

AMS-02 Launch Commit Criteria GSE

Revision 01

Document Number: AMS02-LLC-GSE-R01

14 Apr 2008

APPROVAL and SIGNATURE

DOCUMENT NAME:

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Author: _____

Name and Organization

Signature

Date

Approved: _____

Name and Organization

Signature

Date

Approved: _____

Name and Organization

Signature

Date

Approved: _____

Name and Organization

Signature

Date

DOCUMENT RELEASE RECORD

<u>Rev No.</u>	<u>History</u>	<u>Date</u>	<u>Remark</u>
00	Initial draft review	14-Apr-08	PAD

1 Introduction

This document presents the ground support equipment systems supporting the delivery of the safety critical pre-launch data used to monitor AMS-02 and controls its interface the KSC network systems. This system and data are used to support a T-9 minute assessment of the AMS-02 vacuum case integrity. The requirement is derived from:

JSC49978 – AMS-02 Phase II Safety Data Package

Hazard report – AMS-02-F04 Overpressurization of Orbiter Payload Bay

Safety Verification 2.1.8

“2.1.8 SVM: Launch Commit Criteria for launch acceptability at L-9 minutes. Trend Data will be utilized to establish cryosystem health status prior to launch.”

1.1 AMS-02 T-0 Connection Operations

The following diagram illustrates the connections among the AMS-02 payload, the AMS-02 Avionics Lab (AAL) systems, the AMS-02 Payload Operations Control Center (POCC), and the Launch Control Center (LCC) via the T-0 cable to the MLP and the network connection from the MLP to both the LCC and AMS-02 POCC.

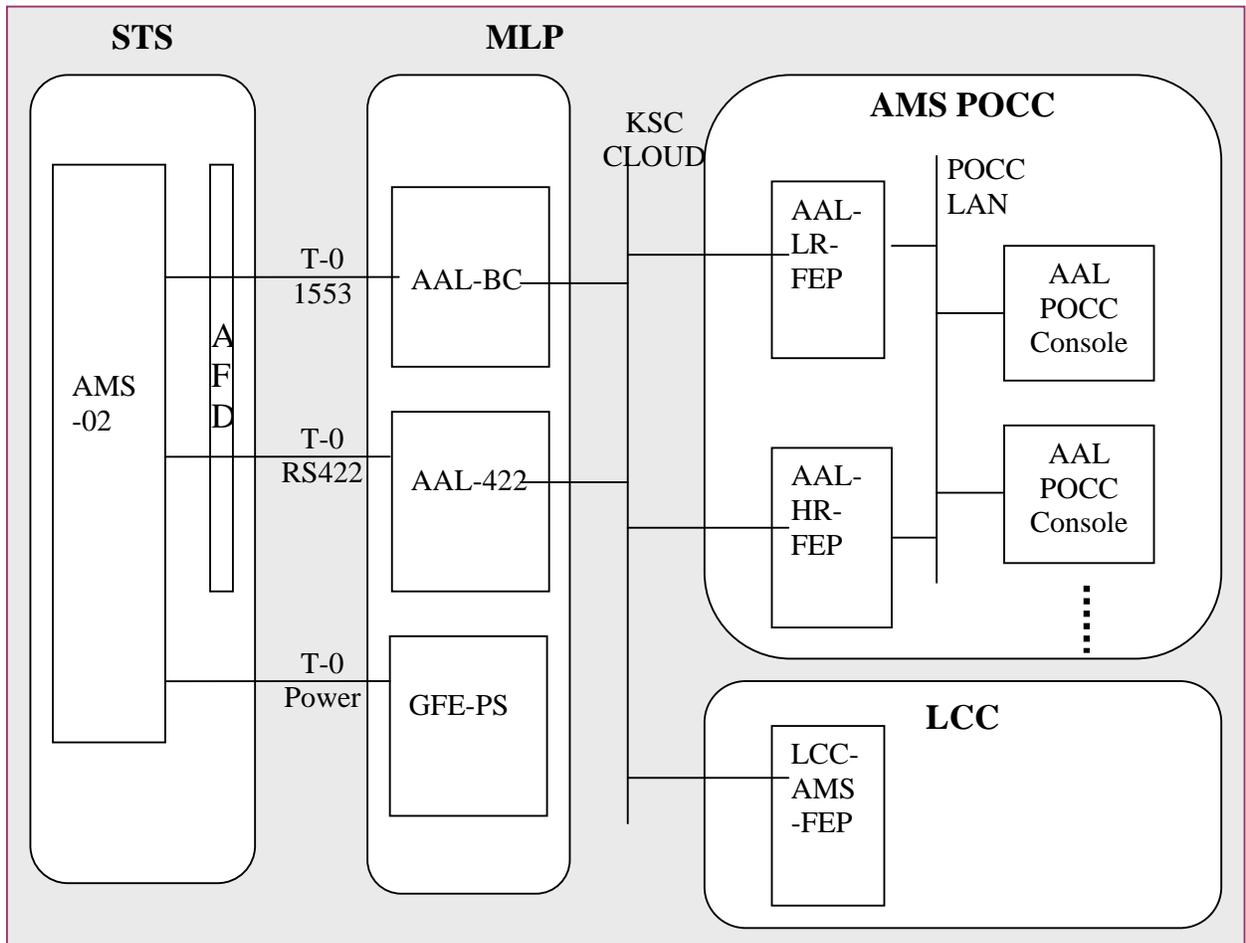


Figure 1 AMS-02 T-0 Connections

The following table defines the acronyms used in the above figure.

AAL-BC	AMS provided 1553 Bus Controller
AAL-422	AMS provided serial communications system – <u>this is not DDRS-02.</u>
AFD	Aft Flight Deck
AAL-HR-FEP	High Rate Front End Processor
LCC-AMS-FEP	NASA developed interface and display of AMS-02 data
AAL-LR-FEP	Low Rate Front End Processor
MLP	Mobil Launch Platform
MLP-LAN	KSC provided Local Area Network based on 802.3 communications.
POCC	Payload Operations Control Center
POCC-LAN	AMS-02 internal POCC Local Area Network.
STS	Space Transportation System

Table 1 Acronyms

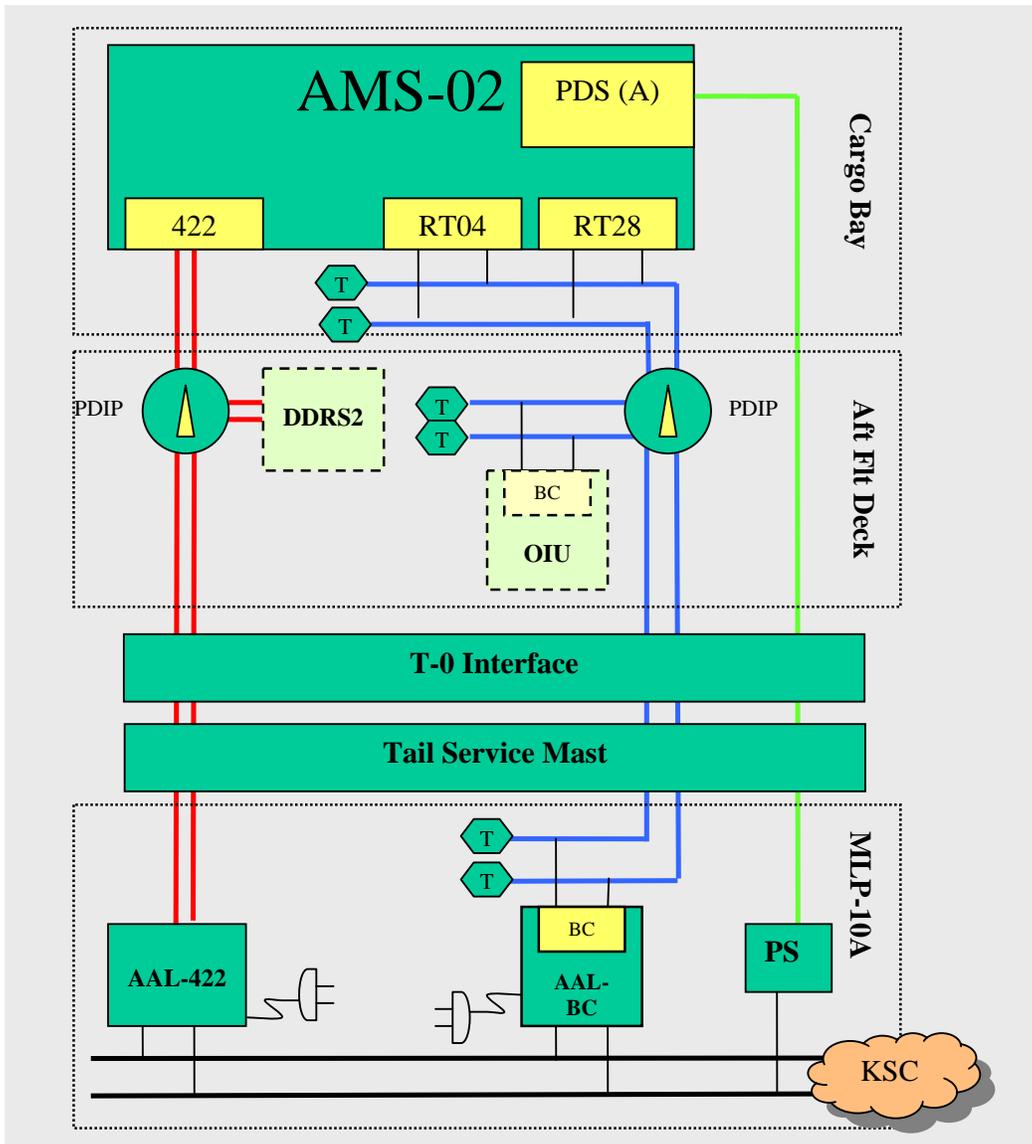


Figure 2 Flight and EGSE Systems at PAD

1.2 AAL Systems

1.2.1 AAL Hardware

The AAL-BC and AAL-422 systems are based on ITX form factor Via EPIA-MII motherboards mounted within a rugged housing measuring 8.25 x 6 x 8.25. (w, h, d). The depth requires an addition 3 inches to accommodate cabling.

The two systems are secured side by side to a single shelf suitable for mounting with the 19" equipment racks found in MLP Room 10. The assembly requires 8 inches of rack height.

Each system is powered by an 110v power brick.

Each system runs "headless" (without keyboard, mouse, or display).

1.2.2 AAL-BC

The AAL-BC system acts as the 1553 bus controller during pad operations. This system utilizes a DDC BU65553M2-300 PC Card as a 1553 interface. This provides a dual redundant serial bus connection to the AMS-02 J-Crate over the T-0 RF class feeds. This system performs the same polling sequence of AMS-02 as the ISS PLMDM (similar to the OIU polling) and has full access the AMS-02 housekeeping data and its embedded Critical Health Data (CHD).

The measurements required for the launch criteria are collected by AAL-BC during the 1-hertz polling sequence and multicast per Section 2.2.1 below. This multicast is expressly for providing the measurements to the LCC.

Commanding on this interface is supported from the AMS-POCC only.

1.2.3 AAL-422

The AAL-422 uses an USB422 interface to the bidirectional 2mbit/second RS422 serial data stream of AMS-02. AMS-02 provides a copy of the house keeping data on this interface.

The measurements required for launch criteria are collected each second from this data stream for multicast per Section 2.2.1 below. This multicast is expressly for providing the measurements to the LCC.

Commanding on this interface is supported from the AMS-POCC only.

1.2.4 Software

Operating System: Fedora LINUX Core 4 (TBR).

Applications: Developed by the AMS-02 Collaboration.

1.3 Wire Service

The following indicates the wire service types used within the STS and pad wiring.

J74	Power runs.
J59	RS422 signals (Tested by X38 program for RS422 serial to about 2mbit).
J58	1553 signals. (Special run used by MPLM for 1553. Has no panel connections from Tail Service Mast to MLP 10A).

1.4 Power for AMS-02

During operations on the launch pad AMS-02 is powered over the T-0 cable from GFE remotely controlled redundant power sources located in room 10A of the MLP.

2 Interface Control

2.1 Mechanical

All customer provided equipment shall be mounted to MLP customer racks.

2.2 Logical Network Systems Demarcation

Customer equipment shall be attached to KSC provided network systems shown as the "KSC cloud" on Figure 2 above. Connection shall be by CAT-5 or equivalent network cables. KSC shall provide data routing from the MLP KSC Cloud to the Launch Control Center (LCC), the AMS-02 KSC POCC, the AMS-02 JSC POCC, and other points as mutually agreed.

2.2.1 Software - Telemetry for LCC

2.3 Network Protocol and Ports

Transmission of the measurements by AAL-BC and AAL-422 shall be by UDP multicast transmissions at 1 hertz of 7-bit ASCII XML formatted data using ports as defined below:

IP: 224.0.0.24 TTL: 1 AAL-BC Port: 62500, AAL-422 Port: 62501

2.3.1 XML Envelope

The XML data envelop contents shall be defined as per below:

```
<?xml version="1.0"?>
<AAL-422 heartbeat="nnn">
  <measurement name="name" units="units"> value </measurement>
  <measurement name="name" units="units"> value </measurement>
  ...
  <chd> XX XX XX XX XX XX XX XX XX XX</chd>
</AAL-442>
```

```
<?xml version="1.0"?>
<AAL-BC heartbeat="nnn">
  <measurement name="name" units="units"> value </measurement>
  <measurement name="name" units="units"> value </measurement>
  ...
  <chd> XX XX XX XX XX XX XX XX XX XX</chd>
</AAL-BC>
```

The heartbeat is a three digit wrap around counter (0-999) indicating that updates are progressing.

The measurement values are provided as integer or floating point values, as appropriate.

The Critical Health Data (CHD) is provided as two character hex constants. The contents of the CHD is defined by the “AMS-02 Command and Data Handling Interface Control Document” current revision.

2.3.2 Parameter Set

Details of the parameters to be transmitted are under development.

2.3.3 Web Page Display

A self refreshing display of the parameters shall be available by web page display directly from the AAL-BC and AAL-422 systems.

Details to be confirmed.