CHANGE NOTICE

Date Prepared: 07/09/99

1.	2.	3. Code Ident.	4. Doc. No.
The Boeing Company Post Office Box 58747 Houston, TX 77258	☐ Proposed ☒ Approved	2B945	SSP 30240C
		5. Code Ident. 2B945	6. CDCN No. 002

7. System Designation	8. Related ECP No./Title	9. Contract No.	10. Contractual Activity
ISS	SSCN 002107	NAS15–10000	SSCN 002107

11. Document Title: Space Station Cable/Wire Design and Control Requirements for Electromagnetic Compatibility	12. Effectivity All Units

THIS NOTICE INFORMS RECIPIENTS THAT THE DOCUMENT IDENTIFIED BY THE NUMBER (AND REVISION LETTER) SHOWN IN BLOCK 4 HAS BEEN CHANGED. THE PAGES CHANGED BY THIS CDCN BEING THOSE FURNISHED HEREWITH AND CARRYING THE SAME DATE AS THIS CDCN. THE PAGES OF THE PAGE NUMBERS AND DATES LISTED BELOW IN THE SUMMARY OF CHANGED PAGES COMBINED WITH NON–LISTED PAGES OF THE ORIGINAL ISSUE OF THE REVISION SHOWN IN BLOCK 4 CONSTITUTE THE CURRENT VERSION OF THIS DOCUMENT.

13. CDCN No.	14. Pages Changed (Indicate Deletions)	S*	A*	15. Date
002	Revision and History page.	X		07/09/99
	Pages 3–2 and 3–3	X		
	Page C–1.	X		
002	Page C–2.		X	
	Order of Incorporation: DCN 002			

16. Technical Concurrence (Contracting Agency)	Date

* “S” indicates supersedes earlier page. “A” indicates added page.

REVISION AND HISTORY PAGE

REV.	DESCRIPTION	PUB. DATE
–	Draft Revision B: SDR Version	03–22–94
B	Revision B (Reference SSCBD 000008 R1, Eff. 6–03–94) Revised to transition from Freedom program to ISSA. Changes include extensive simplification of requirements and scope.	09–30–94
	DCN 001 incorporates SSCN 001462	09–21–98
C	Revision C released in accordance with SSCN 001481.	06–15–99
	DCN 002 incorporates SSCN 002107	08–30–99

configuration is not dependent on the presence or absence of flight elements, systems, subsystems, equipment, or users. Primary electrical power shall be dc isolated from chassis, structure, equipment conditioned power return/reference, and signal returns by a minimum of 1 megohm, individually, when grounds are not terminated to chassis or structure. See appendix C for exception (EMECB TIA–0148) to this paragraph. **DCN 002**

3.2.1.2 SECONDARY AND TERTIARY ELECTRICAL POWER

Secondary and tertiary electrical power shall be single point grounded. Secondary electrical power shall be dc isolated from chassis, structure, equipment conditioned power return/reference, and signal circuits by a minimum of 1 megohm, individually, when all grounds are not terminated to chassis or structure.

3.2.1.3 CONTROL POWER BUS RETURN

The dc power control bus shall be independent of the primary electrical power and shall be referenced to the system reference at a single location.

3.2.1.4 ISOLATED ELECTRICAL POWER WITHIN EQUIPMENT

Within equipment, conditioned electrical power shall be dc isolated from chassis and structure except at no more than one electrically conductive common point. Where termination is desired, the equipment designer has the option of either bringing the single point reference external to the equipment for termination to the nearest structure ground or, of terminating the reference point to the chassis internal to the equipment; both methods may be used simultaneously.

3.2.1.5 ISOLATED ELECTRICAL POWER BETWEEN EQUIPMENT

Where equipment further conditions and isolates electrical power, e.g., for external channel–to–channel isolation or external signal–to–signal isolation, each secondary conditioned power reference shall be treated individually in the same manner as in 3.2.1.4.

3.2.1.6 LOAD CONVERSION

Where load conversion is done to supply any form of conditioned power to several devices or functions, that conversion shall re–establish a single point reference for the serviced equipment or functions.

3.2.2 RETURNS

3.2.2.1 SIGNAL CIRCUIT RETURN GROUNDING

Signal circuit electrical power shall be dc isolated from chassis, structure, and equipment conditioned power return/reference, by a minimum of 1 megohm, individually, when not

terminated to chassis or structure. Under no circumstances shall separate flight elements, assembly elements, systems, subsystems, or equipment depend on other equipment for signal reference or signal return grounding unless they are also dependent upon the other equipment for power.

3.2.2.2 ALTERNATING CURRENT POWER RETURN

A neutral return wire shall accompany the alternating current input wires to individual equipment loads in the distribution of power.

3.2.2.3 ANALOG, DIFFERENTIAL CIRCUIT RETURN

Each differential analog circuit shall employ a separate return.

3.2.2.4 DISCRETE RETURNS

Low–level discrete signals shall use individual returns.

3.2.2.5 PULSE OR CLOCK CIRCUIT RETURNS

All digital, pulse, or clock circuits that do not use fiber–optic cabling shall use individual returns.

3.2.2.6 RETURNS, SIGNALS BELOW FOUR MEGAHERTZ

Signal circuits external to equipment with frequency content below four megahertz shall be balanced and shall be isolated from chassis, structure, and user–conditioned power return/reference by a minimum of 6,000 ohms, individually (i.e., measured per connection, pin, wire, etc.). Otherwise external signals shall be isolated through optical isolators, transformers, etc. All references for circuits with frequencies below 4 MHz shall be single point grounded to conductive structure. Shield connections shall be made to either connector shells or to connector pins that are grounded when mated. Shield treatment is specified in SSP 30242.

3.2.2.7 SIGNALS EQUAL TO AND ABOVE FOUR MEGAHERTZ

Signals circuits with frequency components equal to or above four megahertz shall use controlled impedance transmission and reception media such as shielded twisted 72–ohm cable, “twin–ax” cable, “tri–ax” cable, or “co–ax” cable. Circuits using “twin–ax” cable shall be balanced and referenced to primary structure at a single point. “Tri–ax” cable shall use the center and inner shield conductors for unbalanced transmission, referenced to primary structure at a single point with the outer shield multipoint grounded as an “overshield”. DC isolated, single–ended circuits coupled by coaxial cable with the shield terminated 360 degrees at each end and at available intermediate point, shall be permitted for signals with the lowest frequency component equal to or above 4 MHz. See appendix C for exception (EMECB TIA–00166) to this paragraph. **DCN 002**

3.2.2.8 BRIDGE WIRE ACTUATED DEVICE GROUNDING

To preclude adverse electromagnetic effects, Bridge Wire Actuated Device (BWAD) firing circuits, including electroexplosive device firing circuits, shall be isolated from other electrical

APPENDIX C APPROVED TAILORING/INTERPRETATION AGREEMENTS

EMECB TIA–0069

C.3.2.3 GROUNDING TO EQUIPMENT/VEHICLE NOT PERMANENTLY ATTACHED TO THE SPACE STATION

Exception: This requirement is relaxed for the Local End Effector (LEE) (PN 51612–4000–1 N) and applied instead to the Power Data Grapple Fixture (PDGF) or Flight Support Equipment Grapple Fixture (FSEGF) of all free–flyers that the LEE is required to interface with, thus meeting the objective of the requirement. (Therefore the LEE will offer a low–impedance path to ground per the other station requirements.)

Rationale: All ORUs and payloads being moved by the Space Station Remote Manipulator System (SSRMS) on the station are already bonded to structure when picked up by the LEE. Thus the requirement only applied to free–flyers on first contact (and does not therefore apply to the Orbiter which is docked and grounded before arm–operations commence).

It is also highly doubtful whether this requirement is necessary even for free–flyers because the plasma contactor holds the station structure within 40 volts of the plasma potential, which is acquired by any free–flyer within less than a minute.

On the Shuttle Remote Manipulator System (SRMS), a similar requirement is satisfied as proposed in the tailoring/interpretation agreement presented above.

EMECB TIA–0148

C.3.2.1.1 PRIMARY ELECTRICAL POWER

Exception: The Circuit Interrupt Device (CID) (PNs LAB DDCU1A P301/J201, LAB DDCU1B P302/J202, LAB DDCU2B P316/J216, LAB DDCU3B P315/J215, Z1 CHANNEL2B P240/J440, Z1 CHANNEL4B P230/J430, S0 CHANNEL2B P488/J487, S0 CHANNEL4B P485/J484) is not required to meet the Class H bonding requirement of SSP 30245, paragraphs 3.2.1.1, 3.2.1.1.1, and 3.2.1.1.2. **DCN 002**

Rationale: The Circuit Interrupt Device (CID) is susceptible to hot to chassis faults which may cause fault currents that could create an electrical hazard. To protect against such an occurrence, the following precautions as shown in Figure C.3.2.1.1–1 will be taken: **DCN 002**

1. A resistive bond wire is added between the switch box and the “T” box to prevent the fault current from traveling to the connector. **DCN 002**

2. The switch box will be coated inside with a Halar coating to prevent the hot line from touching the switch box in the event of a failure. **DCN 002**

3. Insulating material will be placed inside the “T” box to prevent the wires from moving in the event of a failure. **DCN 002**

With these precautions, it is believed that the CID will be sufficiently isolated from the chassis, and the risk of causing an electrical hazard will be sufficiently reduced. **DCN 002**

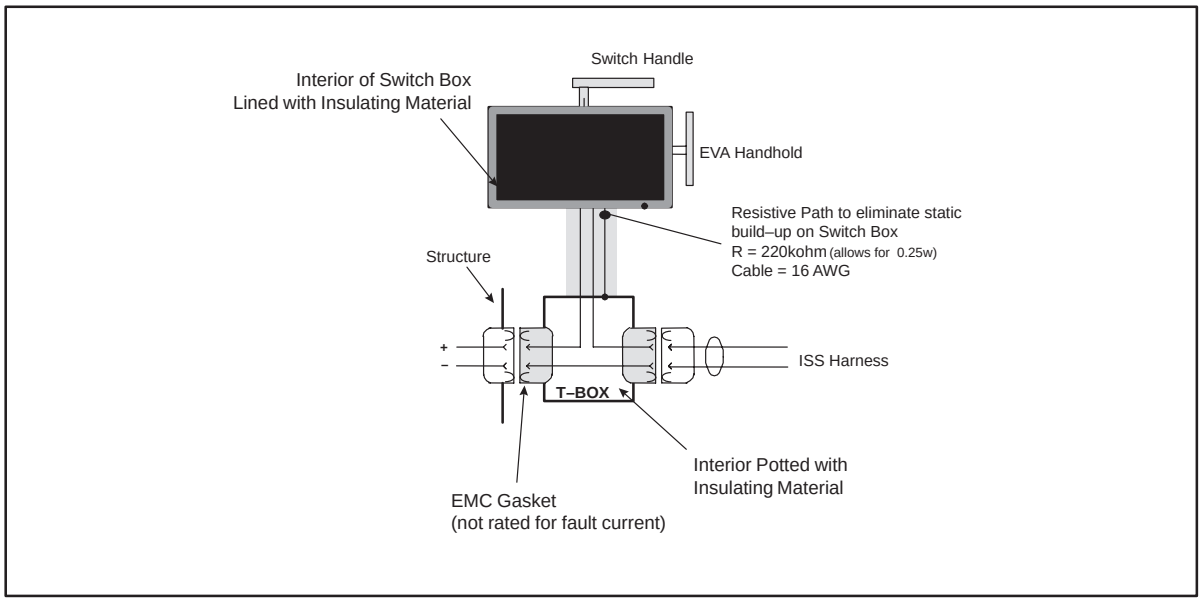

FIGURE C.3.2.1.1–1 CID FAULT PREVENTION **DCN 002**

EMECB TIA–0166

C.3.2.2.7 SIGNALS EQUAL TO AND ABOVE FOUR MEGAHERTZ

Exception: The SGANT (CI 222016A, PN 10033190–1) is allowed to exceed the SSP 30237, paragraph 3.2.3.1.2, RE02 requirements by 28 dB from 1 MHz to 7 MHz. The SGANT is permitted to not follow the SSP 30240, paragraph 3.2.2.7, requirement by not terminating the harness shield at both ends. The SGANT is allowed to not meet the SSP 30245, paragraph 3.2.1.2.1, Class R Bonding requirement at the titanium interfaces. **DCN 002**

Rationale: 1) Currently there are no intended receiver systems in the noted frequency band, hence, low level signals would impose no impact on RF systems. **DCN 002**

2) An emission level of 80 dB μV is 54 dB below the radiated susceptibility RS03 test level of 5 V/m in that frequency band. This level of incident field would not impose any threat to ORUs qualified to that RS03 level. **DCN 002**

3) The data busses and power busses near to the SGANT that would be illuminated by the out–of–specification field have been thoroughly tested in both laboratory and installed vehicle environments. Neither have shown any susceptibility in the frequency range noted at fields much greater than those noted. **DCN 002**

4) Assuming the SGANT emissions to be a plane wave, the field intensity would decrease as 1/r, hence, a 25 meter sphere would be considered as potentially illuminated by this field. The systems and ORUs within this sphere comprise the P6 assembly, all of which have been successfully tested at field strengths significantly higher than those noted. **DCN 002**

5) The SGANT passed the RS03 tests. **DCN 002**