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<th>Document #</th>
<th>Date effective</th>
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<tbody>
<tr>
<td>LAT-TD-03623-1</td>
<td>19 APRIL 04</td>
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<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Supersedes</th>
</tr>
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<tbody>
<tr>
<td>Larry Lecrone</td>
<td></td>
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<tr>
<th>Subsystem/Office</th>
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<tr>
<td>Electronics &amp; DAQ Subsystem</td>
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**Document Title**

Final Acceptance Test for EGSE ACD G3 Test Stand with GLAT0785/6 GASU

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# CHANGE HISTORY LOG

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1. **SCOPE**

This document lists the results of the final test performed before the test-stand is shipped to GSFC.

Note that these results are specific to GASU #GLAT0785/#GLAT0786 (see serial ID bar-code on enclosure and cover, respectively).
DEFINITIONS AND ACRONYMS

The following terms, abbreviations, and acronyms are used in this document:

1.1 Acronyms

ACD               Anti Coincidence Detector
EM                Engineering Model
FH                Flight Hardware
FREE              Front End Electronics
GLAST             Gamma Ray Large Area Space Telescope
GASU              Global Trigger ACD Signal Distribution Unit
LAT               Large Area Telescope
LVDS              Low Voltage Differential Signaling
2. REFERENCES

The list below provides documents that are to be used as references for this procedure:

2.1 Applicable Documents

<table>
<thead>
<tr>
<th>Document Number</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>LAT-TD-01346</td>
<td>ACD G3 Test Stand, GASU to ADC FREE Interface Test Procedure for GLAT0785/6 GASU (includes safe-to-mate)</td>
</tr>
</tbody>
</table>
3. **TEST SETUP**

3.1 **Test Equipment**

The list below indicates the equipment that is used as the ACD G3 Test Stand test setup:

<table>
<thead>
<tr>
<th>Type</th>
<th>Manufacturer/Model/ID Number</th>
<th>Version/Revision</th>
<th>Customer Provided</th>
</tr>
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<tbody>
<tr>
<td>VME Crate</td>
<td>Dawn VME Products 11-1011777-2119</td>
<td>VME64x (series 767)</td>
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<tr>
<td>VME SBC MVME2304 card</td>
<td>Motorola PN MVME2304-0123</td>
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<td></td>
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<tr>
<td>VME LCB Mezzanine card</td>
<td>LAT-TD-00860</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Software for the local PC</td>
<td>LATTE P03-00-00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2) DC Power supplies</td>
<td>BK Precision MN1786A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>28 Volt supply cable</td>
<td>LAT-DS-03611</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LCB Transition board cable</td>
<td>LAT-DS-02104</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAT5 Ethernet cable</td>
<td>TRD855PL-50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RS-232 Cable</td>
<td>TDC003-7 (RECO98M connectors)</td>
<td></td>
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</tr>
</tbody>
</table>

Measurement Equipment used:

Meterman 38XR DVM

HP 3400A RMS Voltmeter with external 1 MHz LC band-limiting filter.
3.2 Test Setup

The Figure below shows the interconnections, cables and equipment for testing the interface between the GASU unit and one ACD FREE board.

Figure 1. Test setup Interconnection Diagram
CAUTION: DO NOT turn ON BOTH power supplies. SEVERE DAMAGE to the GASU will result if they are USED together.

Note: Follow the appropriate ESD precautions while performing the processes in this document.

Note: Dust caps shall be used on all connectors when the connections are not mated. Insure that the dust caps are clean inside and outside.

4. TEST RESULT

4.1 Notes

- Before executing this final test other tests were run to insure that the cables/connector cabling is correct. Please consult LAT-TD-1346 to insure that the GASU-FREE cabling used is correct.
- The test described in this document is NOT the safe-to-mate procedure to connect flight-hardware. This document describes the tests executed before shipment of the G3 to GSFC.
- Important: Measure resistance of FREE card 3.3V and 28V BEA pins to ground and make sure that it is not shorted (> 1 kohm). This is important for this G3 (GLAT0785/6) since the voltage feeds from the GASU are not sufficiently protected on this EM and the bipolar pnp transistor in the GASU could be damaged.
- All these procedures must be checked and feedback from ACD experience included before real flight hardware is connected
- GLAT0785/6 supplies a constant 20-MHz clock and a constant 3.3V ACD supply voltage
  - Future versions will incorporate external clock input to vary system clock and external voltage to vary FREE voltages
- Only power one of the 28V supplies! Either the primary or the redundant 28V supply must be powered, never both.
- A set of cables from the GASU to the FREE card was sent with the test-stand (contrary to the figure text).

4.2 Hook-up

1) Inspect all connectors for bent pins and damage before mate
2) Insert VME processors with LCB PMC card into VME crate slot 0
3) Connect VME crate to AC power, make sure VME power is off

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4) Connect LCB card connector to GASU connector via cable as shown in LAT-TD-1346.
5) Connect 28V supply to AC, make sure supply is off
6) Connect GASU power cables to 28V supply
   a. Note that in this setup two 28V supplies are used
      i. 28-V supply primary powers GASU DAQ board primary and 3.3V/28V ACD power primary
      ii. 28-V supply redundant powers GASU DAQ board redundant and 3.3V/28V ACD power redundant
   b. The ACD 3.3V are constant and cannot be varied. The 28V will track the voltage on the bench supply (i.e. is unregulated)
7) Power VME crate

4.3 Test steps performed for each FREE board connector; Primary GASU side

In this section the generic test flow is listed. These tests were performed for each of the 4 prime and 4 redundant GASU side FREE connectors (4LB-A, 4RB-A, 4RA-A, 4LA-A and 4LB-B, 4RB-B, 4RA-B, 4LA-B) at a time with the BEA. The ACD-supplied BEA assembly used has only one FREE card, so all 8 connectors are tested individually.

1) Make sure redundant 28V is off!
2) Connect BEA engineering unit to connector 4LB-A, or 4RB-A, or 4RA-A, or 4LA-A
3) Power Primary 28-V supply.
4) Boot VME-SBC
   i. Boot successful: Yes
5) Start LATTE (see I&T LATTE instructions)
6) Check current of 28V supply, should be nominal 350 mA +/- 50 mA
   ii. Reading: within limits
7) Execute ACD supplied script to write/read on-board AEM registers with ACD front-end power disabled on GASU (via power-on registers)
   iii. Passed write/read scripts: Yes
8) Measure 3.3V and 28V voltage with DVM at BEA interface
   b. Nominal 3.3V measured: see table below
   c. Nominal 28V measured: see table below
9) Turn on power of BEA on primary GASU via AEM registers (on LATTE global panel press “Power Up”)
10) Measure 3.3V and 28V voltage with DVM at BEA interface
    d. Nominal 3.3V measured: see table below
    e. Nominal 28V measured: see table below
11) Measure RMS of 3.3V and 28V (1 MHz band-limit)
    f. 3.3V RMS noise: < 1 mV
    g. 28 V RMS noise: < 1 mV
12) Run script (AemGarc.py) to write/read BEA registers

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h. Ran scripts, passed: Yes
13) Run ACD scripts to trigger and readout BEA
   i. Ran scripts, passed: Yes
14) Turn on-BEA HV to nominal default SAA value

4.4 Test steps performed for each FREE board connector; Redundant GASU side

Same tests and results as in previous section, but connectors (4LB-B, 4RB-B, 4RA-B, 4LA-B) connected to redundant GASU side are tested. Use steps as in previous section but use bench supply connected to redundant GASU side instead of the primary.

4.5 Voltages at BEA Interface

Voltages at BEA Interface measured with DVM. Note that off voltages may not be reproducible. The supply line from the GASU is off, but since the LVDS drivers and receivers are powered, the BEA supply-lines get pulled up to those voltages via protection diodes from the powered GASU LVDS driver lines. One should set limits to define “off”. (Maybe < 1V). Note that when the AEM turns off the BEA voltages, the supply lines to the BEA are disconnected and are thus discharged through parasitic paths. The 0785/6 test-stand used National LVDS drivers/receivers.

<table>
<thead>
<tr>
<th></th>
<th>3.3V off</th>
<th>3.3V on</th>
<th>28V off</th>
<th>28V on</th>
</tr>
</thead>
<tbody>
<tr>
<td>4LB-A</td>
<td>750 mV</td>
<td>3.25 V</td>
<td>500 mV</td>
<td>27.74 V</td>
</tr>
<tr>
<td>4RB-A</td>
<td>757 mV</td>
<td>3.36 V</td>
<td>540 mV</td>
<td>27.73 V</td>
</tr>
<tr>
<td>4RA-A</td>
<td>759 mV</td>
<td>3.35 V</td>
<td>240 mV</td>
<td>27.73 V</td>
</tr>
<tr>
<td>4LA-A</td>
<td>750 mV</td>
<td>3.27 V</td>
<td>540 mV</td>
<td>27.73 V</td>
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<tr>
<td>4LB-B</td>
<td>730 mV</td>
<td>3.35 V</td>
<td>529 mV</td>
<td>27.76 V</td>
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<tr>
<td>4RB-B</td>
<td>755 mV</td>
<td>3.35 V</td>
<td>529 mV</td>
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<td>4RA-B</td>
<td>755 mV</td>
<td>3.35 V</td>
<td>180 mV</td>
<td>27.78 V</td>
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<tr>
<td>4LA-B</td>
<td>740 mV</td>
<td>3.28 V</td>
<td>3 mV</td>
<td>27.75 V</td>
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</tbody>
</table>
4.6 Comments

- As previously noted the documentation and testing of this first G3 delivery is not complete, therefore several engineers from I&T and DAQ are traveling with the G3 teststand for test and installation at GSFC. The next delivery will include complete testing & documentation.

- Readback of high-voltage levels, temperatures, and low-voltages were not tested on this GASU (although should be operational), since there were no scripts yet ready to test.

- Read Mike Huffer’s doc “GASU-Based Teststands” for description of the capabilities of the G3 teststand

- The CNO function of the G3 was tested via an external pattern generator since the FREE card could not provide a CNO signal. (Latter it was determined to be the LATTE software in that the Veto-Vernier DAC and the HLD DAC register addresses were exchanged, I&T is supposed to release a new version with the fix around April 22, 04.)