERPENDICULAR DIRECTIONS FOR A DURATION OF 60 SECONDS AT THE FOLLOWING LEVELS:

20 - 80 HZ	INCREASING @ 3dB/OCTAVE
80 - 350 HZ	0.04 g^2/HZ CONSTANT
350 - 2000 HZ	DECREASING @ -3dB/OCTAVE

ITEMS A TO D ABOVE ARE CONDUCTED AFTER VIBRATION TESTS EXCEPT FUNCTIONAL IS AT 23 ± 0.5 VOLTS (DC.)

F. THERMAL (ATT):

1. 77 °F (25 °C) TO 122 °F (50 °C) TO 21.2 °F (-6 °C) TO 122 °F (50 °C) TO 77 °F (25 °C).
2. STABILIZE AND DWELL AT EXTREMES FOR ONE HOUR THEN CONDUCT PERFORMANCE TEST PER SECTION VI.
3. MONITOR CIRCUITS FOR SHORTS/OPENS DURING TEMPERATURE TRANSITIONS.
4. RAMP RATE SHALL BE BETWEEN 1.8 AND 4.2 °F/MINUTE.
5. PERFORMANCE TESTS ARE CONDUCTED BEFORE AND AFTER ENVIRONMENT.

G. HUMIDITY TEST:

1. AT RELATIVE HUMIDITY OF 92 TO 98% AND A TEMPERATURE OF 68 TO 77 °F (20 TO 25 °C), SOAK FOR 48 HOURS WITH POWER OFF.
2. CONDUCT A PERFORMANCE TEST PER SECTION VI.
3. DRY AT 95 TO 122 °F (35 TO 50 °C) FOR 2 HOURS.
4. COOL AT ROOM TEMPERATURE AND CONDUCT PERFORMANCE TEST.

QUALIFICATION TEST REQUIREMENTS

ENVIRONMENT	DURATION	ON/OFF STATUS	LEVEL
PACKAGE QUALIFICATION TEST	5 - 10 mSEC IN EACH OF THE 3 PERPENDICULAR DIRECTIONS	OFF	PEAK SHOCK ACCELERATION = 9 ± 1.8 g's 1) 2500 ± 125 SHOCKS PERPENDICULAR TO CONTAINER 2) 1760 ± 90 SHOCKS IN TWO MUTUALLY PERPENDICULAR DIRECTION 3) 6000 ± 300 TOTAL NUMBER OF SHOCKS/MINUTE ≤ 120

QUALIFICATION TEST REQUIREMENTS (CONT'D)

ENVIRONMENT	DURATION	ON/OFF STATUS	LEVEL
RANDOM VIBRATION TEST (QAVT)	560 SEC IN EACH OF THE 3 MUTUALLY PERPENDICULAR DIRECTIONS	ON/OFF	20 - 80 Hz INCREASING @ 3 dB PER OCTAVE 80 - 350 Hz CONSTANT @ 0.057 g^2/Hz 350 - 2000 Hz DECREASING @ -3dB PER OCTAVE FROM 0.067 g^2/Hz @ 350 Hz
DESIGN SHOCK	IN EACH OF 3 MUTUALLY PERPENDICULAR DIRECTIONS: 1 SHOCK FOR 1 TO 3 MSEC 2 SHOCKS FOR 3 TO 5 MSEC	OFF	100 G HALF SINE WAVE SHOCK PULSE 40 G HALF SINE WAVE SHOCK PULSE
ACCELERATION	12 MINUTES IN EACH OF THE 3 PERPENDICULAR DIRECTIONS.	OFF	13.5 G'S
THERMAL VACUUM CYCLING	1 HOUR MINIMUM AT EACH TEMPERATURE PLATEAU (5 CYCLES)	ON/OFF	AT AMBIENT PRESSURE: 1. RAMP FROM 77 TO 122 ° F (25 TO 50 °C), STABILIZE DWELL FOR 1 HOUR; CONDUCT PERFORMANCE TEST. 2. 122 TO -22 ° F (50 TO 30 °C), STABILIZE; DWELL FOR 1 HOUR CONDUCT PERFORMANCE TEST. 3. REPEAT (1) AND (2) 3 TIMES. AT VACUUM OF 2 X 10^{-6} PSIA (2 X 10^{-4} MM OF HG): 4. RAMP FROM -22 TO 122 ° F (-30 TO 50 °C), STABILIZE; DWELL FOR 1 HOUR. 5. RAMP FROM 122 TO -22 ° F (50 TO -30 °C), STABILIZE FOR 1 HOUR. 6. RAMP FROM -22 TO 77 ° F (-30 TO 25 °C).
COLD EXPOSURE TEST	5 HOURS AT TEMPERATURE PLATEAU	OFF	1) 77 TO -76° F (26 TO -60 °C), DWELL FOR 24 HOURS. 2) DRY AT 95 TO 122° F (35 TO 50 ° C) FOR 2 HOURS MINIMUM. 3) COOL AT 77° F (25° C) FOR 2 HOURS MINIMUM.
HEAT EXPOSURE TEST	5 HOURS AT TEMPERATURE PLATEAU	OFF	1) 77 TO 140° F (26 TO 60 °C), DWELL FOR 6 HOURS. 3) COOL AT 77° F (25° C) FOR 2 HOURS MINIMUM.

QUALIFICATION TEST REQUIREMENTS (CONT'D)

ENVIRONMENT	DURATION	ON/OFF STATUS	LEVEL
HUMIDITY TEST	96 HOURS AT TEMPERATURE PLATEAU	OFF	1) 68 TO 77 ° F (20 TO 25 °C), DWELL FOR 6 HOURS AT RELATIVE HUMIDITY OF 95±3%. 2) DRY AT 95 TO 122° F (35 TO 50 ° C) FOR 2 HOURS MINIMUM RELATIVE HUMIDITY OF 60%. 3) COOL AT 77° F (25° C) FOR 2 HOURS MINIMUM.
SUPPLY VOLTAGE RESERVE VERIFICATION TEST	AS REQUIRED	ON/OFF	1) (20 ± 0.5) V SUPPLY VOLTAGE 2) (37 ± 0.5) V SUPPLY VOLTAGE
LOW TEMPERATURE RESERVE VERIFICATION TEST	5 HOURS AT TEMPERATURE PLATEAU	ON/OFF	1) 77 TO -4 ° F (25 TO -20 °C), DWELL FOR 3 HOURS CONDUCT PERFORMANCE TEST. 2) DRY AT 95 TO 122° F (35 TO 50 ° C) FOR 2 HOURS MINIMUM 3) COOL AT 77° F (25° C) FOR 2 HOURS MINIMUM.
HIGH TEMPERATURE RESERVE VERIFICATION TEST	5 HOURS AT TEMPERATURE PLATEAU	ON/OFF	1) 77 TO 122 ° F (25 TO 50 °C), DWELL FOR 3 HOURS CONDUCT PERFORMANCE TEST. 2) COOL AT 77° F (25° C) FOR 2 HOURS MINIMUM.

CERTIFICATION BY ANALYSIS:

ALL ELECTRICAL EQUIPMENT/COMPONENTS INSTALLED IN THE PANEL HAVE BEEN CERTIFIED FOR THE APPLICABLE REQUIREMENTS NOTED BELOW IN ACCORDANCE WITH MC621-00878. ANALYSIS/SIMILARITY HAS BEEN USED BY THE SUPPLIER TO CERTIFY FOR THE FOLLOWING ENVIRONMENTS:

A) RADIATION: ENERGIA HAS CONDUCTED TESTS ON SIMILAR HARDWARE (11F732.7692-0A.) AN ENGINEERING ANALYSIS REPORT (EAR) IS BEING PREPARED TO DEMONSTRATE THAT IDENTICAL COMPONENTS, MATERIALS, AND PROCESSES WERE USED FOR BOTH UNITS.

B) OZONE: ROCKWELL HAS VERIFIED ENERGIA COMPLIANCE WITH MATERIAL SELECTION CRITERIA FOR OZONE SENSITIVITY AND DEGRADATION. THE RATIONALE FOR THIS VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

C) FUNGUS: ROCKWELL HAS VERIFIED ENERGIA COMPLIANCE WITH MATERIAL SELECTION CRITERIA FOR NON-NUTRIENT TO FUNGI AND TREATMENT. THE RATIONALE FOR THIS VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

D) SAND/DUST: THE DSCU CONTAINS NO MOVING PARTS.

E) SALT/FOG: ROCKWELL HAS VERIFIED ENERGIA COMPLIANCE WITH MATERIAL SELECTION CRITERIA FOR SALT FOG SENSITIVITY AND DEGRADATION. THE RATIONALE FOR THIS VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

G) ODOR/OFFGASING: ROCKWELL HAS VERIFIED ENERGIA COMPLIANCE WITH MATERIAL SELECTION CRITERIA FOR ODOR/OFFGASING. THE RATIONALE FOR THIS VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

H) FLAMMABILITY: ROCKWELL HAS VERIFIED ENERGIA COMPLIANCE WITH MATERIAL SELECTION CRITERIA FOR FLAMMABILITY. THE RATIONALE FOR THIS VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

J) LIGHTNING: THE RATIONALE FOR VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

K) ELECTROMAGNETIC COMPATIBILITY: CE01, CE03, CS01, CS02, CS06, RE02, RS02, RS03, RS04, AND TT01 (TIME DOMAIN TRANSIENT AND RIPPLE TEST) PERFORMED PER CR # 21-621-0087-0005A ON THE BRASSBOARD ITEM. THE RATIONALE FOR THIS VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

(C) INSPECTION:
RECEIVING INSPECTIONS: (FAILURE CAUSE A, B.) RECEIVING INSPECTIONS AT ENERGIA ARE PERFORMED IN ACCORDANCE TO THE FOLLOWING STANDARDS. CNG304-120-86, CNG304-408-89, EEH-121-471-90, EEH-137-475-81, AND EEH-008-471-88. QA IN COOPERATION WITH SPECIALIZED DIVISIONS (SUCH AS M&P LAB, TOOLS, CALIBRATION LAB, ETC.) CONDUCTS RECEIVING INSPECTIONS FOR PARTS ARTICLES AND RAW MATERIALS. NECESSARY DATA, SHELF LIFE, RESOURCE LIFE AND TEST DATA ARE VERIFIED FOR ACCEPTANCE. INDIVIDUAL ELEMENTS ARE INSPECTED/ MEASURED FOR CONFORMITY WITH DRAWING TECHNICAL REQUIREMENTS. PARTS COATING QUALITY, JOINTS QUALITY, OVERALL AND INSTALLATION DIMENSIONS, QUALITY OF ASSEMBLY, AND INSTALLATION MARKINGS ARE CHECKED. COMPLIANCE WITH ELECTRICAL CONNECTION TABLES IS VERIFIED BY PERFORMING THE FOLLOWING OPERATIONS: CONTINUITY TEST OF THE ASSEMBLY AND WIRE NUMBER AND COLORING VISUAL INSPECTION FOR EACH CIRCUIT POINT. A RECORD OF THESE INSPECTIONS IS KEPT IN THE ASSEMBLY DATA CARD.

CONTAMINATION CONTROL & CRITICAL PROCESSES: (FAILURE CAUSE A, B, C) PRODUCTION ROOM COMPLIANCE WITH THE OPERATIONAL ENVIRONMENTAL REQUIREMENTS ARE IMPLEMENTED PER THE FOLLOWING ENERGIA SPECIFICATIONS: CNG304-108-91, CNG304-187-78, CNG304-188-88, CNG304-93-88, AND CNG304-172-92. A WORKING COMMITTEE TEAM -WHICH INCLUDES DESIGNER, QUALITY, OPERATIONS, AND SPECIALISTS- PERFORMS DAILY CONTROL OF PROCESSES, TOOLS AND FIXTURES, WORKING ENVIRONMENTS, AND SEQUENCES OF OPERATIONS.

TESTING: (FAILURE CAUSE A, B, C, D, E, F) TESTS ARE DESIGNED TO ENSURE MAXIMUM DESIGN COMPLIANCE. PRE-PLANNED INSPECTION POINTS ARE IDENTIFIED AND ARE SUPPLEMENTED WITH INSPECTION INSTRUCTIONS BASED ON THE COMPLEXITY OF THE ASSEMBLY. THE QUALITY DEPARTMENT MONITORS THE PERFORMANCE OF INSPECTIONS AND TESTS REQUIRED BY DESIGN DOCUMENTATION. THE FOLLOWING ENERGIA SPECIFICATIONS ARE APPLICABLE: 33Y.6201.008-05, CNG304-A87-88, AND CNG304-144-88.

HANDLING/PACKAGING: (FAILURE CAUSE C, D) PACKAGING AND TRANSPORT CONTAINER ARE VERIFIED FOR COMPLIANCE WITH SPECIFICATIONS AND DRAWING REQUIREMENTS. ENERGIA ENGINEERING DRAWINGS, PROCEDURES, AND INSTRUCTIONS DEFINE THE REQUIREMENTS FOR STORAGE, PACKAGING, AND SHIPPING. THE FOLLOWING ENERGIA SPECIFICATIONS ARE APPLICABLE: RD92-0256-89 AND EEN-121-471-75

(D) FAILURE HISTORY:
DATA ON TEST FAILURES, UNEXPLAINED ANOMALIES, AND OTHER FAILURES EXPERIENCED DURING GROUND PROCESSING OF THE ODS CAN BE FOUND IN THE PRACA DATA BASE.

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX D

DISPOSITION AND RATIONALE

(PYROTECHNIC FIRING CONTROL UNIT)

FUNCTION:
THE PFCU CONTAINS THE COMMAND RECEPTION MODULE, THE RELAY MODULES REQUIRED TO ISSUE PYROBOLT INITIATION, AND THE INHIBIT CIRCUITS TO PRECLUDE UNWANTED FIRINGS. THE PFCU PROVIDES INITIATION OF TWO GROUPS (BUSES +NN1, AND +NN2) OF 12 INITIATORS ON TWO FILAMENTS ONE/PER HOOK (ACTIVE AND PASSIVE.) IT REMOVES STATIC ELECTRICITY FROM THE PYROTECHNIC CIRCUITS, AND IT ALLOWS CHECK-OUT OF THE PYRO CIRCUIT INTEGRITY DURING GROUND OPERATIONS.

HARDWARE DESCRIPTION:
THE PFCU CONTAIN THE FOLLOWING COMPONENTS:

REFERENCE DESIGNATOR	ITEM	QUANTITY
X1201/10, X1202/10, X1203/10, X1204/10, X1205/10, X1206/10, X1207/10	Plug OSRS50ATV_AVO.364.047TU bRO.364.045TU	7
X1208/10, X1291/10	Plug OSMR-1-102-Z-V, GEO.364.184TU bRO.364.045TU	2
X1209/10, X1210/10	Socket OS2RMT22B4G3AIV, GEO.364.126TU bRO.364.045TU	2
X1211/10, X1294/10	Plug OS2RMT22B4Sh3A1V, GEO.364.126TU bRO.364.045TU	2
X1292/10	Plug OSRS32ATV_AVO.364.047TU bRO.364.045TU	1
X1293/10	Plug OSRS19ATV_AVO.364.047TU bRO.364.045TU	1
Relay Cells		
E1-E164	Ya22 33U.5225.003	164
E171-E172	Ya12 33U.5225.002	2
E165-E168	Ya23 33U.5225.001	4
E169-E170	Ya24 33U.5225.006	2
Diode Cells		
E173-E186, E202,E203	Diode Cell 33U.5222.006	16
E204-E206,E217	Diode Cell 33U.5222.007	4
E207-E216	Diode-resistor cell 33U.5221.007	10
K1-K40	Relay RES-60 OS RS4.569.435-00.01_RSO.459.006TU OSTV4.450.019-82	40
KQ1, KQ2	Switch DP-1-25_TU16 526.455-79 group 3U	2
R1-R80	Resistor 7 ohms 33U.5279.003-03	80
R161-R240	Resistor OS S2-23-0.25-1m ohms ± 10%-A-B-V_OZhO.467.081TU_OZhO.467.138TU	79

DESIGN:
ELECTRICAL AND RADIO COMPONENTS ARE CHOSEN IN ACCORDANCE WITH THE DEVICE'S OPERATING MODES AND PARAMETERS. INTEGRATED RELAY, DIODE, AND RESISTOR CELLS UTILIZED IN THE DESIGN HAVE PASSED STRICT GROUND DEVELOPMENT TESTS AND HAVE SHOWN GOOD PERFORMANCE DURING FLIGHT OPERATIONS. RELIABILITY IS ENHANCED USING REDUNDANCY TECHNIQUES SUCH AS: DUPLICATION, TRIPLING, VOTERS 2 OF 3, AND 3 OF 4. POWER BUSES AND CONTROL CIRCUITS ARE SEPARATED. PROVISION ARE MADE FOR CIRCUIT CHECK-OUT DURING SERVICE AND REPAIR STATES. THE WIRE BUNDLES ARE ADDITIONALLY INSULATED AND SECURED BY A CORD. INDIVIDUAL WIRES ARE SECURED USING SEALANT. WIRE JUMPERS LONGER THAN 5MM, AS WELL AS, OTHER BARE CURRENT CONDUCTING AND CURRENT-BEARING SURFACES OF LESS THAN 2MM ARE INSULATED BY SHRINK TUBING. SOLDERING SPOTS AND COMPONENTS TERMINALS ARE COATED WITH VARNISH.

COMPONENT PROCUREMENT CONTROL:
THE DESIGN DEPARTMENT SELECTS THE SUPPLIERS FROM AN APPROVED SUPPLIER LIST (ASL) FOR THE SPECIFIC PRODUCT, BASED ON EXPERT ASSESSMENT OF THE QUALITY AND RELIABILITY HISTORICAL DATA FOR THE PRODUCT TO BE PROCURED ALL SUPPLIERS FROM THE ASL ARE ESTABLISHED AND IN COMPLIANCE TO THE INDUSTRY'S GOSTs/STANDARDS AND ENERGIA QUALITY ASSURANCE, RELIABILITY, AND SAFETY PROVISIONS AND REQUIREMENTS. WHEN A PURCHASE ORDER IS PLACED FOR A NEW OR MODIFIED (NON-OFF-SHELF), THE SUPPLIER SUBMITS A PROPOSED OPERATION AND TECHNOLOGICAL PROCESS FOR MANUFACTURING THE REQUIRED ITEM FOR ENERGIA REVIEW AND APPROVAL. THE DESIGN DEPARTMENT IN CONJUNCTION WITH QUALITY AND RELIABILITY EXPERTS, PERFORM TRADE ANALYSES AND MAINTAIN SURVEILLANCE OF THE SUPPLIERS BASED ON THE HISTORY OR PERFORMANCE AND REJECTION RATES OF THE FURNISHED SUPPLIES. APPLICABLE ENERGIA STANDARDS CNG351-143-84, CNG351-159-86, CNG304-667-91.

TEST:
TECHNICAL INSPECTIONS ARE PERFORMED BEFORE AND AFTER TESTS WITH THE CASE REMOVED. THESE INSPECTION CHECK FOR MECHANICAL DAMAGES, LOOSE FASTENERS, AND SOLDERED JOINTS DAMAGE. WIRE CHECKS ARE PERFORMED FOR PROPER CONNECTIONS TO BUSES AND TO CONNECTOR CONTACTS. IN ADDITION, CIRCUIT DIAGRAM VERIFICATION IS PERFORMED. CIRCUITS WITH DIODES ARE CHECKED FOR CONTINUITY. TIME RELAY AND CURRENT CONSUMPTION ARE VERIFIED IN ADDITION TO INDIVIDUAL ELEMENT FUNCTIONAL VERIFICATION. VIBRATION, VIBRATION STRENGTH, IMPACT STRENGTH, COLD/HEAT RESISTANCE AND MOISTURE RESISTANCE TESTS ARE PERFORMED. ELECTRONIC RADIO EMISSIONS (ERE) AND ELECTRIC INSULATION RESISTANCE TESTS ARE PERFORMED FOR THE UNIT.

QUALIFICATION, CERTIFICATION TESTS, AND ANALYSES ARE IMPLEMENTED AT THE LINE REPLACEABLE UNIT (LRU) LEVEL. SPECIFIC DETAILS APPLICABLE TO THE PFCU TESTING ARE INCLUDED IN THIS AND THE FOLLOWING SECTIONS.

ACCEPTANCE TEST REQUIREMENTS:

A. EXAMINATION: NO PHYSICAL DAMAGE, NO MISSING OR LOOSE HARDWARE, CORRECT WEIGHT, FINISH, DIMENSIONS, NO CONTAMINATION AND PROPER IDENTIFICATION.
B. INSULATION RESISTANCE: 20 MEGOHMS MINIMUM AT A POTENTIAL OF 100 VOLTS (DC) BETWEEN CONNECTORS AND MUTUALLY ISOLATED PINS.
C. DIELECTRIC STRENGTH: NO MORE THAN TWO MILIAMPS AT A POTENTIAL OF 200 VOLTS (AC) FOR ONE SECOND BETWEEN CONNECTORS AND MUTUALLY ISOLATED PINS.
D. FUNCTIONAL: USING SUPPLY VOLTAGES OF 23 ± 0.5 VOLTS (DC) AND 34 ± 0.5 VOLTS (DC,) VERIFY CONTINUITY, RESISTANCE, POWER CONSUMPTION, TIMING CIRCUITS AND SWITCHING LOGIC FUNCTIONS.

E. VIBRATION: SINUSOIDAL CONDUCTED IN EACH OF THE THREE MUTUALLY PERPENDICULAR DIRECTIONS FOR A DURATION OF 787 SECONDS AT THE FOLLOWING LEVELS:

20 - 40 HZ	0.8 g/HZ
40 - 80 HZ	1.3 g/HZ
80 - 160 HZ	2.3 g/HZ
160 - 320 HZ	4.2 g/HZ
320 - 640 HZ	6.7 g/HZ
640 - 1280 HZ	6.7 g/HZ
1280 - 2560 HZ	6.7 g/HZ

ITEMS A TO D ABOVE ARE CONDUCTED AFTER VIBRATION TESTS EXCEPT FUNCTIONAL IS AT 27 ± 0.5 VOLTS (DC.)

F. THERMAL :

1. COLD - OPERATING:
a. SOAK @ 9 +0/-5.4 °F C (-13 0/-3 ° C) FOR 3 HOURS
b. INSULATION RESISTANCE TEST PER B EXCEPT AT 5 MEGOHMS (MINIMUM)
c. FUNCTIONAL TEST PER ITEM D
d. DRIES @ 86 - 122 °F (35 - 50 °C) FOR 3 HOURS
e. COOLS AT ROOM TEMPERATURE FOR A MINIMUM OF 2 HOURS
f. EXAMINATION PER A ABOVE

2. HOT - OPERATING
a. SOAK @ 113 +9/-0 °F (45 +5/-0 °C) FOR 3 HOURS
b. INSULATION RESISTANCE TEST PER B EXCEPT AT 5 MEGOHMS (MINIMUM)
c. FUNCTIONAL TEST PER ITEM D
d. COOLS AT ROOM TEMPERATURE FOR A MINIMUM OF 2 HOURS
e. EXAMINATION PER A ABOVE

G. HUMIDITY (MOISTURE RESISTANCE) TEST:

1. AT RELATIVE HUMIDITY OF 92 - 98% AND A TEMPERATURE OF 68 TO 77 °F (20 - 25 °C), SOAK FOR 48 HOURS WITH POWER OFF.
2. PERFORM INSULATION RESISTANCE TEST PER B ABOVE EXCEPT AT 1 MEGOHM
3. DRIES AT 95 - 122 °F (35 - 50 °C) FOR 2 HOURS MINIMUM.
4. COOLS AT ROOM TEMPERATURE EXAMINATION PER "A" ABOVE

QUALIFICATION TEST REQUIREMENTS

ENVIRONMENT	DURATION	ON/OFF STATUS	LEVEL
PACKAGE QUALIFICATION TEST	5 - 10 mSEC IN EACH OF THE 3 PERPENDICULAR DIRECTIONS	OFF	PEAK SHOCK ACCELERATION = 9 ± 1.8 G'S 1) 2500 ± 125 SHOCKS PERPENDICULAR TO CONTAINER 2) 1750 ± 90 SHOCKS IN TWO MUTUALLY PERPENDICULAR DIRECTION 3) 6000 ± 300 TOTAL NUMBER OF SHOCKS/MINUTE ≤ 120
RANDOM VIBRATION TEST (QAVT)	560 SEC IN EACH OF THE 3 MUTUALLY PERPENDICULAR DIRECTIONS	OFF	20 - 80 Hz INCREASING @ 3 dB PER OCTAVE 80 - 350 Hz CONSTANT @ 0.067 g^2/Hz 350 - 2000 Hz DECREASING @ -3dB PER OCTAVE FROM 0.067 g^2/Hz @ 350 Hz
DESIGN SHOCK	3 - 5 MSEC IN EACH OF 3 MUTUALLY PERPENDICULAR DIRECTIONS;	OFF	5 HALF SINE WAVE SHOCKS OF 40 G'S AND 5 HALF SINE WAVE SHOCKS OF 100 G'S
ACCELERATION	LINEAR ACCELERATION IN EACH OF THE 3 PERPENDICULAR DIRECTIONS FOR 3 MINUTES	OFF	10 G'S
THERMAL VACUUM CYCLING	1 HOUR MINIMUM AT EACH TEMPERATURE PLATEAU	ON/OFF	1. AT AMBIENT PRESSURE: RAMP FROM 77 TO 122 ° F (25 TO 50 °C), STABILIZE DWELL FOR 1 HOUR; CONDUCT PERFORMANCE TEST. 2. 122 TO -22 ° F (50 TO 30 °C), STABILIZE; DWELL FOR 1 HOUR CONDUCT PERFORMANCE TEST. 3. REPEAT (1) AND (2) 3 TIMES. 4. AT VACUUM OF 2 X 10^{-6} PSIA (2 X 10^{-4} MM OF HG); RAMP FROM -22 TO 122 ° F (-30 TO 50 °C), STABILIZE; DWELL FOR 1 HOUR. 5. RAMP FROM 122 TO -22 ° F (50 TO -30 °C), STABILIZE FOR 1 HOUR. 6. RAMP FROM -22 TO 77 ° F (-30 TO 25 °C).

QUALIFICATION TEST REQUIREMENTS (CONT'D)

ENVIRONMENT	DURATION	ON/OFF STATUS	LEVEL
COLD EXPOSURE TEST	3 HOURS AT TEMPERATURE PLATEAU	OFF	1) 77 TO -76° F (26 TO -60 °C), DWELL FOR 24 HOURS. 2) DRY AT 95 TO 122° F (35 TO 50 ° C) FOR 2 HOURS MINIMUM. 3) COOL AT 77° F (25° C) FOR TWO HOURS MINIMUM.
HEAT EXPOSURE TEST	3 HOURS AT TEMPERATURE PLATEAU	OFF	1) 77 TO 140° F (25 TO 60 °C), DWELL FOR 6 HOURS. 3) COOL AT 77° F (25° C) FOR TWO HOURS MINIMUM.
HUMIDITY TEST	96 HOURS AT TEMPERATURE PLATEAU	OFF	1) 68 TO 77 ° F (20 TO 25 °C), DWELL FOR 6 HOURS AT RELATIVE HUMIDITY OF 95±3%. 2) DRY AT 95 TO 122° F (35 TO 50 ° C) FOR 2 HOURS MINIMUM RELATIVE HUMIDITY OF 60%. 3) COOL AT 77° F (25° C) FOR TWO HOURS MINIMUM.
SUPPLY VOLTAGE RESERVE VERIFICATION TEST	AS REQUIRED	ON/OFF	1) (20 ± 0.5) V SUPPLY VOLTAGE 2) (37 ± 0.5) V SUPPLY VOLTAGE
LOW TEMPERATURE RESERVE VERIFICATION TEST	3 HOURS AT TEMPERATURE PLATEAU	ON/OFF	1) 77 TO -4 ° F (25 TO -20 °C), DWELL FOR 3 HOURS CONDUCT PERFORMANCE TEST. 2) DRY AT 95 TO 122° F (35 TO 50 ° C) FOR 2 HOURS MINIMUM 3) COOL AT 77° F (25° C) FOR TWO HOURS MINIMUM.
HIGH TEMPERATURE RESERVE VERIFICATION TEST	3 HOURS AT TEMPERATURE PLATEAU	ON/OFF	1) 77 TO 122 ° F (25 TO 50 °C), DWELL FOR 3 HOURS CONDUCT PERFORMANCE TEST. 2) COOL AT 77° F (25° C) FOR TWO HOURS MINIMUM.

CERTIFICATION BY ANALYSIS:

ALL ELECTRICAL EQUIPMENT/COMPONENTS INSTALLED IN THE ASSEMBLY HAVE BEEN CERTIFIED FOR THE APPLICABLE REQUIREMENTS NOTED BELOW IN ACCORDANCE WITH MC621-0087B. ANALYSIS/SIMILARITY HAS BEEN USED BY THE SUPPLIER TO CERTIFY FOR THE FOLLOWING ENVIRONMENTS:

A) RADIATION: ENERGIA HAS CONDUCTED TESTS ON SIMILAR HARDWARE (11F732.7692-0A.) AN ENGINEERING ANALYSIS REPORT (EAR) IS BEING PREPARED TO DEMONSTRATE THAT IDENTICAL COMPONENTS, MATERIALS, AND PROCESSES WERE USED FOR BOTH UNITS.

B) OZONE: ROCKWELL HAS VERIFIED ENERGIA COMPLIANCE WITH MATERIAL SELECTION CRITERIA FOR OZONE SENSITIVITY AND DEGRADATION. THE RATIONALE FOR THIS VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

C) FUNGUS: ROCKWELL HAS VERIFIED ENERGIA COMPLIANCE WITH MATERIAL SELECTION CRITERIA FOR NON-NUTRIENT TO FUNGI AND TREATMENT. THE RATIONALE FOR THIS VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

D) SAND/DUST: THE PFCU CONTAINS NO MOVING PARTS.

E) SALT/FOG: ROCKWELL HAS VERIFIED ENERGIA COMPLIANCE WITH MATERIAL SELECTION CRITERIA FOR SALT FOG SENSITIVITY AND DEGRADATION. THE RATIONALE FOR THIS VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

G) ODOR/OFFGASING: ROCKWELL HAS VERIFIED ENERGIA COMPLIANCE WITH MATERIAL SELECTION CRITERIA FOR ODOR/OFFGASING. THE RATIONALE FOR THIS VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

H) FLAMMABILITY: ROCKWELL HAS VERIFIED ENERGIA COMPLIANCE WITH MATERIAL SELECTION CRITERIA FOR FLAMMABILITY. THE RATIONALE FOR THIS VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

J) LIGHTNING: THE RATIONALE FOR VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

K) ELECTROMAGNETIC COMPATIBILITY: CE01, CE03, CS01, CS02, CS06, RE02, RS02, RS03, RS04, AND TT01 (TIME DOMAIN TRANSIENT AND RIPPLE TEST) PERFORMED PER CR # 21-621-0087-0005A ON THE BRASSBOARD ITEM. THE RATIONALE FOR THIS VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

(C) INSPECTION:

RECEIVING INSPECTIONS:
RECEIVING INSPECTIONS AT ENERGIA ARE PERFORMED IN ACCORDANCE TO THE FOLLOWING ENERGIA STANDARDS. CNG304-120-86, CNG304-408-89, EEH-121-471-90, EEH-137-475-81, AND EEH-008-471-88. QA IN COOPERATION WITH SPECIALIZED DIVISIONS (SUCH AS M&P LAB, TOOLS, CALIBRATION LAB, ETC.) CONDUCTS RECEIVING INSPECTIONS FOR PARTS ARTICLES AND RAW MATERIALS. NECESSARY DATA, SHELF LIFE, RESOURCE LIFE AND TEST DATA ARE CHECKED FOR ACCEPTANCE. INDIVIDUAL ELEMENTS ARE INSPECTED/ MEASURED FOR CONFORMITY WITH DRAWING TECHNICAL REQUIREMENTS. PARTS COATING QUALITY, JOINTS QUALITY, OVERALL AND INSTALLATION DIMENSIONS, QUALITY OF ASSEMBLY, AND INSTALLATION, MARKINGS ARE CHECKED. COMPLIANCE WITH ELECTRICAL CONNECTIONS TABLES IS CARRIED OUT BY PERFORMING THE FOLLOWING OPERATIONS: CONTINUITY TEST OF THE ASSEMBLY AND WIRE NUMBER AND COLORING VISUAL INSPECTION FOR EACH CIRCUIT POINT. A RECORD OF THESE INSPECTIONS IS KEPT IN THE ASSEMBLY DATA CARD.

CONTAMINATION CONTROL & CRITICAL PROCESSES:
PRODUCTION ROOM COMPLIANCE WITH THE OPERATIONAL ENVIRONMENTAL REQUIREMENTS ARE IMPLEMENTED PER THE FOLLOWING ENERGIA SPECIFICATIONS: CNG304-106-91, CNG304-187-78, CNG304-188-88, CNG304-93-88, AND CNG304-172-92. A WORKING COMMITTEE TEAM, WHICH INCLUDES DESIGNER, QUALITY, OPERATIONS, AND SPECIALISTS PERFORM DAILY CONTROL OF PROCESSES, TOOLS AND FIXTURES, WORKING ENVIRONMENTS AND SEQUENCES OF OPERATIONS.

TESTING:
TESTS ARE DESIGNED TO ASSURE MAXIMUM DESIGN COMPLIANCE. PRE-PLANNED INSPECTION POINTS ARE DEFINED AND MAY BE SUPPLEMENTED WITH INSPECTION INSTRUCTIONS BASED ON THE COMPLEXITY OF THE ASSEMBLY. QUALITY CONTROLS THE PERFORMANCE OF INSPECTIONS AND TESTS REQUIRED BY DESIGN DOCUMENTATION. THE FOLLOWING ENERGIA SPECIFICATIONS ARE APPLICABLE: 33Y.6201.008-05, CNG304-A87-88, AND CNG304-144-88.

HANDLING/PACKAGING:
PACKAGING AND TRANSPORT CONTAINER ARE CHECKED FOR COMPLIANCE WITH THE SPECIFICATIONS AND DRAWING REQUIREMENTS. ENERGIA ENGINEERING DRAWINGS, PROCEDURES AND INSTRUCTIONS DEFINE THE REQUIREMENTS FOR STORAGE, PACKAGING, AND SHIPPING. THE FOLLOWING ENERGIA SPECIFICATIONS ARE APPLICABLE: RD92-0256-89 AND EEN-121-471-75

(D) FAILURE HISTORY:
DATA ON TEST FAILURES, UNEXPLAINED ANOMALIES, AND OTHER FAILURES EXPERIENCED DURING GROUND PROCESSING OF THE ODS CAN BE FOUND IN THE PRACA DATA BASE.

APPENDIX E

DISPOSITION AND RATIONALE

(DOCKING MECHANISM CONTROL UNIT)

FUNCTION:
THE DMCU IS DESIGNED TO CONTROL THE TWO DOCKING MECHANISM (RING) ACTUATOR ELECTROMOTORS (M4 & M5.) CELLS E9-E14, IN COMBINATION WITH RELAYS K1-K24, ARE USED TO IMPLEMENT THE SWITCHING LOGIC REQUIRED TO IMPLEMENT THE COMMANDS RECEIVED FROM THE DOCKING SYSTEM CONTROL UNIT (DSCU) IN THE AUTOMATIC AND MANUAL MODES. THESE CIRCUITS ARE USED IN CONJUNCTION WITH THE KQ1-KQ8 AND CELLS E1-E8 AND E17 TO IMPLEMENT THE TWO BRIDGE CIRCUITS WHICH SWITCH THE ELECTROMOTORS ON AND OFF. ALL COMPONENTS ARE MOUNTED ON A SINGLE BOARD. THE UNIT IS UNSEALED AND ENCASED IN A DUST AND MOISTURE PROOF CONTAINER WHICH INCLUDES HEAT DISSIPATION ELEMENTS.

HARDWARE DESCRIPTION:
THE UNIT CONTAINS THE FOLLOWING ENERGIA PROCURED COMPONENTS:

REFERENCE DESIGNATOR	ITEM	QUANTITY
E-20E21	Cell Ya12-2, 33U.5225.008	2
E1-E-8,E17	Diode cell, 33U.5222.007	9
E9-E14	Cell RD 36, 33U.5221.007	6
KQ1-KQ8	Switch DP-1-10 TU ODS.523.088TU	8
K1-K24	Relay RES-470S_RF4.500.417P1 RFO.450.047TU	24
X201, X203	Plug ONTs-BS-1-32/22-V1-1-V_bro 364.030 TU	2
X202	Plug ONTs-BS-1-50/27-V1-1-V_bro 364.030 TU	1

DESIGN:
ELECTRICAL AND RADIO COMPONENTS ARE CHOSEN IN ACCORDANCE WITH THE DEVICE'S OPERATING MODES AND PARAMETERS. INTEGRATED RELAY, DIODE, AND RESISTOR CELLS UTILIZED IN THE DESIGN HAVE PASSED STRICT GROUND DEVELOPMENT TESTS AND HAVE SHOWN GOOD PERFORMANCE DURING FLIGHT OPERATIONS. RELIABILITY IS ENHANCED USING REDUNDANCY TECHNIQUES SUCH AS: DUPLICATION, TRIPLING, VOTERS 2 OF 3, AND 3 OF 4. POWER BUSES AND CONTROL CIRCUITS ARE SEPARATED. PROVISION ARE MADE FOR CIRCUIT CHECK-OUT DURING SERVICE AND REPAIR STATES. THE WIRE BUNDLES ARE ADDITIONALLY INSULATED AND SECURED BY A CORD. INDIVIDUAL WIRES ARE SECURED USING SEALANT. WIRE JUMPERS LONGER THAN 5MM, AS WELL AS, OTHER BARE CURRENT CONDUCTING AND CURRENT-BEARING SURFACES OF LESS THAN 2MM ARE INSULATED BY SHRINK TUBING. SOLDERING SPOTS AND COMPONENTS TERMINALS ARE COATED WITH VARNISH.

COMPONENT PROCUREMENT CONTROL:
THE DESIGN DEPARTMENT SELECTS THE SUPPLIERS FROM AN APPROVED SUPPLIER LIST (ASL) FOR THE SPECIFIC PRODUCT, BASED ON EXPERT ASSESSMENT OF THE QUALITY AND RELIABILITY HISTORICAL DATA FOR THE PRODUCT TO BE PROCURED. ALL SUPPLIERS FROM THE ASL ARE ESTABLISHED AND IN COMPLIANCE TO THE INDUSTRY'S GOSTs/STANDARDS AND ENERGIA QUALITY ASSURANCE, RELIABILITY, AND SAFETY PROVISIONS AND REQUIREMENTS. WHEN A PURCHASE ORDER IS PLACED FOR A NEW OR MODIFIED (NON-OFF-SHELF), THE SUPPLIER SUBMITS A PROPOSED OPERATION AND TECHNOLOGICAL PROCESS FOR MANUFACTURING THE REQUIRED ITEM FOR ENERGIA REVIEW AND APPROVAL. THE DESIGN DEPARTMENT IN CONJUNCTION WITH QUALITY AND RELIABILITY EXPERTS, PERFORM TRADE ANALYSES AND MAINTAIN SURVEILLANCE OF THE SUPPLIERS BASED ON THE HISTORY OR PERFORMANCE AND REJECTION RATES OF THE FURNISHED SUPPLIES. APPLICABLE ENERGIA STANDARDS CNG351-143-84, CNG351-159-86, CNG304-667-81.

TEST:
TECHNICAL INSPECTIONS ARE PERFORMED BEFORE AND AFTER TESTS WITH THE CASE REMOVED. THESE INSPECTIONS CHECK FOR MECHANICAL DAMAGES, LOOSE FASTENERS, AND SOLDERED JOINTS DAMAGE. WIRE CHECKS ARE PERFORMED FOR PROPER CONNECTIONS TO BUSES AND TO CONNECTOR CONTACTS. IN ADDITION, CIRCUIT DIAGRAM VERIFICATION IS PERFORMED. CIRCUITS WITH DIODES ARE CHECKED FOR CONTINUITY. TIME RELAY AND CURRENT CONSUMPTION ARE VERIFIED IN ADDITION TO INDIVIDUAL ELEMENT FUNCTIONAL VERIFICATION. VIBRATION, VIBRATION STRENGTH, IMPACT STRENGTH, COLD/HEAT RESISTANCE AND MOISTURE RESISTANCE TESTS ARE PERFORMED. ELECTRONIC RADIO EMISSIONS (ERE) AND ELECTRIC INSULATION RESISTANCE TESTS ARE PERFORMED FOR THE UNIT.

QUALIFICATION, CERTIFICATION TESTS, AND ANALYSES ARE IMPLEMENTED AT THE LINE REPLACEABLE UNIT (LRU) LEVEL. SPECIFIC DETAILS APPLICABLE TO THE DMCU TESTING ARE INCLUDED IN THIS AND THE FOLLOWING SECTIONS.

ACCEPTANCE TEST REQUIREMENTS:

A. EXAMINATION: NO PHYSICAL DAMAGE, NO MISSING OR LOOSE HARDWARE, CORRECT WEIGHT, FINISH, DIMENSIONS, NO CONTAMINATION AND PROPER IDENTIFICATION.
B. INSULATION RESISTANCE: 20 MEGOHMS MINIMUM AT A POTENTIAL OF 100 VOLTS (DC) BETWEEN CONNECTORS AND MUTUALLY ISOLATED PINS.
C. DIELECTRIC STRENGTH: NO MORE THAN TWO MILIAMPS AT A POTENTIAL OF 200 VOLTS (AC) FOR ONE SECOND BETWEEN CONNECTORS AND MUTUALLY ISOLATED PINS.
D. FUNCTIONAL: USING SUPPLY VOLTAGES OF 23 ± 0.5 VOLTS (DC) AND 34 ± 0.5 VOLTS (DC.) VERIFY CONTINUITY, RESISTANCE, POWER CONSUMPTION, TIMING CIRCUITS AND SWITCHING LOGIC FUNCTIONS.
E. VIBRATION: SINUSOIDAL CONDUCTED IN EACH OF THE THREE MUTUALLY PERPENDICULAR DIRECTIONS FOR A DURATION OF 787 SECONDS AT THE FOLLOWING LEVELS:

20 - 40 HZ	1.2 g/HZ
40 - 80 HZ	2.1 g/HZ
80 - 160 HZ	4.1 g/HZ
160 - 320 HZ	7.0 g/HZ
320 - 640 HZ	10 g/HZ
640 - 1280 HZ	7.2 g/HZ
1280 - 2560 HZ	6.7 g/HZ

ITEMS A TO D ABOVE ARE CONDUCTED AFTER VIBRATION TESTS EXCEPT FUNCTIONAL IS AT 27 ± 0.5 VOLTS (DC.)

F. THERMAL:

1. COLD - OPERATING:
a. SOAK @ 9 +0/-5.4 °F C (-13 0/-3 ° C) FOR 3 HOURS
b. INSULATION RESISTANCE TEST PER B EXCEPT AT 5 MEGOHMS (MINIMUM)
c. FUNCTIONAL TEST PER ITEM D
d. DRIES @ 86° - 122° F (35 - 50 °C) FOR 3 HOURS
e. COOLS AT ROOM TEMPERATURE FOR A MINIMUM OF 2 HOURS
f. EXAMINATION PER A ABOVE

2. HOT - OPERATING
a. SOAK @ 113 +9/-0 °F (45 +5/-0 °C) FOR 3 HOURS
b. INSULATION RESISTANCE TEST PER B EXCEPT AT 5 MEGOHMS (MINIMUM)
c. FUNCTIONAL TEST PER ITEM D
d. COOLS AT ROOM TEMPERATURE FOR A MINIMUM OF 2 HOURS
e. EXAMINATION PER A ABOVE

G. HUMIDITY (MOISTURE RESISTANCE) TEST:

1. AT RELATIVE HUMIDITY OF 92 - 98% AND A TEMPERATURE OF 68 - 77 °F (20 - 25 °C), SOAK FOR 48 HOURS WITH POWER OFF.
2. PERFORM INSULATION RESISTANCE TEST PER B ABOVE EXCEPT AT 1 MEGOHM
3. DRIES AT 95 - 122 °F (35 - 50 °C) FOR 2 HOURS MINIMUM.
4. COOLS AT ROOM TEMPERATURE EXAMINATION PER "A" ABOVE

QUALIFICATION TEST REQUIREMENTS:

ENVIRONMENT	DURATION	ON/OFF STATUS	LEVEL
PACKAGE QUALIFICATION TEST	5 - 10 mSEC IN EACH OF THE 3 PERPENDICULAR DIRECTIONS	OFF	PEAK SHOCK ACCELERATION = 9 ± 1.8 g's 1) 2500 ± 125 SHOCKS PERPENDICULAR TO CONTAINER 2) 1750 ± 90 SHOCKS IN TWO MUTUALLY PERPENDICULAR DIRECTION 3) 6000 ± 300 TOTAL NUMBER OF SHOCKS/MINUTE ≤ 120
RANDOM VIBRATION TEST (QAVT)	560 SEC IN EACH OF THE 3 MUTUALLY PERPENDICULAR DIRECTIONS	OFF	20 - 80 Hz INCREASING @ 3 dB PER OCTAVE 80 - 350 Hz CONSTANT @ 0.067 g^2/Hz 350 - 2000 Hz DECREASING @ -3dB PER OCTAVE FROM 0.067 g^2/Hz @ 350 Hz

QUALIFICATION TEST REQUIREMENTS (CONT'D)

ENVIRONMENT	DURATION	ON/OFF STATUS	LEVEL
DESIGN SHOCK	IN EACH OF 3 MUTUALLY PERPENDICULAR DIRECTIONS: 1 SHOCK FOR 1 TO 3 MSEC 2 SHOCKS FOR 3 TO 5 MSEC	OFF	 100 G HALF SINE WAVE SHOCK PULSE 40 G HALF SINE WAVE SHOCK PULSE
ACCELERATION	12 MINUTES IN EACH OF THE 3 PERPENDICULAR DIRECTIONS.	OFF	13.5 g's
THERMAL VACUUM CYCLING	1 HOUR MINIMUM AT EACH TEMPERATURE PLATEAU (8 CYCLES)	ON/OFF	1. AT AMBIENT PRESSURE: RAMP FROM 77 TO 122 ° F (25 TO 50 °C), STABILIZE DWELL FOR 1 HOUR; CONDUCT PERFORMANCE TEST. 2. 122 TO -22 ° F (50 TO 30 °C), STABILIZE; DWELL FOR 1 HOUR CONDUCT PERFORMANCE TEST. 3. REPEAT (1) AND (2) 3 TIMES. 4. AT VACUUM OF 2 X 10^{-6} PSIA (2 X 10^{-4} MM OF HG): RAMP FROM -22 TO 122 ° F (-30 TO 50 °C), STABILIZE; DWELL FOR 1 HOUR. 5. RAMP FROM 122 TO -22 ° F (50 TO -30 °C), STABILIZE FOR 1 HOUR. 6. RAMP FROM -22 TO 77 ° F (-30 TO 25 °C).
COLD EXPOSURE TEST	3 HOURS AT TEMPERATURE PLATEAU	OFF	1) 77 TO -76° F (25 TO -60 °C), DWELL FOR 24 HOURS. 2) DRY AT 95 TO 122° F (35 TO 50 ° C) FOR 2 HOURS MINIMUM. 3) COOL AT 77° F (25° C) FOR TWO HOURS MINIMUM.
HEAT EXPOSURE TEST	3 HOURS AT TEMPERATURE PLATEAU	OFF	1) 77 TO 140° F (25 TO 60 °C), DWELL FOR 6 HOURS. 2) COOL AT 77° F (25° C) FOR TWO HOURS MINIMUM.
HUMIDITY TEST	96 HOURS AT TEMPERATURE PLATEAU	OFF	1) 68 TO 77 ° F (20 TO 25 °C), DWELL FOR 96 HOURS AT RELATIVE HUMIDITY OF 95±3%. 2) DRY AT 95 TO 122° F (35 TO 50 ° C) FOR 2 HOURS MINIMUM RELATIVE HUMIDITY OF 60%. 3) COOL AT 77° F (25° C) FOR 2 HOURS MINIMUM.

QUALIFICATION TEST REQUIREMENTS (CONT'D)

ENVIRONMENT	DURATION	ON/OFF STATUS	LEVEL
SUPPLY VOLTAGE RESERVE VERIFICATION TEST	AS REQUIRED	ON/OFF	1) (20 ± 0.5) V SUPPLY VOLTAGE 2) (37 ± 0.5) V SUPPLY VOLTAGE
LOW TEMPERATURE RESERVE VERIFICATION TEST	3 HOURS AT TEMPERATURE PLATEAU	ON/OFF	1) 77 TO -4 ° F (25 TO -20 °C), DWELL FOR 3 HOURS CONDUCT PERFORMANCE TEST. 2) DRY AT 95 TO 122° F (35 TO 50 ° C) FOR 2 HOURS MINIMUM 3) COOL AT 77° F (25° C) FOR 2 HOURS MINIMUM.
HIGH TEMPERATURE RESERVE VERIFICATION TEST	3 HOURS AT TEMPERATURE PLATEAU	ON/OFF	1) 77 TO 122 ° F (25 TO 50 °C), DWELL FOR 3 HOURS CONDUCT PERFORMANCE TEST. 2) COOL AT 77 °F (25 °C) FOR 2 HOURS MINIMUM.

CERTIFICATION BY ANALYSIS:
ALL ELECTRICAL EQUIPMENT/COMPONENTS INSTALLED IN THE ASSEMBLY HAVE BEEN CERTIFIED FOR THE APPLICABLE REQUIREMENTS NOTED BELOW IN ACCORDANCE WITH MC621-0087B. ANALYSIS/SIMILARITY HAS BEEN USED BY THE SUPPLIER TO CERTIFY FOR THE FOLLOWING ENVIRONMENTS:

A) RADIATION: ENERGIA HAS CONDUCTED TESTS ON SIMILAR HARDWARE (11F732.7692-0A.) AN ENGINEERING ANALYSIS REPORT (EAR) IS BEING PREPARED TO DEMONSTRATE THAT IDENTICAL COMPONENTS, MATERIALS, AND PROCESSES WERE USED FOR BOTH UNITS.

B) OZONE: ROCKWELL HAS VERIFIED ENERGIA COMPLIANCE WITH MATERIAL SELECTION CRITERIA FOR OZONE SENSITIVITY AND DEGRADATION. THE RATIONALE FOR THIS VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

C) FUNGUS: ROCKWELL HAS VERIFIED ENERGIA COMPLIANCE WITH MATERIAL SELECTION CRITERIA FOR NON-NUTRIENT TO FUNGI AND TREATMENT. THE RATIONALE FOR THIS VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

D) SAND/DUST: THE DMCU CONTAINS NO MOVING PARTS.

E) SALT/FOG: ROCKWELL HAS VERIFIED ENERGIA COMPLIANCE WITH MATERIAL SELECTION CRITERIA FOR SALT FOG SENSITIVITY AND DEGRADATION. THE RATIONALE FOR THIS VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

G) ODOR/OFFGASING: ROCKWELL HAS VERIFIED ENERGIA COMPLIANCE WITH MATERIAL SELECTION CRITERIA FOR ODOR/OFFGASING. THE RATIONALE FOR THIS VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

H) FLAMMABILITY: ROCKWELL HAS VERIFIED ENERGIA COMPLIANCE WITH MATERIAL SELECTION CRITERIA FOR FLAMMABILITY. THE RATIONALE FOR THIS VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

J) LIGHTNING: THE RATIONALE FOR VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

K) ELECTROMAGNETIC COMPATIBILITY: CE01, CE03, CS01, CS02, CS06, RE02, RS02, RS03, RS04, AND TT01 (TIME DOMAIN TRANSIENT AND RIPPLE TEST) PERFORMED PER CR # 21-621-0087-0005A ON THE BRASSBOARD ITEM. THE RATIONALE FOR THIS VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

(C) INSPECTION:

RECEIVING INSPECTIONS:
RECEIVING INSPECTIONS AT ENERGIA ARE PERFORMED IN ACCORDANCE TO THE FOLLOWING ENERGIA STANDARDS: CNG304-120-86, CNG304-408-89, EEH-121-471-90, EEH-137-475-81, AND EEH-008-471-86. QA IN COOPERATION WITH SPECIALIZED DIVISIONS (SUCH AS M&P LAB, TOOLS, CALIBRATION LAB, ETC.) CONDUCTS RECEIVING INSPECTIONS FOR PARTS ARTICLES AND RAW MATERIALS. NECESSARY DATA, SHELF LIFE, RESOURCE LIFE AND TEST DATA ARE CHECKED FOR ACCEPTANCE. INDIVIDUAL ELEMENTS ARE INSPECTED/ MEASURED FOR CONFORMITY WITH DRAWING TECHNICAL REQUIREMENTS. PARTS COATING QUALITY, JOINTS QUALITY, OVERALL AND INSTALLATION DIMENSIONS, QUALITY OF ASSEMBLY, AND INSTALLATION, MARKINGS ARE CHECKED. COMPLIANCE WITH ELECTRICAL CONNECTIONS TABLES IS CARRIED OUT BY PERFORMING THE FOLLOWING OPERATIONS: CONTINUITY TEST OF THE ASSEMBLY AND WIRE NUMBER AND COLORING VISUAL INSPECTION FOR EACH CIRCUIT POINT. A RECORD OF THESE INSPECTIONS IS KEPT IN THE ASSEMBLY DATA CARD.

CONTAMINATION CONTROL & CRITICAL PROCESSES:
PRODUCTION ROOM COMPLIANCE WITH THE OPERATIONAL ENVIRONMENTAL REQUIREMENTS ARE IMPLEMENTED PER THE FOLLOWING ENERGIA SPECIFICATIONS: CNG304-108-91, CNG304-187-78, CNG304-188-88, CNG304-93-88, AND CNG304-172-92. A WORKING COMMITTEE TEAM, WHICH INCLUDES DESIGNER, QUALITY, OPERATIONS, AND SPECIALISTS PERFORM DAILY CONTROL OF PROCESSES, TOOLS AND FIXTURES, WORKING ENVIRONMENTS AND SEQUENCES OF OPERATIONS.

TESTING:
TESTS ARE DESIGNED TO ASSURE MAXIMUM DESIGN COMPLIANCE. PRE-PLANNED INSPECTION POINTS ARE DEFINED AND MAY BE SUPPLEMENTED WITH INSPECTION INSTRUCTIONS BASED ON THE COMPLEXITY OF THE ASSEMBLY. QUALITY CONTROLS THE PERFORMANCE OF INSPECTIONS AND TESTS REQUIRED BY DESIGN DOCUMENTATION. THE FOLLOWING ENERGIA SPECIFICATIONS ARE APPLICABLE: 93Y.6201.008-05, CNG304-A87-88, AND CNG304-144-88.

HANDLING/PACKAGING:
PACKAGING AND TRANSPORT CONTAINER ARE CHECKED FOR COMPLIANCE WITH THE SPECIFICATIONS AND DRAWING REQUIREMENTS. ENERGIA ENGINEERING DRAWINGS, PROCEDURES AND INSTRUCTIONS DEFINE THE REQUIREMENTS FOR STORAGE, PACKAGING, AND SHIPPING. THE FOLLOWING ENERGIA SPECIFICATIONS ARE APPLICABLE: RD92-0256-89 AND EEN-121-471-75

(D) FAILURE HISTORY:
DATA ON TEST FAILURES, UNEXPLAINED ANOMALIES, AND OTHER FAILURES EXPERIENCED DURING GROUND PROCESSING OF THE ODS CAN BE FOUND IN THE PRACA DATA BASE.

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX F

DISPOSITION AND RATIONALE

(POWER SWITCHING UNIT)

FUNCTION:
THE PSU CONTROLS THE APDS LOGIC BUSES AND DISTRIBUTES THE APDS POWER BUSES. LOGIC AND MAIN POWER IS RECEIVED FROM THE ORBITER THROUGH CONNECTOR X3 AND RETURNED THROUGH CONNECTOR X4. THE LOGIC POWER BUSES ARE –OF- –OD- –OC- AND THE POWER BUSES ARE –C11 AND –C12.

HARDWARE DESCRIPTION:
THE PSU CONSISTS OF INTEGRATED DIODE, RELAYS, AND RESISTOR CELLS. THE DEVICE ALSO INCLUDES SEPARATE RELAYS FOR COMMUTATION OF THE AUTOMATED APDS CONTROL POWER UNITS. THE FUSES ARE USED FOR PROTECTION OF MAIN POWER CIRCUITS. OPTOCOUPLE TRANSISTOR ARE USED FOR CONDITIONING OF THE TELEMETRY SIGNAL FOR THE MAIN POWER CIRCUITS.

THE UNIT CONTAINS THE FOLLOWING ENERGIA PROCURED COMPONENTS:

REFERENCE DESIGNATOR	ITEM	QUANTITY
R20-R28	Resistor OS.S2-23-1-2.1 Kohms + 1%-A-V-V	9
R30-R38	Resistor OS.S2-23-0.125-4.64 ohms + 1%-A-V-V	9
X3	Plug ONTs-BS-1-19/18-V1-1-V bRO.364.030TU	1
X4,X5	Plug ONTs-BS-1-10/14-V1-1-V bRO.364.030TU	2
X252	Plug ONTs-BS-1-32/22-V1-1-V bRO.364.030TU	1
X253	Plug ONTs-BS-1-50/27-V1-1-V bRO.364.030TU	1
X255,X254	Plug ONTs-BS-1-50/18-V1-1-V bRO.364.031TU	2
E1-E4	Cell Ya-34 33U.5223.010 33U.0247.004TU	4
E10-E13	Cell Ya-22 33U.5225.003 33U.0247.004TU	4
E20-E23	Cell Ya-13 33U.5225.004 33U.0247.004TU	4
E25	Cell Ya-24 33U.5225.006 33U.0247.004TU	1
E30-E32	Cell RD36 33U.5221.007 33U.0247.002TU	3
E33-E38	Cell RD36-0.5-2 33U.5221.010 33U.0247.002TU	6
E41-E51	Cell RDP5x1 33U.5226.005 33U.0247.002TU	11
KT1-KT6	Time relay 33U.5214.011-03 33U.5214.011 TU	6
VD15-VD32	Diode 2D103AOS TTZ.362.060TU/D6 aAO339.190TU	18
VT1-VT9	Transistor optocouple 3OT 131A PO 070.052 aAO.339.419TU	9
VD1-VD9	Light-emitting diode (LED) AL307BM aAO336.076TU	9
K1-K6	Relay RPS 42 OS RS4.520.720-01 YaLa.452,102TU OSTV4.450.019.82	6
K11-K16	Relay RPS32LOS RS4.520.216 YaPO.452.080TU OST84.450.019-82	6
FU1-FU10	Fuse link VP1-1-5A 250V OYu).480.003TU	10
FU11-FU18	Fuse link VP1-1-3A 250V OYu).480.003TU	8
R1-R9	Resistor OSS2-23-1.1.5 kohms + 5%-A-V-V OZhO.467.081TU OZhO.467.138TU	9
R10-R18	Resistor OSS2-23-1.25-1 Mohms + 1%-A-V-V OZhO.467.081TU OZhO.467.138TU	9

DESIGN:
ELECTRICAL AND RADIO COMPONENTS ARE CHOSEN IN ACCORDANCE WITH THE DEVICE'S OPERATING MODES AND PARAMETERS. INTEGRATED RELAY, DIODE, AND RESISTOR CELLS UTILIZED IN THE DESIGN HAVE PASSED STRICT GROUND DEVELOPMENT TESTS AND HAVE SHOWN GOOD PERFORMANCE DURING FLIGHT OPERATIONS. RELIABILITY IS ENHANCED USING REDUNDANCY TECHNIQUES SUCH AS: DUPLICATION, TRIPLING, VOTERS 2 OF 3, AND 3 OF 4. POWER BUSES AND CONTROL CIRCUITS ARE SEPARATED. PROVISION ARE MADE FOR CIRCUIT CHECK-OUT DURING SERVICE AND REPAIR STATES. THE WIRE BUNDLES ARE ADDITIONALLY INSULATED AND SECURED BY A CORD. INDIVIDUAL WIRES ARE SECURED USING SEALANT. WIRE JUMPERS LONGER THAN 5MM, AS WELL AS, OTHER BARE CURRENT CONDUCTING AND CURRENT-BEARING SURFACES OF LESS THAN 2MM ARE INSULATED BY SHRINK TUBING. SOLDERING SPOTS AND COMPONENTS TERMINALS ARE COATED WITH VARNISH.

COMPONENT PROCUREMENT CONTROL:
THE DESIGN DEPARTMENT SELECTS THE SUPPLIERS FROM AN APPROVED SUPPLIER LIST (ASL) FOR THE SPECIFIC PRODUCT, BASED ON EXPERT ASSESSMENT OF THE QUALITY AND RELIABILITY HISTORICAL DATA FOR THE PRODUCT TO BE PROCURED. ALL SUPPLIERS FROM THE ASL ARE ESTABLISHED AND IN COMPLIANCE TO THE INDUSTRY'S GOSTs/STANDARDS AND ENERGIA QUALITY ASSURANCE, RELIABILITY, AND SAFETY PROVISIONS AND REQUIREMENTS. WHEN A PURCHASE ORDER IS PLACED FOR A NEW OR MODIFIED (NON-OFF-SHELF) PART, THE SUPPLIER SUBMITS A PROPOSED OPERATION AND TECHNOLOGICAL PROCESS FOR MANUFACTURING THE REQUIRED ITEM FOR ENERGIA REVIEW AND APPROVAL. THE DESIGN DEPARTMENT IN CONJUNCTION WITH QUALITY AND RELIABILITY EXPERTS, PERFORM TRADE ANALYSES AND MAINTAIN SURVEILLANCE OF THE SUPPLIERS BASED ON THE HISTORY OR PERFORMANCE AND REJECTION RATES OF THE FURNISHED SUPPLIES. APPLICABLE ENERGIA STANDARDS CNG351-143-84, CNG351-159-88, CNG304-667-91.

TEST:
TECHNICAL INSPECTIONS ARE PERFORMED BEFORE AND AFTER TESTS WITH THE CASE REMOVED. THESE INSPECTION CHECK FOR MECHANICAL DAMAGES, LOOSE FASTENERS, AND SOLDERED JOINTS DAMAGE. WIRE CHECKS ARE PERFORMED FOR PROPER CONNECTIONS TO BUSES AND TO CONNECTOR CONTACTS. IN ADDITION, CIRCUIT DIAGRAM VERIFICATION IS PERFORMED. CIRCUITS WITH DIODES ARE CHECKED FOR CONTINUITY. TIME RELAY AND CURRENT CONSUMPTION ARE VERIFIED IN ADDITION TO INDIVIDUAL ELEMENT FUNCTIONAL VERIFICATION. VIBRATION, VIBRATION STRENGTH, IMPACT STRENGTH, COLD/HEAT RESISTANCE AND MOISTURE RESISTANCE TESTS ARE PERFORMED. ELECTRONIC RADIO EMISSIONS (ERE) AND ELECTRIC INSULATION RESISTANCE TESTS ARE PERFORMED FOR THE UNIT.

QUALIFICATION, CERTIFICATION TESTS, AND ANALYSES ARE IMPLEMENTED AT THE LINE REPLACEABLE UNIT (LRU) LEVEL. SPECIFIC DETAILS APPLICABLE TO THE PSU TESTING ARE INCLUDED IN THIS AND THE FOLLOWING SECTIONS.

ACCEPTANCE TEST REQUIREMENTS:

A. EXAMINATION: NO PHYSICAL DAMAGE, NO MISSING OR LOOSE HARDWARE, CORRECT WEIGHT, FINISH, DIMENSIONS, NO CONTAMINATION AND PROPER IDENTIFICATION.

B. INSULATION RESISTANCE: 20 MEGOHMS MINIMUM AT A POTENTIAL OF 100 VOLTS (DC) BETWEEN CONNECTORS AND MUTUALLY ISOLATED PINS.

C. DIELECTRIC STRENGTH: NO MORE THAN TWO MILIAMPS AT A POTENTIAL OF 200 VOLTS (AC) FOR ONE SECOND BETWEEN CONNECTORS AND MUTUALLY ISOLATED PINS.

D. FUNCTIONAL: USING SUPPLY VOLTAGES OF 23 ± 0.5 VOLTS (DC) AND 34 ± 0.5 VOLTS (DC,) VERIFY CONTINUITY, RESISTANCE, POWER CONSUMPTION, TIMING CIRCUITS AND SWITCHING LOGIC FUNCTIONS.

E. VIBRATION: RANDOM CONDUCTED IN EACH OF THE THREE MUTUALLY PERPENDICULAR DIRECTIONS FOR A DURATION OF 787 SECONDS AT THE FOLLOWING LEVELS:

20 - 80 HZ	INCREASING @ 3dB/OCTAVE
80 - 350 HZ	0.04 g^2/HZ CONSTANT
350 - 2000 HZ	DECREASING @ -3dB/OCTAVE

ITEMS A TO D ABOVE ARE CONDUCTED AFTER VIBRATION TESTS EXCEPT FUNCTIONAL IS AT 27 ± 0.5 VOLTS (DC.)

F. THERMAL :

1. COLD - OPERATING:
a. SOAK @ 9 +0/-5.4 °F C (-13 0/-3 ° C) FOR 3 HOURS
b. INSULATION RESISTANCE TEST PER B EXCEPT AT 5 MEGOHMS (MINIMUM)
c. FUNCTIONAL TEST PER ITEM D
d. DRIES @ 86° - 122° F (35 - 50 °C) FOR 3 HOURS
e. COOLS AT ROOM TEMPERATURE FOR A MINIMUM OF 2 HOURS
f. EXAMINATION PER A ABOVE

2. HOT - OPERATING
a. SOAK @ 113 +9/-0 °F (45 +5/-0 °C) FOR 3 HOURS
b. INSULATION RESISTANCE TEST PER B EXCEPT AT 5 MEGOHMS (MINIMUM)
c. FUNCTIONAL TEST PER ITEM D
d. COOLS AT ROOM TEMPERATURE FOR A MINIMUM OF 2 HOURS
e. EXAMINATION PER A ABOVE

G. HUMIDITY (MOISTURE RESISTANCE) TEST:
1. AT RELATIVE HUMIDITY OF 92 - 98% AND A TEMPERATURE OF 68 - 77 °F (20 - 25 °C), SOAK FOR 48 HOURS WITH POWER OFF.
2. PERFORM INSULATION RESISTANCE TEST PER B ABOVE EXCEPT AT 1 MEGOHM
3. DRIES AT 95 - 122 °F (35 - 50 °C) FOR 2 HOURS MINIMUM.
4. COOLS AT ROOM TEMPERATURE EXAMINATION PER "A" ABOVE

QUALIFICATION TEST REQUIREMENTS:

ENVIRONMENT	DURATION	ON/OFF STATUS	LEVEL
PACKAGE QUALIFICATION TEST	5 - 10 mSEC IN EACH OF THE 3 PERPENDICULAR DIRECTIONS	OFF	PEAK SHOCK ACCELERATION = 9 ± 1.8 g's 1) 2500 ± 125 SHOCKS PERPENDICULAR TO CONTAINER 2) 1750 ± 90 SHOCKS IN TWO MUTUALLY PERPENDICULAR DIRECTION 3) 6000 ± 300 TOTAL NUMBER OF SHOCKS/MINUTE ≤ 120
RANDOM VIBRATION TEST (QAVT)	560 SEC IN EACH OF THE 3 MUTUALLY PERPENDICULAR DIRECTIONS	OFF	20 - 80 Hz INCREASING @ 3 dB PER OCTAVE 80 - 350 Hz CONSTANT @ 0.067 g^2/Hz 350 - 2000 Hz DECREASING @ -3dB PER OCTAVE FROM 0.067 g^2/Hz @ 350 Hz
DESIGN SHOCK	IN EACH OF 3 MUTUALLY PERPENDICULAR DIRECTIONS: 1 SHOCK FOR 1 TO 3 MSEC 2 SHOCKS FOR 3 TO 5 MSEC	OFF	100 G HALF SINE WAVE SHOCK PULSE 40 G HALF SINE WAVE SHOCK PULSE
ACCELERATION	12 MINUTES IN EACH OF THE 3 PERPENDICULAR DIRECTIONS.	OFF	13.5 g's
THERMAL VACUUM CYCLING	1 HOUR MINIMUM AT EACH TEMPERATURE PLATEAU (6 CYCLES)	ON/OFF	1. AT AMBIENT PRESSURE: RAMP FROM 77 TO 122 ° F (25 TO 50 °C), STABILIZE DWELL FOR 1 HOUR; CONDUCT PERFORMANCE TEST. 2. 122 TO -22 ° F (50 TO 30 °C), STABILIZE; DWELL FOR 1 HOUR CONDUCT PERFORMANCE TEST. 3. REPEAT (1) AND (2) 3 TIMES. 4. AT VACUUM OF 2 X 10^{-6} PSIA (2 X 10^{-4} MM OF HG); RAMP FROM -22 TO 122 ° F (-30 TO 50 °C), STABILIZE; DWELL FOR 1 HOUR. 5. RAMP FROM 122 TO -22 ° F (50 TO -30 °C), STABILIZE FOR 1 HOUR. 6. RAMP FROM -22 TO 77 ° F (-30 TO 25 °C).

QUALIFICATION TEST REQUIREMENTS (CONT'D)

ENVIRONMENT	DURATION	ON/OFF STATUS	LEVEL
COLD EXPOSURE TEST	3 HOURS AT TEMPERATURE PLATEAU	OFF	1) 77 TO -76° F (25 TO -60 °C), DWELL FOR 24 HOURS. 2) DRY AT 95 TO 122° F (35 TO 50 ° C) FOR 2 HOURS MINIMUM. 3) COOL AT 77° F (25° C) FOR TWO HOURS MINIMUM.
HEAT EXPOSURE TEST	3 HOURS AT TEMPERATURE PLATEAU	OFF	1) 77 TO 140° F (25 TO 60 °C), DWELL FOR 6 HOURS. 2) COOL AT 77° F (25° C) FOR TWO HOURS MINIMUM.
HUMIDITY TEST	96 HOURS AT TEMPERATURE PLATEAU	OFF	1) 68 TO 77 ° F (20 TO 25 °C), DWELL FOR 96 HOURS AT RELATIVE HUMIDITY OF 85±3%. 2) DRY AT 95 TO 122° F (35 TO 50 ° C) FOR 2 HOURS MINIMUM RELATIVE HUMIDITY OF 60%. 3) COOL AT 77° F (25° C) FOR 2 HOURS MINIMUM.
SUPPLY VOLTAGE RESERVE VERIFICATION TEST	AS REQUIRED	ON/OFF	1) (20 ± 0.5) V SUPPLY VOLTAGE 2) (37 ± 0.5) V SUPPLY VOLTAGE
LOW TEMPERATURE RESERVE VERIFICATION TEST	3 HOURS AT TEMPERATURE PLATEAU	ON/OFF	1) 77 TO -4 ° F (25 TO -20 °C), DWELL FOR 3 HOURS CONDUCT PERFORMANCE TEST. 2) DRY AT 95 TO 122° F (35 TO 50 ° C) FOR 2 HOURS MINIMUM 3) COOL AT 77° F (25° C) FOR 2 HOURS MINIMUM.
HIGH TEMPERATURE RESERVE VERIFICATION TEST	3 HOURS AT TEMPERATURE PLATEAU	ON/OFF	1) 77 TO 122 ° F (25 TO 50 °C), DWELL FOR 3 HOURS CONDUCT PERFORMANCE TEST. 2) COOL AT 77 °F (25 °C) FOR 2 HOURS MINIMUM.

CERTIFICATION BY ANALYSIS:
ALL ELECTRICAL EQUIPMENT/COMPONENTS INSTALLED IN THE ASSEMBLY HAVE BEEN CERTIFIED FOR THE APPLICABLE REQUIREMENTS NOTED BELOW IN ACCORDANCE WITH MC621-0067B. ANALYSIS/SIMILARITY HAS BEEN USED BY THE SUPPLIER TO CERTIFY FOR THE FOLLOWING ENVIRONMENTS:

A) RADIATION: ENERGIA HAS CONDUCTED TESTS ON SIMILAR HARDWARE (11F732.7692-0A.) AN ENGINEERING ANALYSIS REPORT (EAR) IS BEING PREPARED TO DEMONSTRATE THAT IDENTICAL COMPONENTS, MATERIALS, AND PROCESSES WERE USED FOR BOTH UNITS.

B) OZONE: ROCKWELL HAS VERIFIED ENERGIA COMPLIANCE WITH MATERIAL SELECTION CRITERIA FOR OZONE SENSITIVITY AND DEGRADATION. THE RATIONALE FOR THIS VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

C) FUNGUS: ROCKWELL HAS VERIFIED ENERGIA COMPLIANCE WITH MATERIAL SELECTION CRITERIA FOR NON-NUTRIENT TO FUNGI AND TREATMENT. THE RATIONALE FOR THIS VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

D) SAND/DUST: THE PSU CONTAINS NO MOVING PARTS.

E) SALT/FOG: ROCKWELL HAS VERIFIED ENERGIA COMPLIANCE WITH MATERIAL SELECTION CRITERIA FOR SALT FOG SENSITIVITY AND DEGRADATION. THE RATIONALE FOR THIS VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

G) ODOR/OFFGASING: ROCKWELL HAS VERIFIED ENERGIA COMPLIANCE WITH MATERIAL SELECTION CRITERIA FOR ODOR/OFFGASING. THE RATIONALE FOR THIS VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

H) FLAMMABILITY: ROCKWELL HAS VERIFIED ENERGIA COMPLIANCE WITH MATERIAL SELECTION CRITERIA FOR FLAMMABILITY. THE RATIONALE FOR THIS VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

J) LIGHTNING: THE RATIONALE FOR VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

K) ELECTROMAGNETIC COMPATIBILITY: CE01, CE03, CS01, CS02, CS06, RE02, RS02, RS03, RS04, AND TT01 (TIME DOMAIN TRANSIENT AND RIPPLE TEST) PERFORMED PER CR # 21-621-0087-0005A ON THE BRASSBOARD ITEM. THE RATIONALE FOR THIS VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

(C) INSPECTION:

RECEIVING INSPECTIONS:
RECEIVING INSPECTIONS AT ENERGIA ARE PERFORMED IN ACCORDANCE TO THE FOLLOWING ENERGIA STANDARDS: CNG304-120-86, CNG304-408-89, EEH-121-471-90, EEH-137-475-81, AND EEH-008-471-88. QA IN COOPERATION WITH SPECIALIZED DIVISIONS (SUCH AS M&P LAB, TOOLS, CALIBRATION LAB, ETC.) CONDUCTS RECEIVING INSPECTIONS FOR PARTS ARTICLES AND RAW MATERIALS. NECESSARY DATA, SHELF LIFE, RESOURCE LIFE AND TEST DATA ARE CHECKED FOR ACCEPTANCE. INDIVIDUAL ELEMENTS ARE INSPECTED/ MEASURED FOR CONFORMITY WITH DRAWING TECHNICAL REQUIREMENTS. PARTS COATING QUALITY, JOINTS QUALITY, OVERALL AND INSTALLATION DIMENSIONS, QUALITY OF ASSEMBLY, AND INSTALLATION, MARKINGS ARE CHECKED. COMPLIANCE WITH ELECTRICAL CONNECTIONS TABLES IS CARRIED OUT BY PERFORMING THE FOLLOWING OPERATIONS: CONTINUITY TEST OF THE ASSEMBLY AND WIRE NUMBER AND COLORING VISUAL INSPECTION FOR EACH CIRCUIT POINT. A RECORD OF THESE INSPECTIONS IS KEPT IN THE ASSEMBLY DATA CARD.

CONTAMINATION CONTROL & CRITICAL PROCESSES:
PRODUCTION ROOM COMPLIANCE WITH THE OPERATIONAL ENVIRONMENTAL REQUIREMENTS ARE IMPLEMENTED PER THE FOLLOWING ENERGIA SPECIFICATIONS: CNG304-108-91, CNG304-187-78, CNG304-188-88, CNG304-93-88, AND CNG304-172-92. A WORKING COMMITTEE TEAM, WHICH INCLUDES DESIGNER, QUALITY, OPERATIONS, AND SPECIALISTS PERFORM DAILY CONTROL OF PROCESSES, TOOLS AND FIXTURES, WORKING ENVIRONMENTS AND SEQUENCES OF OPERATIONS.

TESTING:
TESTS ARE DESIGNED TO ASSURE MAXIMUM DESIGN COMPLIANCE. PRE-PLANNED INSPECTION POINTS ARE DEFINED AND MAY BE SUPPLEMENTED WITH INSPECTION INSTRUCTIONS BASED ON THE COMPLEXITY OF THE ASSEMBLY. QUALITY CONTROLS THE PERFORMANCE OF INSPECTIONS AND TESTS REQUIRED BY DESIGN DOCUMENTATION. THE FOLLOWING ENERGIA SPECIFICATIONS ARE APPLICABLE: 33Y.6201.008-05, CNG304-A87-88, AND CNG304-144-88.

HANDLING/PACKAGING:
PACKAGING AND TRANSPORT CONTAINER ARE CHECKED FOR COMPLIANCE WITH THE SPECIFICATIONS AND DRAWING REQUIREMENTS. ENERGIA ENGINEERING DRAWINGS, PROCEDURES AND INSTRUCTIONS DEFINE THE REQUIREMENTS FOR STORAGE, PACKAGING, AND SHIPPING. THE FOLLOWING ENERGIA SPECIFICATIONS ARE APPLICABLE: RD92-0256-89 AND EEN-121-471-75

(D) FAILURE HISTORY:
DATA ON TEST FAILURES, UNEXPLAINED ANOMALIES, AND OTHER FAILURES EXPERIENCED DURING GROUND PROCESSING OF THE ODS CAN BE FOUND IN THE PRACA DATA BASE.

APPENDIX G

DISPOSITION AND RATIONALE

(LATCH ACTUATOR CONTROL UNIT)

FUNCTION:
THE LACU PROVIDES CAPTURE LATCHES ACTUATORS CONTROL. THE UNIT PROVIDES LOGIC PROCESSING FOR PANEL AND AUTOMATIC SEQUENCE COMMANDS TO THE CAPTURE LATCHES. INPUT FROM THE MOTOR POSITION SENSORS SWITCHES THE MOTOR DRIVE RELAY MODULES OFF. PROVIDES CONTROL SIGNALS TO THE DSCU FOR AUTOMATIC SEQUENCE IMPLEMENTATION. PROVIDES TELEMETRY INFORMATION TO THE DCU AND THE APDS CONTROL PANEL FOR MONITORING PURPOSES.

HARDWARE DESCRIPTION:
THE UNIT CONTAINS THE FOLLOWING ENERGIA PROCURED COMPONENTS:

REFERENCE DESIGNATOR	ITEM	QUANTITY
E1-E9, E37-E38	Cell Ya22 33U.5225.003	11
E10-E11	Cell Ya14 33U.5225.005	2
E12-E15	Cell Ya13 33U.5225.004	4
E33	Cell Ya12-2 33U.5225.008	1
KT16-KT18	Time relay 33U.5214.011-04	3
E19-E21	Cell RD 36 33U.5221.07	3
E22-E24	Cell YaDP-3x2 OP 33U.5226.006	3
E25;E31;E35;E36	Cell YaDP-3x2-OM 33U.5226.001	4
E26;E27;E32;E36	Cell YaDP 5x1 33U.5226.005	4
E28-E30	Diode cell 33U.5222.007	3
K1-K12	Relay RES47OS RF4.500.407-02.01_RFO.450.047 TU OST V4.450.019-82	12
X207	Plug OS ONTs-BS-1-50/27-V1-1-V_bro 364.030 TU bro.364.045 TU	1
X208; X223	Plug OS ONTs-BM-1-30/14-V1-1-V_bro 364.031 TU bro.364.045 TU	2
X209	Plug OS ONTs-BS-1-19/18-V1-1-V_bro 364.030 TU bro.364.045 TU	1

DESIGN:
ELECTRICAL AND RADIO COMPONENTS ARE CHOSEN IN ACCORDANCE WITH THE DEVICE'S OPERATING MODES AND PARAMETERS. INTEGRATED RELAY, DIODE, AND RESISTOR CELLS UTILIZED IN THE DESIGN HAVE PASSED STRICT GROUND DEVELOPMENT TESTS AND HAVE SHOWN GOOD PERFORMANCE DURING FLIGHT OPERATIONS. RELIABILITY IS ENHANCED USING REDUNDANCY TECHNIQUES SUCH AS: DUPLICATION, TRIPLING, VOTERS 2 OF 3, AND 3 OF 4. POWER BUSES AND CONTROL CIRCUITS ARE SEPARATED. PROVISION ARE MADE FOR CIRCUIT CHECK-OUT DURING SERVICE AND REPAIR STATES. THE WIRE BUNDLES ARE ADDITIONALLY INSULATED AND SECURED BY A CORD. INDIVIDUAL WIRES ARE SECURED USING SEALANT. WIRE JUMPERS LONGER THAN 5MM, AS WELL AS, OTHER BARE CURRENT CONDUCTING AND CURRENT-BEARING SURFACES OF LESS THAN 2MM ARE INSULATED BY SHRINK TUBING. SOLDERING SPOTS AND COMPONENTS TERMINALS ARE COATED WITH VARNISH.

COMPONENT PROCUREMENT CONTROL:
THE DESIGN DEPARTMENT SELECTS THE SUPPLIERS FROM AN APPROVED SUPPLIER LIST (ASL) FOR THE SPECIFIC PRODUCT, BASED ON EXPERT ASSESSMENT OF THE QUALITY AND RELIABILITY HISTORICAL DATA FOR THE PRODUCT TO BE PROCURED. ALL SUPPLIERS FROM THE ASL ARE ESTABLISHED AND IN COMPLIANCE TO THE

INDUSTRY'S GOSTs/STANDARDS AND ENERGIA QUALITY ASSURANCE, RELIABILITY, AND SAFETY PROVISIONS AND REQUIREMENTS. WHEN A PURCHASE ORDER IS PLACED FOR A NEW OR MODIFIED (NON-OFF-SHELF), THE SUPPLIER SUBMITS A PROPOSED OPERATION AND TECHNOLOGICAL PROCESS FOR MANUFACTURING THE REQUIRED ITEM FOR ENERGIA REVIEW AND APPROVAL. THE DESIGN DEPARTMENT IN CONJUNCTION WITH QUALITY AND RELIABILITY EXPERTS, PERFORM TRADE ANALYSES AND MAINTAIN SURVEILLANCE OF THE SUPPLIERS BASED ON THE HISTORY OR PERFORMANCE AND REJECTION RATES OF THE FURNISHED SUPPLIES. APPLICABLE ENERGIA STANDARDS CNG351-143-84, CNG351-159-88, CNG304-667-91.

TEST:
TECHNICAL INSPECTIONS ARE PERFORMED BEFORE AND AFTER TESTS WITH THE CASE REMOVED. THESE INSPECTION CHECK FOR MECHANICAL DAMAGES, LOOSE FASTENERS, AND SOLDERED JOINTS DAMAGE. WIRE CHECKS ARE PERFORMED FOR PROPER CONNECTIONS TO BUSSES AND TO CONNECTOR CONTACTS. IN ADDITION, CIRCUIT DIAGRAM VERIFICATION IS PERFORMED. CIRCUITS WITH DIODES ARE CHECKED FOR CONTINUITY. TIME RELAY AND CURRENT CONSUMPTION ARE VERIFIED IN ADDITION TO INDIVIDUAL ELEMENT FUNCTIONAL VERIFICATION. VIBRATION, VIBRATION STRENGTH, IMPACT STRENGTH, COLD/HEAT RESISTANCE AND MOISTURE RESISTANCE TESTS ARE PERFORMED. ELECTRONIC RADIO EMISSIONS (ERE) AND ELECTRIC INSULATION RESISTANCE TESTS ARE PERFORMED FOR THE UNIT.

QUALIFICATION, CERTIFICATION TESTS, AND ANALYSES ARE IMPLEMENTED AT THE LINE REPLACEABLE UNIT (LRU) LEVEL. SPECIFIC DETAILS APPLICABLE TO THE LACU TESTING ARE INCLUDED IN THIS AND THE FOLLOWING SECTIONS.

ACCEPTANCE TEST REQUIREMENTS:

A. EXAMINATION: NO PHYSICAL DAMAGE, NO MISSING OR LOOSE HARDWARE, CORRECT WEIGHT, FINISH, DIMENSIONS, NO CONTAMINATION AND PROPER IDENTIFICATION.
B. INSULATION RESISTANCE: 20 MEGOHMS MINIMUM AT A POTENTIAL OF 100 VOLTS (DC) BETWEEN CONNECTORS AND MUTUALLY ISOLATED PINS.
C. DIELECTRIC STRENGTH: NO MORE THAN TWO MILIAMPS AT A POTENTIAL OF 200 VOLTS (AC) FOR ONE SECOND BETWEEN CONNECTORS AND MUTUALLY ISOLATED PINS.
D. FUNCTIONAL: USING SUPPLY VOLTAGES OF 23 ± 0.5 VOLTS (DC) AND 34 ± 0.5 VOLTS (DC,) VERIFY CONTINUITY, RESISTANCE, POWER CONSUMPTION, TIMING CIRCUITS AND SWITCHING LOGIC FUNCTIONS.
E. VIBRATION: RANDOM CONDUCTED IN EACH OF THE THREE MUTUALLY PERPENDICULAR DIRECTIONS FOR A DURATION OF 787 SECONDS AT THE FOLLOWING LEVELS:

20 - 80 HZ	INCREASING @ 3dB/OCTAVE
80 - 350 HZ	0.04 g^2/HZ CONSTANT
350 - 2000 HZ	DECREASING @ -3dB/OCTAVE

ITEMS A TO D ABOVE ARE CONDUCTED AFTER VIBRATION TESTS EXCEPT FUNCTIONAL IS AT 27 ± 0.5 VOLTS (DC.)

F. THERMAL :

1. COLD - OPERATING:
a. SOAK @ 9 +0/-5.4 °F C (-13 0/-3 ° C) FOR 3 HOURS
b. INSULATION RESISTANCE TEST PER B EXCEPT AT 5 MEGOHMS (MINIMUM)
c. FUNCTIONAL TEST PER ITEM D
d. DRIES @ 86° - 122° F (35 - 50 °C) FOR 3 HOURS
e. COOLS AT ROOM TEMPERATURE FOR A MINIMUM OF 2 HOURS
f. EXAMINATION PER A ABOVE

2. HOT - OPERATING
a. SOAK @ 113 +9/-0 °F (45 +5/-0 °C) FOR 3 HOURS
b. INSULATION RESISTANCE TEST PER B EXCEPT AT 5 MEGOHMS (MINIMUM)
c. FUNCTIONAL TEST PER ITEM D
d. COOLS AT ROOM TEMPERATURE FOR A MINIMUM OF 2 HOURS
e. EXAMINATION PER A ABOVE

G. HUMIDITY (MOISTURE RESISTANCE) TEST:

1. AT RELATIVE HUMIDITY OF 92 - 98% AND A TEMPERATURE OF 68 - 77 °F (20 - 25 °C), SOAK FOR 48 HOURS WITH POWER OFF.
2. PERFORM INSULATION RESISTANCE TEST PER B ABOVE EXCEPT AT 1 MEGOHM
3. DRIES AT 95 - 122 °F (35 - 50 °C) FOR 2 HOURS MINIMUM.
4. COOLS AT ROOM TEMPERATURE EXAMINATION PER "A" ABOVE

QUALIFICATION TEST REQUIREMENTS

ENVIRONMENT	DURATION	ON/OFF STATUS	LEVEL
PACKAGE QUALIFICATION TEST	5 - 10 mSEC IN EACH OF THE 3 PERPENDICULAR DIRECTIONS	OFF	PEAK SHOCK ACCELERATION = 9 ± 1.8 g's 1) 2500 ± 125 SHOCKS PERPENDICULAR TO CONTAINER 2) 1750 ± 90 SHOCKS IN TWO MUTUALLY PERPENDICULAR DIRECTION 3) 6000 ± 300 TOTAL NUMBER OF SHOCKS/MINUTE ≤ 120

QUALIFICATION TEST REQUIREMENTS (CONT'D)

ENVIRONMENT	DURATION	ON/OFF STATUS	LEVEL
RANDOM VIBRATION TEST (QAVT)	560 SEC IN EACH OF THE 3 MUTUALLY PERPENDICULAR DIRECTIONS	ON/OFF OFF	LEVEL 1: 20 - 80 Hz INCREASING @ 3 dB PER OCTAVE 80 - 350 Hz CONSTANT @ 0.067 g^2/Hz 350 - 2000 Hz DECREASING @ -3dB PER OCTAVE FROM 0.067 g^2/Hz @ 350 Hz LEVEL 2: 20 - 50 HZ @ 0.025 g^2/Hz 50 - 100 HZ @ 0.025 - 0.05 g^2/Hz 100 - 200 HZ @ 0.05 - 0.1 g^2/Hz 200 - 500 HZ @ 0.1 g^2/Hz 500 - 1000 HZ @ 0.1 TO 0.025 g^2/Hz 1000 - 2000 HZ @ 0.025 TO 0.01 g^2/Hz
DESIGN SHOCK	IN EACH OF 3 MUTUALLY PERPENDICULAR DIRECTIONS: 1 SHOCK FOR 1 TO 3 MSEC 2 SHOCKS FOR 3 TO 5 MSEC	OFF	 100 G HALF SINE WAVE SHOCK PULSE 40 G HALF SINE WAVE SHOCK PULSE
ACCELERATION	12 MINUTES IN EACH OF THE 3 PERPENDICULAR DIRECTIONS.	OFF	13.5 g's
THERMAL VACUUM CYCLING	1 HOUR MINIMUM AT EACH TEMPERATURE PLATEAU	ON/OFF	1. AT AMBIENT PRESSURE: RAMP FROM 77 TO 122 ° F (25 TO 50 °C), STABILIZE DWELL FOR 1 HOUR; CONDUCT PERFORMANCE TEST. 2. 122 TO -22 ° F (50 TO 30 °C), STABILIZE; DWELL FOR 1 HOUR CONDUCT PERFORMANCE TEST. 3. REPEAT (1) AND (2) 3 TIMES. 4. AT VACUUM OF 2 X 10^{-6} PSIA (2 X 10^{-4} MM OF HG): RAMP FROM -22 TO 122 ° F (-30 TO 50 °C), STABILIZE; DWELL FOR 1 HOUR. 5. RAMP FROM 122 TO -22 ° F (50 TO -30 °C), STABILIZE FOR 1 HOUR. 6. RAMP FROM -22 TO 77 ° F (-30 TO 25 °C).

QUALIFICATION TEST REQUIREMENTS (CONT'D)

ENVIRONMENT	DURATION	ON/OFF STATUS	LEVEL
COLD EXPOSURE TEST	3 HOURS AT TEMPERATURE PLATEAU	OFF	1) 77 TO -76° F (26 TO -60 °C), DWELL FOR 24 HOURS. 2) DRY AT 95 TO 122° F (35 TO 50 ° C) FOR 2 HOURS MINIMUM. 3) COOL AT 77° F (25° C) FOR TWO HOURS MINIMUM.
HEAT EXPOSURE TEST	3 HOURS AT TEMPERATURE PLATEAU	OFF	1) 77 TO 140° F (25 TO 60 °C), DWELL FOR 6 HOURS. 3) COOL AT 77° F (25° C) FOR TWO HOURS MINIMUM.
HUMIDITY TEST	96 HOURS AT TEMPERATURE PLATEAU	OFF	1) 68 TO 77 ° F (20 TO 25 °C), DWELL FOR 6 HOURS AT RELATIVE HUMIDITY OF 95±3%. 2) DRY AT 95 TO 122° F (35 TO 50 ° C) FOR 2 HOURS MINIMUM RELATIVE HUMIDITY OF 60%. 3) COOL AT 77° F (25° C) FOR TWO HOURS MINIMUM.
SUPPLY VOLTAGE RESERVE VERIFICATION TEST	AS REQUIRED	ON/OFF	1) (20 ± 0.5) V SUPPLY VOLTAGE 2) (37 ± 0.5) V SUPPLY VOLTAGE
LOW TEMPERATURE RESERVE VERIFICATION TEST	3 HOURS AT TEMPERATURE PLATEAU	ON/OFF	1) 77 TO -4 ° F (26 TO -20 °C), DWELL FOR 3 HOURS CONDUCT PERFORMANCE TEST. 2) DRY AT 95 TO 122° F (35 TO 50 ° C) FOR 2 HOURS MINIMUM 3) COOL AT 77° F (25° C) FOR TWO HOURS MINIMUM.
HIGH TEMPERATURE RESERVE VERIFICATION TEST	3 HOURS AT TEMPERATURE PLATEAU	ON/OFF	1) 77 TO 122 ° F (25 TO 50 °C), DWELL FOR 3 HOURS CONDUCT PERFORMANCE TEST. 2) COOL AT 77° F (25° C) FOR TWO HOURS MINIMUM.

CERTIFICATION BY ANALYSIS:

ALL ELECTRICAL EQUIPMENT/COMPONENTS INSTALLED IN THE ASSEMBLY HAVE BEEN CERTIFIED FOR THE APPLICABLE REQUIREMENTS NOTED BELOW IN ACCORDANCE WITH MC621-0087B. ANALYSIS/SIMILARITY HAS BEEN USED BY THE SUPPLIER TO CERTIFY FOR THE FOLLOWING ENVIRONMENTS:

A) RADIATION: ENERGIA HAS CONDUCTED TESTS ON SIMILAR HARDWARE (11F732.7692-0A.) AN ENGINEERING ANALYSIS REPORT (EAR) IS BEING PREPARED TO DEMONSTRATE THAT IDENTICAL COMPONENTS, MATERIALS, AND PROCESSES WERE USED FOR BOTH UNITS.

B) OZONE: ROCKWELL HAS VERIFIED ENERGIA COMPLIANCE WITH MATERIAL SELECTION CRITERIA FOR OZONE SENSITIVITY AND DEGRADATION. THE RATIONALE FOR THIS VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

C) FUNGUS: ROCKWELL HAS VERIFIED ENERGIA COMPLIANCE WITH MATERIAL SELECTION CRITERIA FOR NON-NUTRIENT TO FUNGI AND TREATMENT. THE RATIONALE FOR THIS VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

D) SAND/DUST: THE LACU CONTAINS NO MOVING PARTS.

E) SALT/FOG: ROCKWELL HAS VERIFIED ENERGIA COMPLIANCE WITH MATERIAL SELECTION CRITERIA FOR SALT FOG SENSITIVITY AND DEGRADATION. THE RATIONALE FOR THIS VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

G) ODOR/OFFGASING: ROCKWELL HAS VERIFIED ENERGIA COMPLIANCE WITH MATERIAL SELECTION CRITERIA FOR ODOR/OFFGASING. THE RATIONALE FOR THIS VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

H) FLAMMABILITY: ROCKWELL HAS VERIFIED ENERGIA COMPLIANCE WITH MATERIAL SELECTION CRITERIA FOR FLAMMABILITY. THE RATIONALE FOR THIS VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

J) LIGHTNING: THE RATIONALE FOR VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

K) ELECTROMAGNETIC COMPATIBILITY: CE01, CE03, CS01, CS02, CS06, RE02, RS02, RS03, RS04, AND TT01 (TIME DOMAIN TRANSIENT AND RIPPLE TEST) PERFORMED PER CR # 21-621-0087-0005A ON THE BRASSBOARD ITEM. THE RATIONALE FOR THIS VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

(C) INSPECTION:

RECEIVING INSPECTIONS:
RECEIVING INSPECTIONS AT ENERGIA ARE PERFORMED IN ACCORDANCE TO THE FOLLOWING ENERGIA STANDARDS. CNG304-120-86, CNG304-408-89, EEH-121-471-90, EEH-137-475-81, AND EEH-008-471-88. QA IN COOPERATION WITH SPECIALIZED DIVISIONS (SUCH AS M&P LAB, TOOLS, CALIBRATION LAB, ETC.) CONDUCTS RECEIVING INSPECTIONS FOR PARTS ARTICLES AND RAW MATERIALS. NECESSARY DATA, SHELF LIFE, RESOURCE LIFE AND TEST DATA ARE CHECKED FOR ACCEPTANCE. INDIVIDUAL ELEMENTS ARE INSPECTED/ MEASURED FOR CONFORMITY WITH DRAWING TECHNICAL REQUIREMENTS. PARTS COATING QUALITY, JOINTS QUALITY, OVERALL AND INSTALLATION DIMENSIONS, QUALITY OF ASSEMBLY, AND INSTALLATION, MARKINGS ARE CHECKED. COMPLIANCE WITH ELECTRICAL CONNECTIONS TABLES IS CARRIED OUT BY PERFORMING THE FOLLOWING OPERATIONS: CONTINUITY TEST OF THE ASSEMBLY AND WIRE NUMBER AND COLORING VISUAL INSPECTION FOR EACH CIRCUIT POINT. A RECORD OF THESE INSPECTIONS IS KEPT IN THE ASSEMBLY DATA CARD.

CONTAMINATION CONTROL & CRITICAL PROCESSES:
PRODUCTION ROOM COMPLIANCE WITH THE OPERATIONAL ENVIRONMENTAL REQUIREMENTS ARE IMPLEMENTED PER THE FOLLOWING ENERGIA SPECIFICATIONS: CNG304-106-91, CNG304-187-78, CNG304-188-88, CNG304-93-88, AND CNG304-172-92. A WORKING COMMITTEE TEAM, WHICH INCLUDES DESIGNER, QUALITY, OPERATIONS, AND SPECIALISTS PERFORM DAILY CONTROL OF PROCESSES, TOOLS AND FIXTURES, WORKING ENVIRONMENTS AND SEQUENCES OF OPERATIONS.

TESTING:
TESTS ARE DESIGNED TO ASSURE MAXIMUM DESIGN COMPLIANCE. PRE-PLANNED INSPECTION POINTS ARE DEFINED AND MAY BE SUPPLEMENTED WITH INSPECTION INSTRUCTIONS BASED ON THE COMPLEXITY OF THE ASSEMBLY. QUALITY CONTROLS THE PERFORMANCE OF INSPECTIONS AND TESTS REQUIRED BY DESIGN DOCUMENTATION. THE FOLLOWING ENERGIA SPECIFICATIONS ARE APPLICABLE: 33Y.6201.008-05, CNG304-A87-88, AND CNG304-144-88.

HANDLING/PACKAGING:
PACKAGING AND TRANSPORT CONTAINER ARE CHECKED FOR COMPLIANCE WITH THE SPECIFICATIONS AND DRAWING REQUIREMENTS. ENERGIA ENGINEERING DRAWINGS, PROCEDURES AND INSTRUCTIONS DEFINE THE REQUIREMENTS FOR STORAGE, PACKAGING, AND SHIPPING. THE FOLLOWING ENERGIA SPECIFICATIONS ARE APPLICABLE: RD92-0256-89 AND EEN-121-471-75

(D) FAILURE HISTORY:
DATA ON TEST FAILURES, UNEXPLAINED ANOMALIES, AND OTHER FAILURES EXPERIENCED DURING GROUND PROCESSING OF THE ODS CAN BE FOUND IN THE PRACA DATA BASE.

APPENDIX H

DISPOSITION AND RATIONALE

(PRESSURIZATION ACTUATOR CONTROL UNIT)

FUNCTION:
THE PACU'S ARE USED TO CONTROL MOTORS M6, M7, M8, & M9. THE MOTORS CONTROL THE PRESSURIZATION HOOKS 1 AND 2. THE UNIT PROVIDES LOGIC PROCESSING FOR PANEL AND AUTOMATIC SEQUENCE COMMANDS TO THE PRESSURIZATION HOOKS. IT PROVIDES STATUS INDICATION TO THE CONTROL PANEL AND TELEMETRY SIGNALS TO THE DCUs.

HARDWARE DESCRIPTION:
THE UNIT CONTAINS THE FOLLOWING ENERGIA PROCURED COMPONENTS:

REFERENCE DESIGNATOR	ITEM	QUANTITY
E1-E26	Cell Ya22 33U.5225.003 33U.0247.004TU	26
E30-E33	Cell Ya13 33U.5225.004 33U.0247.004TU	4
E44-E47	Cell Ya14 33U.5225.005 33U.0247.004	4
E50-E53	Cell Ya44 33U.5225.013 33U.0247.004TU	4
E60-E61	Cell Ya12-2 33U.5225.008 33U.0247.004TU	2
E70-E75	Cell RD36 33U.5221.007 33U.0247.002	6
E80-E81	Cell YaDP-5x1 33U.5214.011-011_ 33U.5214.011 TU	22
KT1-KT12	Time relay 33U.5214.011-011_Time relay 33U.5214.011 TU	12
E110-E117	Cell Ya12 33U.5225.002 33U.0247.004	8
K1-K24	Relay RES 47-OS RF4.500.407-02.01_RFO.450.047 TU OST V4.450.019-82	24
R1-R12	Resistor OS S2-23 0.25-2.0kohms ± 5%- A-B-V_OZhO.467.081 TU OZhO.467.138 TU	12
X204	Plug OS RS 50 ATV AVO.364.047 TU_bro 364.045 TU	1
X206	Plug OS RS 32 ATV AVO.364.047 TU_bro 364.045 TU	1
X205	Plug OSMR1-76-2 V GEO.364.184 TU _bro 364.045 TU	1
X222	Plug OSMR1-102-2 V GEO.364.184 TU _bro 364.045 TU .	1
C1-C12	Capacitor OS K10-48S-M1500-1500 pF ± 10%_OZhO.460.173 TU OZhO.460.183 TU	12
C13-C24	Capacitor OS K10-17S-a-N90-0.1 F-V_OZhO.460.107 TU OZhO.460.183 TU	12

DESIGN:
ELECTRICAL AND RADIO COMPONENTS ARE CHOSEN IN ACCORDANCE WITH THE DEVICE'S OPERATING MODES AND PARAMETERS. INTEGRATED RELAY, DIODE, AND RESISTOR CELLS UTILIZED IN THE DESIGN HAVE PASSED STRICT GROUND DEVELOPMENT TESTS AND HAVE SHOWN GOOD PERFORMANCE DURING FLIGHT OPERATIONS. RELIABILITY IS ENHANCED USING REDUNDANCY TECHNIQUES SUCH AS: DUPLICATION, TRIPLING, VOTERS 2 OF 3, AND 3 OF 4. POWER BUSES AND CONTROL CIRCUITS ARE SEPARATED. PROVISION ARE MADE FOR CIRCUIT CHECK-OUT DURING SERVICE AND REPAIR STATES. THE WIRE BUNDLES ARE ADDITIONALLY INSULATED AND SECURED BY A CORD. INDIVIDUAL WIRES ARE SECURED USING SEALANT. WIRE JUMPERS LONGER THAN 5MM, AS WELL AS, OTHER BARE CURRENT CONDUCTING AND CURRENT-BEARING SURFACES OF LESS THAN 2MM ARE INSULATED BY SHRINK TUBING. SOLDERING SPOTS AND COMPONENTS TERMINALS ARE COATED WITH VARNISH.

COMPONENT PROCUREMENT CONTROL:
THE DESIGN DEPARTMENT SELECTS THE SUPPLIERS FROM AN APPROVED SUPPLIER LIST (ASL) FOR THE SPECIFIC PRODUCT, BASED ON EXPERT ASSESSMENT OF THE QUALITY AND RELIABILITY HISTORICAL DATA FOR THE PRODUCT TO BE PROCURED. ALL SUPPLIERS FROM THE ASL ARE ESTABLISHED AND IN COMPLIANCE TO THE INDUSTRY'S GOSTs/STANDARDS AND ENERGIA QUALITY ASSURANCE, RELIABILITY, AND SAFETY PROVISIONS AND REQUIREMENTS. WHEN A PURCHASE ORDER IS PLACED FOR A NEW OR MODIFIED (NON-OFF-SHELF), THE SUPPLIER SUBMITS A PROPOSED OPERATION AND TECHNOLOGICAL PROCESS FOR MANUFACTURING THE REQUIRED ITEM FOR ENERGIA REVIEW AND APPROVAL. THE DESIGN DEPARTMENT IN CONJUNCTION WITH QUALITY AND RELIABILITY EXPERTS, PERFORM TRADE ANALYSES AND MAINTAIN SURVEILLANCE OF THE SUPPLIERS BASED ON THE HISTORY OR PERFORMANCE AND REJECTION RATES OF THE FURNISHED SUPPLIES. APPLICABLE ENERGIA STANDARDS CNG351-143-84, CNG351-159-86, CNG304-667-91.

TEST:
TECHNICAL INSPECTIONS ARE PERFORMED BEFORE AND AFTER TESTS WITH THE CASE REMOVED. THESE INSPECTION CHECK FOR MECHANICAL DAMAGES, LOOSE FASTENERS, AND SOLDERED JOINTS DAMAGE. WIRE CHECKS ARE PERFORMED FOR PROPER CONNECTIONS TO BUSES AND TO CONNECTOR CONTACTS. IN ADDITION, CIRCUIT DIAGRAM VERIFICATION IS PERFORMED. CIRCUITS WITH DIODES ARE CHECKED FOR CONTINUITY. TIME RELAY AND CURRENT CONSUMPTION ARE VERIFIED IN ADDITION TO INDIVIDUAL ELEMENT FUNCTIONAL VERIFICATION. VIBRATION, VIBRATION STRENGTH, IMPACT STRENGTH, COLD/HEAT RESISTANCE AND MOISTURE RESISTANCE TESTS ARE PERFORMED. ELECTRONIC RADIO EMISSIONS (ERE) AND ELECTRIC INSULATION RESISTANCE TESTS ARE PERFORMED FOR THE UNIT.

QUALIFICATION, CERTIFICATION TESTS, AND ANALYSES ARE IMPLEMENTED AT THE LINE REPLACEABLE UNIT (LRU) LEVEL. SPECIFIC DETAILS APPLICABLE TO THE PACU TESTING ARE INCLUDED IN THIS AND THE FOLLOWING SECTIONS.

ACCEPTANCE TEST REQUIREMENTS:

A. EXAMINATION: NO PHYSICAL DAMAGE, NO MISSING OR LOOSE HARDWARE, CORRECT WEIGHT, FINISH, DIMENSIONS, NO CONTAMINATION AND PROPER IDENTIFICATION.
B. INSULATION RESISTANCE: 20 MEGOHMS MINIMUM AT A POTENTIAL OF 100 VOLTS (DC) BETWEEN CONNECTORS AND MUTUALLY ISOLATED PINS.
C. DIELECTRIC STRENGTH: NO MORE THAN TWO MILIAMPS AT A POTENTIAL OF 200 VOLTS (AC) FOR ONE SECOND BETWEEN CONNECTORS AND MUTUALLY ISOLATED PINS.
D. FUNCTIONAL: USING SUPPLY VOLTAGES OF 23 ± 0.5 VOLTS (DC) AND 34 ± 0.5 VOLTS (DC,) VERIFY CONTINUITY, RESISTANCE, POWER CONSUMPTION, TIMING CIRCUITS AND SWITCHING LOGIC FUNCTIONS.

E. VIBRATION: SINUSOIDAL CONDUCTED IN EACH OF THE THREE MUTUALLY PERPENDICULAR DIRECTIONS FOR A DURATION OF 787 SECONDS AT THE FOLLOWING LEVELS:

20 - 40 HZ	1.2 g/HZ
40 - 80 HZ	2.1 g/HZ
80 - 160 HZ	4.1 g/HZ
160 - 320 HZ	7.0 g/HZ
320 - 640 HZ	10 g/HZ
640 - 1280 HZ	7.2 g/HZ
1280 - 2560 HZ	6.7 g/HZ

ITEMS A TO D ABOVE ARE CONDUCTED AFTER VIBRATION TESTS EXCEPT FUNCTIONAL IS AT 27 ± 0.5 VOLTS (DC.)

F. THERMAL:

1. COLD - OPERATING:
a. SOAK @ 9 +0/-5.4 °F C (-13 0/-3 ° C) FOR 3 HOURS
b. INSULATION RESISTANCE TEST PER B EXCEPT AT 5 MEGOHMS (MINIMUM)
c. FUNCTIONAL TEST PER ITEM D
d. DRIES @ 86° - 122° F (35 - 50 °C) FOR 3 HOURS
e. COOLS AT ROOM TEMPERATURE FOR A MINIMUM OF 2 HOURS
f. EXAMINATION PER A ABOVE

2. HOT - OPERATING
a. SOAK @ 113 +9/-0 °F (45 +5/-0 °C) FOR 3 HOURS
b. INSULATION RESISTANCE TEST PER B EXCEPT AT 5 MEGOHMS (MINIMUM)
c. FUNCTIONAL TEST PER ITEM D
d. COOLS AT ROOM TEMPERATURE FOR A MINIMUM OF 2 HOURS
e. EXAMINATION PER A ABOVE

G. HUMIDITY (MOISTURE RESISTANCE) TEST:

1. AT RELATIVE HUMIDITY OF 92 - 98% AND A TEMPERATURE OF 88 - 77 °F (20 - 25 °C), SOAK FOR 48 HOURS WITH POWER OFF.
2. PERFORM INSULATION RESISTANCE TEST PER B ABOVE EXCEPT AT 1 MEGOHM
3. DRIES AT 95 - 122 °F (35 - 50 °C) FOR 2 HOURS MINIMUM.
4. COOLS AT ROOM TEMPERATURE EXAMINATION PER "A" ABOVE

QUALIFICATION TEST REQUIREMENTS:

ENVIRONMENT	DURATION	ON/OFF STATUS	LEVEL
PACKAGE QUALIFICATION TEST	5 - 10 mSEC IN EACH OF THE 3 PERPENDICULAR DIRECTIONS	OFF	PEAK SHOCK ACCELERATION = 9 ± 1.8 g's 1) 2500 ± 125 SHOCKS PERPENDICULAR TO CONTAINER 2) 1750 ± 90 SHOCKS IN TWO MUTUALLY PERPENDICULAR DIRECTION 3) 6000 ± 300 TOTAL NUMBER OF SHOCKS/MINUTE ≤ 120
RANDOM VIBRATION TEST (QAVT)	560 SEC IN EACH OF THE 3 MUTUALLY PERPENDICULAR DIRECTIONS	OFF	20 - 80 Hz INCREASING @ 3 dB PER OCTAVE 80 - 350 Hz CONSTANT @ 0.067 g^2/Hz 350 - 2000 Hz DECREASING @ -3dB PER OCTAVE FROM 0.067 g^2/Hz @ 350 Hz
DESIGN SHOCK	IN EACH OF 3 MUTUALLY PERPENDICULAR DIRECTIONS: 1 SHOCK FOR 1 TO 3 MSEC 2 SHOCKS FOR 3 TO 5 MSEC	OFF	100 G HALF SINE WAVE SHOCK PULSE 40 G HALF SINE WAVE SHOCK PULSE
ACCELERATION	12 MINUTES IN EACH OF THE 3 PERPENDICULAR DIRECTIONS.	OFF	13.5 g's
THERMAL VACUUM CYCLING	1 HOUR MINIMUM AT EACH TEMPERATURE PLATEAU (5 CYCLES)	ON/OFF	1. AT AMBIENT PRESSURE: RAMP FROM 77 TO 122 ° F (25 TO 50 °C), STABILIZE DWELL FOR 1 HOUR; CONDUCT PERFORMANCE TEST. 2. 122 TO -22 ° F (50 TO 30 °C), STABILIZE; DWELL FOR 1 HOUR CONDUCT PERFORMANCE TEST. 3. REPEAT (1) AND (2) 3 TIMES. 4. AT VACUUM OF 2 X 10^{-6} PSIA (2 X 10^{-4} MM OF HG): RAMP FROM -22 TO 122 ° F (-30 TO 50 °C), STABILIZE; DWELL FOR 1 HOUR. 5. RAMP FROM 122 TO -22 ° F (50 TO -30 °C), STABILIZE FOR 1 HOUR. 6. RAMP FROM -22 TO 77 ° F (-30 TO 25 °C).

QUALIFICATION TEST REQUIREMENTS (CONT'D)

ENVIRONMENT	DURATION	ON/OFF STATUS	LEVEL
COLD EXPOSURE TEST	3 HOURS AT TEMPERATURE PLATEAU	OFF	1) 77 TO -76° F (26 TO -60 °C), DWELL FOR 24 HOURS. 2) DRY AT 95 TO 122° F (35 TO 50 ° C) FOR 2 HOURS MINIMUM. 3) COOL AT 77° F (25° C) FOR TWO HOURS MINIMUM.
HEAT EXPOSURE TEST	3 HOURS AT TEMPERATURE PLATEAU	OFF	1) 77 TO 140° F (25 TO 60 °C), DWELL FOR 6 HOURS. 2) COOL AT 77° F (25° C) FOR TWO HOURS MINIMUM.
HUMIDITY TEST	96 HOURS AT TEMPERATURE PLATEAU	OFF	1) 68 TO 77 ° F (20 TO 25 °C), DWELL FOR 96 HOURS AT RELATIVE HUMIDITY OF 95±3%. 2) DRY AT 95 TO 122° F (35 TO 50 ° C) FOR 2 HOURS MINIMUM RELATIVE HUMIDITY OF 60%. 3) COOL AT 77° F (25° C) FOR 2 HOURS MINIMUM.
SUPPLY VOLTAGE RESERVE VERIFICATION TEST	AS REQUIRED	ON/OFF	1) (20 ± 0.5) V SUPPLY VOLTAGE 2) (37 ± 0.5) V SUPPLY VOLTAGE
LOW TEMPERATURE RESERVE VERIFICATION TEST	3 HOURS AT TEMPERATURE PLATEAU	ON/OFF	1) 77 TO -4 ° F (25 TO -20 °C), DWELL FOR 3 HOURS CONDUCT PERFORMANCE TEST. 2) DRY AT 95 TO 122° F (35 TO 50 ° C) FOR 2 HOURS MINIMUM 3) COOL AT 77° F (25° C) FOR 2 HOURS MINIMUM.
HIGH TEMPERATURE RESERVE VERIFICATION TEST	3 HOURS AT TEMPERATURE PLATEAU	ON/OFF	1) 77 TO 122 ° F (25 TO 50 °C), DWELL FOR 3 HOURS CONDUCT PERFORMANCE TEST. 2) COOL AT 77 °F (25 °C) FOR 2 HOURS MINIMUM.

CERTIFICATION BY ANALYSIS:
ALL ELECTRICAL EQUIPMENT/COMPONENTS INSTALLED IN THE ASSEMBLY HAVE BEEN CERTIFIED FOR THE APPLICABLE REQUIREMENTS NOTED BELOW IN ACCORDANCE WITH MC621-0087B. ANALYSIS/SIMILARITY HAS BEEN USED BY THE SUPPLIER TO CERTIFY FOR THE FOLLOWING ENVIRONMENTS:

A) RADIATION: ENERGIA HAS CONDUCTED TESTS ON SIMILAR HARDWARE (11F732.7692-0A.) AN ENGINEERING ANALYSIS REPORT (EAR) IS BEING PREPARED TO DEMONSTRATE THAT IDENTICAL COMPONENTS, MATERIALS, AND PROCESSES WERE USED FOR BOTH UNITS.

B) OZONE: ROCKWELL HAS VERIFIED ENERGIA COMPLIANCE WITH MATERIAL SELECTION CRITERIA FOR OZONE SENSITIVITY AND DEGRADATION. THE RATIONALE FOR THIS VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

C) FUNGUS: ROCKWELL HAS VERIFIED ENERGIA COMPLIANCE WITH MATERIAL SELECTION CRITERIA FOR NON-NUTRIENT TO FUNGI AND TREATMENT. THE RATIONALE FOR THIS VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

D) SAND/DUST: THE PACU CONTAINS NO MOVING PARTS.

E) SALT/FOG: ROCKWELL HAS VERIFIED ENERGIA COMPLIANCE WITH MATERIAL SELECTION CRITERIA FOR SALT FOG SENSITIVITY AND DEGRADATION. THE RATIONALE FOR THIS VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

G) ODOR/OFFGASING: ROCKWELL HAS VERIFIED ENERGIA COMPLIANCE WITH MATERIAL SELECTION CRITERIA FOR ODOR/OFFGASING. THE RATIONALE FOR THIS VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

H) FLAMMABILITY: ROCKWELL HAS VERIFIED ENERGIA COMPLIANCE WITH MATERIAL SELECTION CRITERIA FOR FLAMMABILITY. THE RATIONALE FOR THIS VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

J) LIGHTNING: THE RATIONALE FOR VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

K) ELECTROMAGNETIC COMPATIBILITY: CE01, CE03, CS01, CS02, CS06, RE02, RS02, RS03, RS04, AND TT01 (TIME DOMAIN TRANSIENT AND RIPPLE TEST) PERFORMED PER CR # 21-621-0087-0005A ON THE BRASSBOARD ITEM. THE RATIONALE FOR THIS VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

(C) INSPECTION:

RECEIVING INSPECTIONS:
RECEIVING INSPECTIONS AT ENERGIA ARE PERFORMED IN ACCORDANCE TO THE FOLLOWING ENERGIA STANDARDS: CNG304-120-86, CNG304-408-89, EEH-121-471-90, EEH-137-475-81, AND EEH-008-471-88. QA IN COOPERATION WITH SPECIALIZED DIVISIONS (SUCH AS M&P LAB, TOOLS, CALIBRATION LAB, ETC.) CONDUCTS RECEIVING INSPECTIONS FOR PARTS ARTICLES AND RAW MATERIALS. NECESSARY DATA, SHELF LIFE, RESOURCE LIFE AND TEST DATA ARE CHECKED FOR ACCEPTANCE. INDIVIDUAL ELEMENTS ARE INSPECTED/ MEASURED FOR CONFORMITY WITH DRAWING TECHNICAL REQUIREMENTS. PARTS COATING QUALITY, JOINTS QUALITY, OVERALL AND INSTALLATION DIMENSIONS, QUALITY OF ASSEMBLY, AND INSTALLATION, MARKINGS ARE CHECKED. COMPLIANCE WITH ELECTRICAL CONNECTIONS TABLES IS CARRIED OUT BY PERFORMING THE FOLLOWING OPERATIONS: CONTINUITY TEST OF THE ASSEMBLY AND WIRE NUMBER AND COLORING VISUAL INSPECTION FOR EACH CIRCUIT POINT. A RECORD OF THESE INSPECTIONS IS KEPT IN THE ASSEMBLY DATA CARD.

CONTAMINATION CONTROL & CRITICAL PROCESSES:
PRODUCTION ROOM COMPLIANCE WITH THE OPERATIONAL ENVIRONMENTAL REQUIREMENTS ARE IMPLEMENTED PER THE FOLLOWING ENERGIA SPECIFICATIONS: CNG304-108-91, CNG304-187-78, CNG304-188-88, CNG304-93-88, AND CNG304-172-92. A WORKING COMMITTEE TEAM, WHICH INCLUDES DESIGNER, QUALITY, OPERATIONS, AND SPECIALISTS PERFORM DAILY CONTROL OF PROCESSES; TOOLS AND FIXTURES, WORKING ENVIRONMENTS AND SEQUENCES OF OPERATIONS.

TESTING:
TESTS ARE DESIGNED TO ASSURE MAXIMUM DESIGN COMPLIANCE. PRE-PLANNED INSPECTION POINTS ARE DEFINED AND MAY BE SUPPLEMENTED WITH INSPECTION INSTRUCTIONS BASED ON THE COMPLEXITY OF THE ASSEMBLY. QUALITY CONTROLS THE PERFORMANCE OF INSPECTIONS AND TESTS REQUIRED BY DESIGN DOCUMENTATION. THE FOLLOWING ENERGIA SPECIFICATIONS ARE APPLICABLE: 33Y.6201.008-05, CNG304-A87-88, AND CNG304-144-88.

HANDLING/PACKAGING:
PACKAGING AND TRANSPORT CONTAINER ARE CHECKED FOR COMPLIANCE WITH THE SPECIFICATIONS AND DRAWING REQUIREMENTS. ENERGIA ENGINEERING DRAWINGS, PROCEDURES AND INSTRUCTIONS DEFINE THE REQUIREMENTS FOR STORAGE, PACKAGING, AND SHIPPING. THE FOLLOWING ENERGIA SPECIFICATIONS ARE APPLICABLE: RD92-0256-89 AND EEN-121-471-75

(D) FAILURE HISTORY:
DATA ON TEST FAILURES, UNEXPLAINED ANOMALIES, AND OTHER FAILURES EXPERIENCED DURING GROUND PROCESSING OF THE ODS CAN BE FOUND IN THE PRACA DATA BASE.

APPENDIX I

DISPOSITION AND RATIONALE

(DOCKING SYSTEM CONTROL UNIT)

FUNCTION:
THE DSCU IS USED TO IMPLEMENT THE AUTOMATED DOCKING SEQUENCE AND TO RECEIVE AND PROCESS THE COMMANDS FROM THE APDS CONTROL PANEL (A8A3.) THE UNIT PROVIDES TELEMETRY TO THE DCUs AND STATUS INDICATION TO THE APDS CONTROL PANEL. THE UNIT IS INTEGRATED IN A SINGLE UNSEALED (VACUUM) ENCLOSURE WITH PROTECTION AGAINST HUMIDITY AND DUST. THIS UNIT USES HEAVY DUTY COMPONENTS TO PRECLUDE DAMAGE FROM HEATING. THE UNIT HAS THIRTEEN JACKS. TWO ARE USED FOR GROUND TESTING.

HARDWARE DESCRIPTION:
THE DSCU CONTAIN THE FOLLOWING COMPONENTS:

REFERENCE DESIGNATOR	ITEM	QUANTITY
X30Sh40 X31Sh40 X213Sh40 X218Sh40	PLUG OSONTs-BS-1-50/27-V1-1-V bRO.364.030TU	4
X32Sh40 X221Sh40 X224Sh40	PLUG ONTs-BM-1-76/22-V1-1-V bRO.364.031TU	3
X220Sh20 X211Sh20	PLUG ONTs-BM-1-30/14-V1-1-V bRO.364.031TU	2
X219Sh20 X210Sh20 X212Sh20 X214Sh20	PLUG ONTs-BM-1-50/18-V1-1-V bRO.364.031TU	4
KT1-KT36	TIME RELAYS 33U.5214.011.-03 33U.5214.011.-TU	36
KT61-KT63	TIME RELAYS 33U.5214.011.-16 33U.5214.011.-TU	3
KT71-KT82	TIME RELAYS 33U.5214.011.-13 33U.5214.011.-TU	12
KT91-KT93	TIME RELAYS 33U.5214.011.-11 33U.5214.011.-TU	3
KT101-KT106	TIME RELAYS 33U.5214.011.-16 33U.5214.011.-TU	6
KT111-KT113	TIME RELAYS 33U.5214.011.-07 33U.5214.011.-TU	3
KT131-KT133 KT124-KT126	TIME RELAYS 33U.5214.011.-05 33U.5214.011.-TU	6
KR1-KR3	RELAYS RES 470S RF4.500 407-02.01 RFO.450.047TU OST V4.450.019-82	16
K1-K16	RELAYS RPS 32A OS RS4.520.224 YaLO.452.080TU OST V4.450.019-82	3
KR4-KR8	RELAYS RPS 32A OS RS4.520.720-01 YaLO.452.080TU OST V4.450.019-82	5
KR11-KR19	RELAYS RPS 32A OS RS4.520.216 YaLO.452.102 TU OST V4.450.019-82	9
R1-R10	RESISTOR OS S5-5-5W-200Ω ±0.2 % OZhO.467.505 TU OZhO.467.554 TU	10

REFERENCE DESIGNATOR	ITEM	QUANTITY
N1, N2, N4 N5, N9, N11 N13, N14 N17-N20 N25, N26 N29, N30	CONNECTOR K49	16
N3, N6 N10, N12	CONNECTOR K75	4
A1	33U.5214.033 N1 UNIT	1
A2	33U.5214.034 N2 UNIT	1
A3	33U.5214.035 N3 UNIT	1
A4	33U.5214.036 N4 UNIT	1
E1-E37	CELL Ya12 33U.5225.002	37
E61-E71	CELL Ya12-2 33U.5225.008	11
E91, E92 E94, E95	CELL Ya22 33U.5225.003	4
E101, E168 E170, E178	CELL Ya13 33U.5225.004	39
E141-E168 E170-E187	CELL Ya23 33U.5225.001	46
E201-E209 E211-E214	CELL Ya14 33U.5225.005	13
E221-E227	CELL Ya14 33U.5225.006	7
E301-E325	CELL YaDP-5x1 33U.5226.005	25
E341-E350 E401-E412	CELL YaDP-2x3 33U.5226.002	22
E351-E367 E369-E375	CELL YaDP-3x2 OM 33U.5226.001	24
E381-E400 E415-E416	CELL YaDP-3x2 OP 33U.5226.006	22
E431-E440	CELL RD 36 33U.5221.007	10
E451-E459	CELL RD 36-0.5.-2	9
E421-E428	DIODE CELL 33U.5222.007	8

DESIGN:

ELECTRICAL AND RADIO COMPONENTS ARE CHOSEN IN ACCORDANCE WITH THE DEVICE'S OPERATING MODES AND PARAMETERS. INTEGRATED RELAY, DIODE, AND RESISTOR CELLS UTILIZED IN THE DESIGN HAVE PASSED STRICT GROUND DEVELOPMENT TESTS AND HAVE SHOWN GOOD PERFORMANCE DURING FLIGHT OPERATIONS. RELIABILITY IS ENHANCED USING REDUNDANCY TECHNIQUES SUCH AS: DUPLICATION, TRIPLING, VOTERS 2 OF 3, AND 3 OF 4. POWER BUSES AND CONTROL CIRCUITS ARE SEPARATED. PROVISION ARE MADE FOR CIRCUIT CHECK-OUT DURING SERVICE AND REPAIR STATES. THE WIRE BUNDLES ARE ADDITIONALLY INSULATED AND SECURED BY A CORD. INDIVIDUAL WIRES ARE SECURED USING SEALANT. WIRE JUMPERS LONGER THAN 5MM, AS WELL AS, OTHER BARE CURRENT CONDUCTING AND CURRENT-BEARING SURFACES OF LESS THAN 2MM ARE INSULATED BY SHRINK TUBING. SOLDERING SPOTS AND COMPONENT TERMINALS ARE COATED WITH VARNISH.

COMPONENT PROCUREMENT CONTROL:
THE ENERGIA DESIGN DEPARTMENT SELECTS THE SUPPLIERS FROM AN APPROVED SUPPLIER LIST (ASL) FOR THE SPECIFIC PRODUCT, BASED ON EXPERT ASSESSMENT OF THE QUALITY AND RELIABILITY HISTORICAL DATA FOR THE PRODUCT TO BE PROCURED. ALL SUPPLIERS FROM THE ASL ARE ESTABLISHED AND IN COMPLIANCE TO THE INDUSTRY'S GOSTs/STANDARDS AND ENERGIA QUALITY ASSURANCE, RELIABILITY, AND SAFETY PROVISIONS AND REQUIREMENTS. WHEN A PURCHASE ORDER IS PLACED FOR A NEW OR MODIFIED (NON-OFF-SHELF), THE SUPPLIER SUBMITS A PROPOSED OPERATION AND TECHNOLOGICAL PROCESS FOR MANUFACTURING THE REQUIRED ITEM FOR ENERGIA REVIEW AND APPROVAL. THE DESIGN DEPARTMENT, IN CONJUNCTION WITH QUALITY AND RELIABILITY EXPERTS, PERFORM TRADE ANALYSES AND MAINTAIN SURVEILLANCE OF THE SUPPLIERS BASED ON THE HISTORY OR PERFORMANCE AND REJECTION RATES OF THE FURNISHED SUPPLIES. APPLICABLE ENERGIA STANDARDS CNG351-143-84, CNG351-158-86, CNG304-567-91.

TEST:
TECHNICAL INSPECTIONS ARE PERFORMED BEFORE AND AFTER TESTS WITH THE CASE REMOVED. THESE INSPECTION CHECK FOR MECHANICAL DAMAGES, LOOSE FASTENERS, AND SOLDERED JOINTS DAMAGE. WIRE CHECKS ARE PERFORMED FOR PROPER CONNECTIONS TO BUSES AND TO CONNECTOR CONTACTS. IN ADDITION, CIRCUIT DIAGRAM VERIFICATION IS PERFORMED. CIRCUITS WITH DIODES ARE CHECKED FOR CONTINUITY. TIME RELAY AND CURRENT CONSUMPTION ARE VERIFIED IN ADDITION TO INDIVIDUAL ELEMENT FUNCTIONAL VERIFICATION. VIBRATION, VIBRATION STRENGTH, IMPACT STRENGTH, COLD/HEAT RESISTANCE AND MOISTURE RESISTANCE TESTS ARE PERFORMED. ELECTRONIC RADIO EMISSIONS (ERE) AND ELECTRIC INSULATION RESISTANCE TESTS ARE PERFORMED.

QUALIFICATION, CERTIFICATION TESTS, AND ANALYSES ARE IMPLEMENTED AT THE LINE REPLACEABLE UNIT (LRU) LEVEL. SPECIFIC DETAILS APPLICABLE TO THE DSCU TESTING ARE INCLUDED IN THIS AND THE FOLLOWING SECTIONS.

ACCEPTANCE TEST REQUIREMENTS:

A. EXAMINATION: NO PHYSICAL DAMAGE, NO MISSING OR LOOSE HARDWARE, CORRECT WEIGHT, FINISH, DIMENSIONS, NO CONTAMINATION AND PROPER IDENTIFICATION.
B. INSULATION RESISTANCE: 20 MEGOHMS MINIMUM AT A POTENTIAL OF 100 VOLTS (DC) BETWEEN CONNECTORS AND MUTUALLY ISOLATED PINS.
C. DIELECTRIC STRENGTH: NO MORE THAN TWO MILLIAMPS AT A POTENTIAL OF 200 VOLTS (AC) FOR ONE SECOND BETWEEN CONNECTORS AND MUTUALLY ISOLATED PINS.
D. FUNCTIONAL: USING SUPPLY VOLTAGES OF 23 ± 0.5 VOLTS (DC) AND 34 ± 0.5 VOLTS (DC.) VERIFY CONTINUITY, RESISTANCE, POWER CONSUMPTION, TIMING CIRCUITS AND SWITCHING LOGIC FUNCTIONS.
E. VIBRATION (AVT): RANDOM CONDUCTED IN EACH OF THE THREE MUTUALLY PERPENDICULAR DIRECTIONS FOR A DURATION OF 80 SECONDS AT THE FOLLOWING LEVELS:

20 - 80 HZ	INCREASING @ 3dB/OCTAVE
80 - 350 HZ	0.04 g^2/HZ CONSTANT
350 - 2000 HZ	DECREASING @ -3dB/OCTAVE

ITEMS A TO D ABOVE ARE CONDUCTED AFTER VIBRATION TESTS EXCEPT FUNCTIONAL IS AT 23 ± 0.5 VOLTS (DC.)

F. THERMAL:

1. COLD - OPERATING:
a. SOAK @ 9 +0/-5.4 °F C (-13 0/-3 ° C) FOR 5 HOURS
b. INSULATION RESISTANCE TEST PER B EXCEPT AT 5 MEGOHMS (MINIMUM)
c. FUNCTIONAL TEST PER ITEM D
d. DRIES @ 86° - 122° F (35 - 50 °C) FOR 2 HOURS
e. COOLS AT ROOM TEMPERATURE FOR A MINIMUM OF 2 HOURS
f. EXAMINATION PER A ABOVE

2. HOT - OPERATING
a. SOAK @ 113 +9/-0 °F (45 +5/-0 °C) FOR 5 HOURS
b. INSULATION RESISTANCE TEST PER B EXCEPT AT 5 MEGOHMS (MINIMUM)
c. FUNCTIONAL TEST PER ITEM D ABOVE
d. COOLS AT ROOM TEMPERATURE FOR A MINIMUM OF 2 HOURS
e. EXAMINATION PER A ABOVE

G. HUMIDITY (MOISTURE RESISTANCE) TEST:

1. AT RELATIVE HUMIDITY OF 92 - 98% AND A TEMPERATURE OF 68 TO 77 °F (20 - 25 °C) SOAK FOR 48 HOURS WITH POWER OFF.
2. PERFORM INSULATION RESISTANCE TEST PER B ABOVE EXCEPT AT 1 MEGOHM
3. DRIES AT 95 - 122 °F (35 - 50 °C) FOR 2 HOURS MINIMUM.
4. COOLS AT ROOM TEMPERATURE EXAMINATION PER "A" ABOVE

QUALIFICATION TEST REQUIREMENTS

ENVIRONMENT	DURATION	ON/OFF STATUS	LEVEL
PACKAGE QUALIFICATION TEST	5 - 10 mSEC IN EACH OF THE 3 PERPENDICULAR DIRECTIONS	OFF	PEAK SHOCK ACCELERATION = 9 ± 1.8 g's 1) 2500 ± 125 SHOCKS PERPENDICULAR TO CONTAINER 2) 1750 ± 80 SHOCKS IN TWO MUTUALLY PERPENDICULAR DIRECTION 3) 6000 ± 300 TOTAL NUMBER OF SHOCKS/MINUTE ≤ 120
RANDOM VIBRATION TEST (QAVT)	560 SEC IN EACH OF THE 3 MUTUALLY PERPENDICULAR DIRECTIONS	ON/OFF	20 - 80 Hz INCREASING @ 3 dB PER OCTAVE 80 - 350 Hz CONSTANT @ 0.067 g^2/Hz 350 - 2000 Hz DECREASING @ -3dB PER OCTAVE FROM 0.067 g^2/Hz @ 350 Hz

QUALIFICATION TEST REQUIREMENTS (CONT'D)

ENVIRONMENT	DURATION	ON/OFF STATUS	LEVEL
DESIGN SHOCK	IN EACH OF 3 MUTUALLY PERPENDICULAR DIRECTIONS: 1 SHOCK FOR 1 TO 3 MSEC 2 SHOCKS FOR 3 TO 5 MSEC	OFF	100 G HALF SINE WAVE SHOCK PULSE 40 G HALF SINE WAVE SHOCK PULSE
ACCELERATION	12 MINUTES IN EACH OF THE 3 PERPENDICULAR DIRECTIONS.	OFF	13.5 G'S
THERMAL VACUUM CYCLING	1 HOUR MINIMUM AT EACH TEMPERATURE PLATEAU (5 CYCLES)	ON/OFF	1. AT AMBIENT PRESSURE: RAMP FROM 77 TO 122 ° F (25 TO 50 °C), STABILIZE DWELL FOR 1 HOUR; CONDUCT PERFORMANCE TEST. 2. 122 TO -22 ° F (50 TO 30 °C), STABILIZE; DWELL FOR 1 HOUR CONDUCT PERFORMANCE TEST. 3. REPEAT (1) AND (2) 3 TIMES. 4. AT VACUUM OF 2 X 10^{-5} PSIA (2 X 10^{-4} MM OF HG); RAMP FROM -22 TO 122 ° F (-30 TO 50 °C), STABILIZE; DWELL FOR 1 HOUR. 5. RAMP FROM 122 TO -22 ° F (50 TO -30 °C), STABILIZE FOR 1 HOUR. 6. RAMP FROM -22 TO 77 ° F (-30 TO 25 °C).
COLD EXPOSURE TEST	5 HOURS AT TEMPERATURE PLATEAU	OFF	1) 77 TO -76° F (26 TO -60 °C), DWELL FOR 24 HOURS. 2) DRY AT 95 TO 122° F (35 TO 50 ° C) FOR 2 HOURS MINIMUM. 3) COOL AT 77° F (25° C) FOR 2 HOURS MINIMUM.
HEAT EXPOSURE TEST	5 HOURS AT TEMPERATURE PLATEAU	OFF	1) 77 TO 140° F (25 TO 60 °C), DWELL FOR 6 HOURS. 3) COOL AT 77° F (25° C) FOR 2 HOURS MINIMUM.
HUMIDITY TEST	96 HOURS AT TEMPERATURE PLATEAU	OFF	1) 68 TO 77 ° F (20 TO 25 °C), DWELL FOR 6 HOURS AT RELATIVE HUMIDITY OF 95±3%. 2) DRY AT 95 TO 122° F (35 TO 50 ° C) FOR 2 HOURS MINIMUM RELATIVE HUMIDITY OF 60%. 3) COOL AT 77° F (25° C) FOR 2 HOURS MINIMUM.

QUALIFICATION TEST REQUIREMENTS (CONT'D)

ENVIRONMENT	DURATION	ON/OFF STATUS	LEVEL
SUPPLY VOLTAGE RESERVE VERIFICATION TEST	AS REQUIRED	ON/OFF	1) (20 ± 0.5) V SUPPLY VOLTAGE 2) (37 ± 0.5) V SUPPLY VOLTAGE
LOW TEMPERATURE RESERVE VERIFICATION TEST	5 HOURS AT TEMPERATURE PLATEAU	ON/OFF	1) 77 TO -4 ° F (25 TO -20 °C), DWELL FOR 3 HOURS CONDUCT PERFORMANCE TEST. 2) DRY AT 95 TO 122° F (35 TO 50 ° C) FOR 2 HOURS MINIMUM 3) COOL AT 77° F (25° C) FOR 2 HOURS MINIMUM.
HIGH TEMPERATURE RESERVE VERIFICATION TEST	5 HOURS AT TEMPERATURE PLATEAU	ON/OFF	1) 77 TO 122 ° F (25 TO 50 °C), DWELL FOR 3 HOURS CONDUCT PERFORMANCE TEST. 2) COOL AT 77° F (25° C) FOR 2 HOURS MINIMUM.

CERTIFICATION BY ANALYSIS:

ALL ELECTRICAL EQUIPMENT/COMPONENTS INSTALLED IN THE DSCU HAVE BEEN CERTIFIED FOR THE APPLICABLE REQUIREMENTS NOTED BELOW IN ACCORDANCE WITH MC621-0087B. ANALYSIS/SIMILARITY HAS BEEN USED BY THE SUPPLIER TO CERTIFY FOR THE FOLLOWING ENVIRONMENTS:

A) RADIATION: ENERGIA HAS CONDUCTED TESTS ON SIMILAR HARDWARE (11F732.7692-0A.) AN ENGINEERING ANALYSIS REPORT (EAR) IS BEING PREPARED TO DEMONSTRATE THAT IDENTICAL COMPONENTS, MATERIALS, AND PROCESSES WERE USED FOR BOTH UNITS.

B) OZONE: ROCKWELL HAS VERIFIED ENERGIA COMPLIANCE WITH MATERIAL SELECTION CRITERIA FOR OZONE SENSITIVITY AND DEGRADATION. THE RATIONALE FOR THIS VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

C) FUNGUS: ROCKWELL HAS VERIFIED ENERGIA COMPLIANCE WITH MATERIAL SELECTION CRITERIA FOR NON-NUTRIENT TO FUNGI AND TREATMENT. THE RATIONALE FOR THIS VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

D) SAND/DUST: THE DSCU CONTAINS NO MOVING PARTS.

E) SALT/FOG: ROCKWELL HAS VERIFIED ENERGIA COMPLIANCE WITH MATERIAL SELECTION CRITERIA FOR SALT FOG SENSITIVITY AND DEGRADATION. THE RATIONALE FOR THIS VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

G) ODOR/OFFGASING: ROCKWELL HAS VERIFIED ENERGIA COMPLIANCE WITH MATERIAL SELECTION CRITERIA FOR ODOR/OFFGASING. THE RATIONALE FOR THIS VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

H) FLAMMABILITY: ROCKWELL HAS VERIFIED ENERGIA COMPLIANCE WITH MATERIAL SELECTION CRITERIA FOR FLAMMABILITY. THE RATIONALE FOR THIS VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

J) LIGHTNING: THE RATIONALE FOR VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

K) ELECTROMAGNETIC COMPATIBILITY: CE01, CE03, CS01, CS02, CS06, RE02, RS02, RS03, RS04, AND TT01 (TIME DOMAIN TRANSIENT AND RIPPLE TEST) PERFORMED PER CR # 21-621-0087-0005A ON THE BRASSBOARD ITEM. THE RATIONALE FOR THIS VERIFICATION IS PROVIDED IN AN ENGINEERING ANALYSIS REPORT.

(C) INSPECTION:
RECEIVING INSPECTIONS:
RECEIVING INSPECTIONS AT ENERGIA ARE PERFORMED IN ACCORDANCE TO THE FOLLOWING ENERGIA STANDARDS: CNG304-120-86, CNG304-408-89, EEH-121-471-90, EEH-137-475-81, AND EEH-008-471-88. QA IN COOPERATION WITH SPECIALIZED DIVISIONS (SUCH AS M&P LAB, TOOLS, CALIBRATION LAB, ETC.) CONDUCTS RECEIVING INSPECTIONS FOR PARTS ARTICLES AND RAW MATERIALS. NECESSARY DATA, SHELF LIFE, RESOURCE LIFE AND TEST DATA ARE CHECKED FOR ACCEPTANCE. INDIVIDUAL ELEMENTS ARE INSPECTED/ MEASURED FOR CONFORMITY WITH DRAWING TECHNICAL REQUIREMENTS. PARTS COATING QUALITY, JOINTS QUALITY, OVERALL AND INSTALLATION DIMENSIONS, QUALITY OF ASSEMBLY, AND INSTALLATION, MARKINGS ARE CHECKED. COMPLIANCE WITH ELECTRICAL CONNECTIONS TABLES IS CARRIED OUT BY PERFORMING THE FOLLOWING OPERATIONS: CONTINUITY TEST OF THE ASSEMBLY AND WIRE NUMBER AND COLORING VISUAL INSPECTION FOR EACH CIRCUIT POINT. A RECORD OF THESE INSPECTIONS IS KEPT IN THE ASSEMBLY DATA CARD.

CONTAMINATION CONTROL & CRITICAL PROCESSES:
PRODUCTION ROOM COMPLIANCE WITH THE OPERATIONAL ENVIRONMENTAL REQUIREMENTS ARE IMPLEMENTED PER THE FOLLOWING ENERGIA SPECIFICATIONS: CNG304-108-91, CNG304-187-78, CNG304-188-88, CNG304-93-88, AND CNG304-172-92. A WORKING COMMITTEE TEAM, WHICH INCLUDES DESIGNER, QUALITY, OPERATIONS, AND SPECIALISTS PERFORM DAILY CONTROL OF PROCESSES, TOOLS AND FIXTURES, WORKING ENVIRONMENTS AND SEQUENCES OF OPERATIONS.

TESTING:
TESTS ARE DESIGNED TO ASSURE MAXIMUM DESIGN COMPLIANCE. PRE-PLANNED INSPECTION POINTS ARE DEFINED AND MAY BE SUPPLEMENTED WITH INSPECTION INSTRUCTIONS BASED ON THE COMPLEXITY OF THE ASSEMBLY. QUALITY CONTROLS THE PERFORMANCE OF INSPECTIONS AND TESTS REQUIRED BY DESIGN DOCUMENTATION. THE FOLLOWING ENERGIA SPECIFICATIONS ARE APPLICABLE: 33Y.6201.008-05, CNG304-A87-88, AND CNG304-144-88.

HANDLING/PACKAGING:
PACKAGING AND TRANSPORT CONTAINER ARE CHECKED FOR COMPLIANCE WITH THE SPECIFICATIONS AND DRAWING REQUIREMENTS. ENERGIA ENGINEERING DRAWINGS, PROCEDURES AND INSTRUCTIONS DEFINE THE REQUIREMENTS FOR STORAGE, PACKAGING, AND SHIPPING. THE FOLLOWING ENERGIA SPECIFICATIONS ARE APPLICABLE: RD92-0256-89 AND EEN-121-471-75

(D) FAILURE HISTORY:
DATA ON TEST FAILURES, UNEXPLAINED ANOMALIES, AND OTHER FAILURES EXPERIENCED DURING GROUND PROCESSING OF THE ODS CAN BE FOUND IN THE PRACA DATA BASE.