

FLIGHT PAYLOAD STANDARDIZED HAZARD CONTROL REPORT		A. NUMBER	B. PHASE	C. DATE
		STD- AMS-02-F02	Phase III	August 4, 2010
D. PAYLOAD, DTO, DSO or RME (Include Part Number(s), if applicable)		HAZARD TITLE		E. VEHICLE
Alpha Magnetic Spectrometer (AMS-02) Orbiter Interior Elements—See Attached List		STANDARD HAZARDS		Shuttle
F. DESCRIPTION OF HAZARD:	G. HAZARD CONTROLS: (complies with)	H. APP.	I. VERIFICATION METHOD, REFERENCE, AND STATUS:	
1. Structural Failure (payloads must comply with the listed requirements for all phases of flight) <i>Note: Locker and Soft Stowage items only.</i>	Designed to meet the standard modular locker stowage requirements of NSTS 21000-IDD-MDK or equivalent IDD _____.	<input checked="" type="checkbox"/>	1.1.1. SVM: Review for compliance with Middeck ICD 1.1.1 STATUS: Closed. ESCG Memorandum ESCG-4295-10-CPAS-MEMO-0002, "DDRS-02 Hazard Controls," dated February 2, 2010	
2. Structural Failure of Sealed Containers Note 1: Only sealed containers made of conventional metal (metal alloy) can use the 1230 form. Sealed containers made of unconventional metals or non-metallic materials shall be documented on Unique Hazard Reports. Note 2: The 1230 form is not applicable for "sealed container"(s) employed in levels of containment control of hazardous fluid.	Sealed containers must meet the criteria of NASA-STD-5003, Para. 4.2.2.4.2.3a, contain a substance which is not a hazard if released, be made of conventional metals (e.g. Al, inconel, monel, steel or titanium), contain less than 14,240 foot-pounds (19,130 Joules) of stored energy due to pressure, and have a maximum delta pressure of 1.5 atm.	<input type="checkbox"/>	N/A. – No Sealed Containers used as structure (No Sealed Containers for any purpose)	
APPROVAL	PAYLOAD ORGANIZATION		SSP/ISS	
PHASE I				
PHASE II				
PHASE III	 TRENT MARTIN 8/4/10		 Michael R. Luhn 8/20/10	

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3. Structural Failure of Vented Containers	<p>For intentionally vented containers, vents are sized to maintain a 1.4 factor of safety for Shuttle or a 1.5 factor of safety for Station with respect to pressure loads. Meets all of the applicable pressure rates defined for one or more of the following.</p> <p>a) Shuttle payload bay – ICD 2-19001, Para. 10.6.1</p> <p>b) Station environment – SSP 52005, paragraph 4.3 or equivalent payload specific ICD _____ .</p> <p>c) Station PFE discharge – SSP 57000, Para. 3.1.1.4K, or equivalent payload specific ICD _____ .</p> <p>d) Shuttle Middeck – NSTS 21000-IDD-MDK, Section 6.1.</p>	<input type="checkbox"/> <input type="checkbox"/>	N/A. – No confined volumes in hardware design.	
4. Sharp Edges, Corners, and/or Protrusions.	<p>Meets the <u>intent</u> of one or more of the following:</p> <p>a) NASA-STD-3000 / SSP 50005</p> <p>b) SLP 2104</p> <p>c) NSTS 07700 Vol. XIV App. 7 (EVA hardware)</p> <p>d) NSTS 07700 Vol. XIV App. 9 (IVA hardware) / SSP 57000</p> <p>e) SSP 41163, Para. 3.3.6.12.3 (EVA), Para. 3.3.6.12.4 (IVA).</p>	<input checked="" type="checkbox"/> <input type="checkbox"/>	<p>4.a.1 SVM: Inspection of payload provided flight hardware for sharp edges, corners and protrusions.</p> <p>4.a.1 STATUS: Closed. ESCG Memorandum ESCG-4295-10-CPAS-MEMO-0002, "DDRS-02 Hazard Controls," dated February 2, 2010</p>	

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5. Shatterable Material Release	a) All materials are contained. b) Optical glass (i.e. lenses, filters, etc.) components of crew cabin experiment hardware that are non-stressed (no delta pressure) and have passed both a vibration test at flight levels and a post-test visual inspection. c) Payload bay hardware shatterable material components that weigh less than 0.25 lb and are non-stressed (no delta pressure) or non-structural.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	N/A. No Identified Shatterable Materials	
6. Flammable Materials	a) A-rated materials selected from MAPTIS, or b) Flammability assessment per NSTS 22648	<input type="checkbox"/> <input checked="" type="checkbox"/>	6.b.1 SVM: Review of design for appropriate use of non-flammable materials. 6.b.2 SVM: Review and approval of flammability assessment by JSC/ES4. 6.b.1 STATUS: Closed. ESCG Memorandum ESCG-4390-08-SP-MEMO-0021_RevA, "IVA Offgassing and Flammability," dated February 17, 2009 6.b.2 STATUS: Closed. JSC Materials and Fracture Control Certification MATL-09-036, "Alpha Magnetic Spectrometer (AMS-02) Data Interface Hardware," Approved 3/25/2009	
7. Materials Offgassing	Offgassing tests of assembled article per NASA-STD-6001 (previously published as NHB 8060.1C).	<input type="checkbox"/>	Reference Hazard Report AMS-02-F02	
8. Nonionizing Radiation	Meets all that apply:			
8.1 Non-transmitters	a) Pass ICD-2-19001, 10.7.3.2.2 / SSP 30238 EMI compatibility testing, or b) NSTS/USA approved analysis ICD Section 20, or c) ISS/EMEP approved TIA d) Meets SSP 41163, Para. 3.3.6.6 and SSP 50094, Para. 3.4.	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	8.1.a.1 SVM: EMI testing results reviewed and approved by JSC/EV4 8.1.a.1 STATUS: Closed. Test Reports EV5-09-EMC-010R, "Test Report Electromagnetic Interference (EMI) of the Engineering Evaluation For The Alpha Magnetic Spectrometer (AMS-02) – USB422 Assembly," dated August 25, 2009 and Universita' Degli Studi Di Perugia Polo Scientifico E Didattico Di Terni, Facolta di Ingegneria, Laboratorio di Caratterizzazione Electromagnetica Test Report No. 099, AMS02 Digital Data Recording System USB – RS422 Interface, April 12, 2007. Approved by EV/Scully, EV/Tarditi	

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8.2 Lasers NOTE: Lasers operating at class levels 3b and 4, meeting ANSI Z136.1, shall be documented on Unique Hazard Reports.	Meet ANSI Z136.1-2000 for class 1, 2, or 3a Lasers (as measured at the source).	<input type="checkbox"/>	N/A. Internal elements of AMS-02 do not generate coherent light.	
9.1 Alkaline cells and batteries made of alkaline cells, connected in series or in parallel, up to 12 V and with up to 60 Watt-hours capacity, no potential charging source and cells are not in a gas-tight compartment.	Cells and batteries pass acceptance tests that include loaded and open circuit voltage measurements, visual examination, and leakage check under vacuum (e.g. 6 hours at 0.1 psia).	<input type="checkbox"/>	N/A. AMS-02 Interior elements utilize no batteries. Submission of EP-Form-03(including the form's approved reference number) for EP5 approval Information to be included on the EP5 reviewed/approved Form-03: application and protective circuit schematics	
9.2 Primary button cells such as Li-(CF)x, Li-iodine, LiV ₂ O ₅ , LiMnO ₂ , Ag-Zn and rechargeable button cells such as LiV ₂ O ₅ , Li-ion, Ni-Cd, Ni-MH, Ag-Zn cells or batteries, which have a capacity of 300 mAh or less and no more than 3 cells per common circuit, and cells are not in a gas-tight compartment.	Cells and batteries pass acceptance tests that include loaded and open circuit voltage measurements, visual examination, and leakage check under vacuum (e.g. 6 hours at 0.1 psia). Note: Above acceptance testing for button cells in Section 9.2 which are soldered to a circuit board in commercial equipment (not applicable to those button cells in a spring-loaded clip) is limited to a functional check of the equipment utilizing the subject battery.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	N/A. AMS-02 Interior elements utilize no batteries. Submission of EP-Form-03(including the form's approved reference number) for EP5 approval Information to be included on the EP5 reviewed/approved Form-03: application and protective circuitry.	
9.3 COTS NiMH, NiCd and Ag/Zn cells and batteries for IVA use up to 20 V and 60 Wh	Cells and batteries purchased in one lot; pass acceptance tests that include loaded and open circuit voltage measurements, visual examination, leakage check under vacuum (e.g. 6 hours at 0.1psia) and vibration to workmanship levels with functional checks which include charge/discharge cycles for rechargeable batteries.	<input type="checkbox"/>	N/A. AMS-02 Interior elements utilize no batteries. Submission of EP5 Form-03(including the form's approved reference number) for approval Information to be included on the EP5 reviewed/approved Form-03: manufacturer's specification, battery protective features and charger schematics	

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14. Mating/demating powered connectors	a) Meets the low power criteria of letter MA2-99-170 or, b) Meets the paragraph 1 criteria of letter MA2-99-170 (e.g., IVA and open circuit voltage no greater than 32 volts).	<input checked="" type="checkbox"/> <input type="checkbox"/>	14.a.1 SVM: Review of Design. 14.a.1 STATUS: Closed. ESCG Memorandum ESCG-4175-09-REENTES-MEMO-0055, "Circuit Protection on DDRS-02," dated August 12, 2009	
15. Contingency Return and Rapid Safing	Shuttle Environment: a) If middeck payload – can be stowed within 50 min. (see paragraph 3 of letter MA2-96-190). b) If SPACEHAB transfer item – can establish a safe for return configuration within 3 min. (see paragraph 5 of letter MA2-96-190). Station Environment: c) Payload design does not impede emergency IVA egress to the remaining adjacent pressurized volumes.	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	15a.1 SVM: Rapid Safing Assessment to establish that the PGSC and data cables can be stowed within 50 minutes. 15.a.1 STATUS: Closed. A. M. Vaughan/DO5 concurrence with AMS-02 assessment documented in ESCG Memorandum ESCG-4390-08-SP-MEMO-0011 Rev A., "AMS-02 Digital Data Recording Systems -02 (DDRS-02) Rapid Safing" that stowage of PGSC and DDRS-02 cabling will occur in approximately six minutes.	
16. Release of Mercury from bulbs into crew habitable environment.	a) Mercury vapor bulbs contain less than 30 mg of Mercury per bulb, and b) No more than one bulb could break due to a single failure.	<input type="checkbox"/> <input type="checkbox"/>	N/A. AMS-02 internal hardware elements do not utilize mercury containing bulbs.	

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Alpha Magnetic Spectrometer –02 (AMS-02) Orbiter Interior Hardware Elements:

- DDRS-02 Assembly P/N SED39136116-301
 - USB422 Assembly P/N SED39137921-301
 - USB422 to PDIP Cables P/N SED 3939136111-301
 - COTS USB A-B cable, wrapped in Teflon tape (connects USB422 to PGSC/NGLS) P/N SED39136130-801
 - Extension Cable P/N 39137973-301

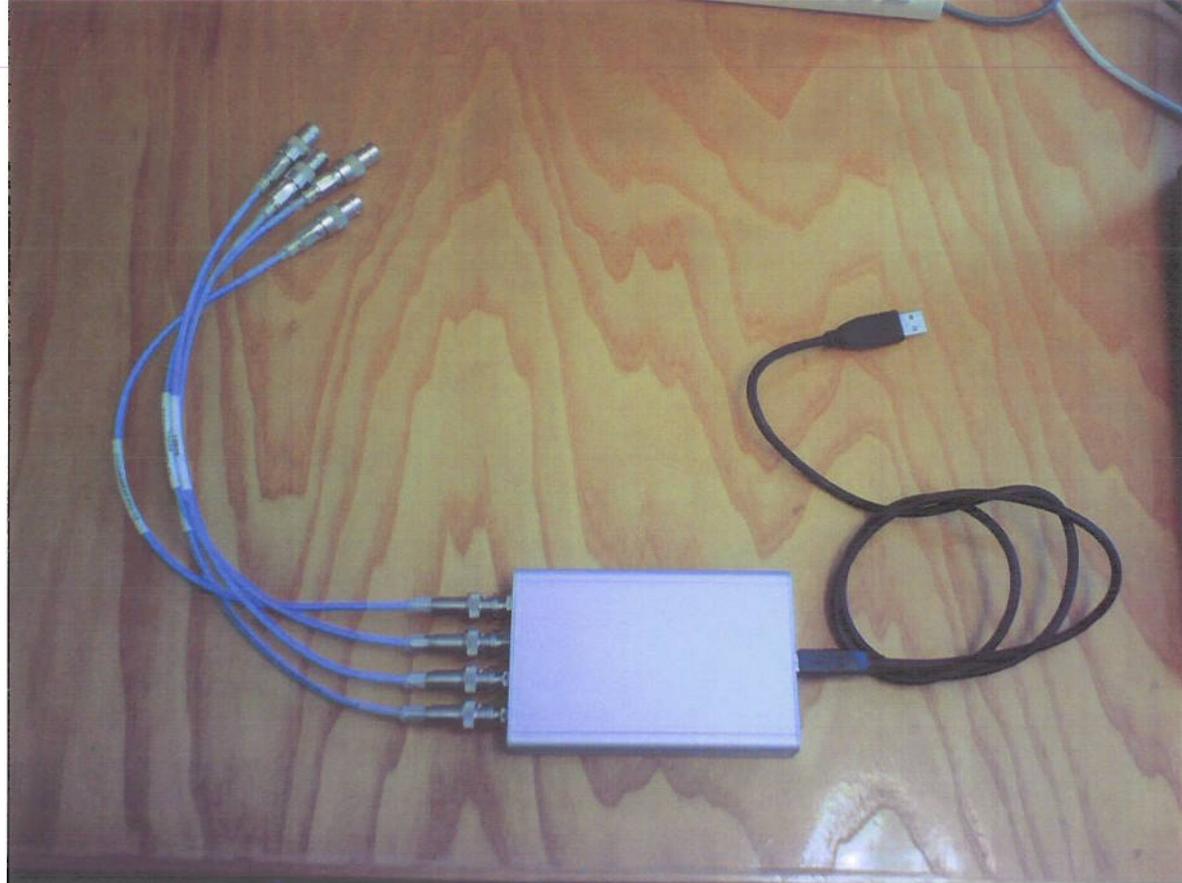
NOTE:

- *Payload General Support Equipment (PGSC)/ Next Generation Laptop System (NGLS), not considered in STD-AMS-02-02, GFE is being used in accordance with its GFE certification.*
 - *Spare Hard Disk (GFE) for PGSC/NGLS, not considered in STD-AMS-02-02, GFE is being used in accordance with its GFE certification.*
- Other Hardware
 - Cable SED 39136112-302 – PDIP J101 to J105 Patch Cable – Patches RS422 to T0 umbilical for GSE monitoring and control of the AMS-02 prior to launch.

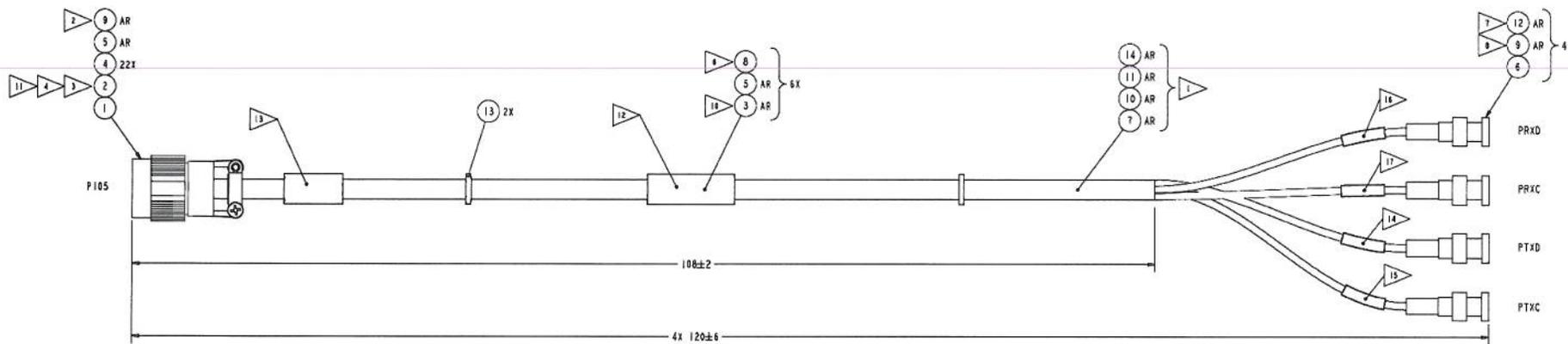
About USB422

The USB422 interface provides inline conversion of RS422 synchronous serial signals to a USB 2.0 interface. The unit is powered by the USB 5.0 volt bus provided power and draws less the 0.5 amp. USB422 is a single PCB based on a Cypress FX2 chip and a gate array. This card will be hand conformal coated with Dow Corning 3140 or equivalent.

USB422 is housed in a rugged aluminum enclosure with Twinax style connections on one end and a commercial USB cable Teflon wrapped on the other. The USB cable plugs into the NGLS USB connection and is strain relieved by a Velcro strap to the power connection cable (TBC).

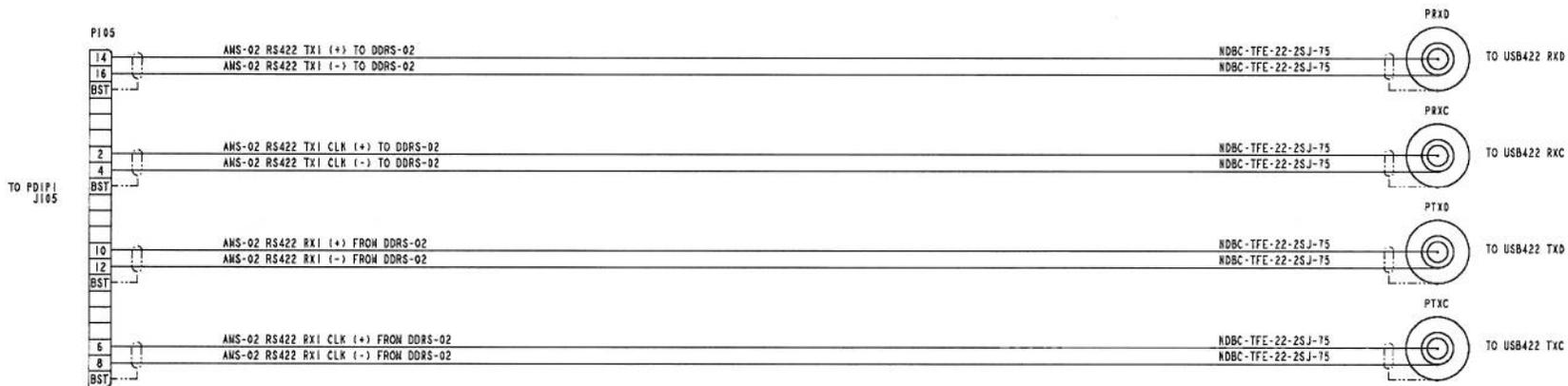


Picture is representation of USB422 and Non-Flight cables



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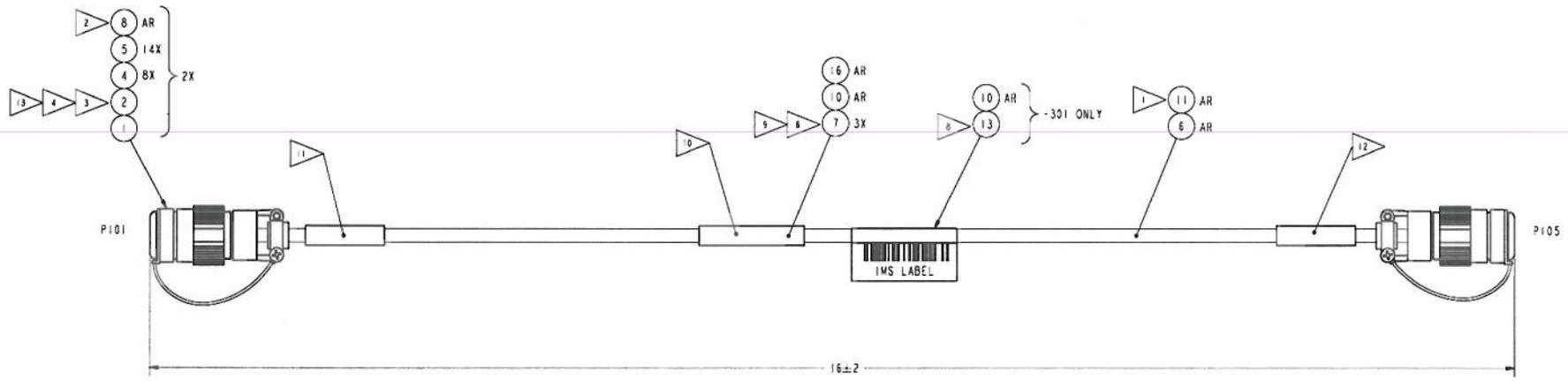
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WIRING SCHEMATIC

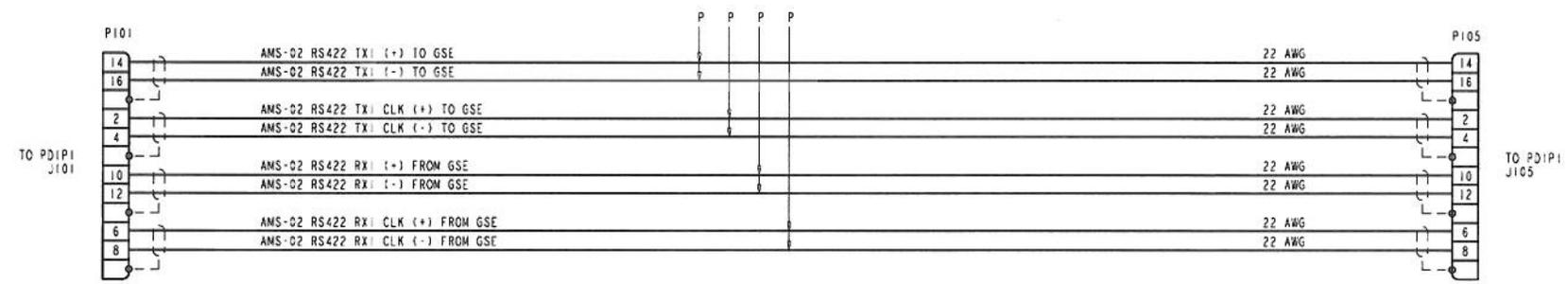
DDRS-02 – Cable RS422 to PDIP (P/N SED 3939136111)

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WIRING SCHEMATIC ▶

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PDIP J101 to J105 Patch Cable Schematic P/N SED39136112

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