TIMED

Thermosphere • Ionosphere • Mesosphere • Energetics and Dynamics

Integrated Electronics Module Test-bed

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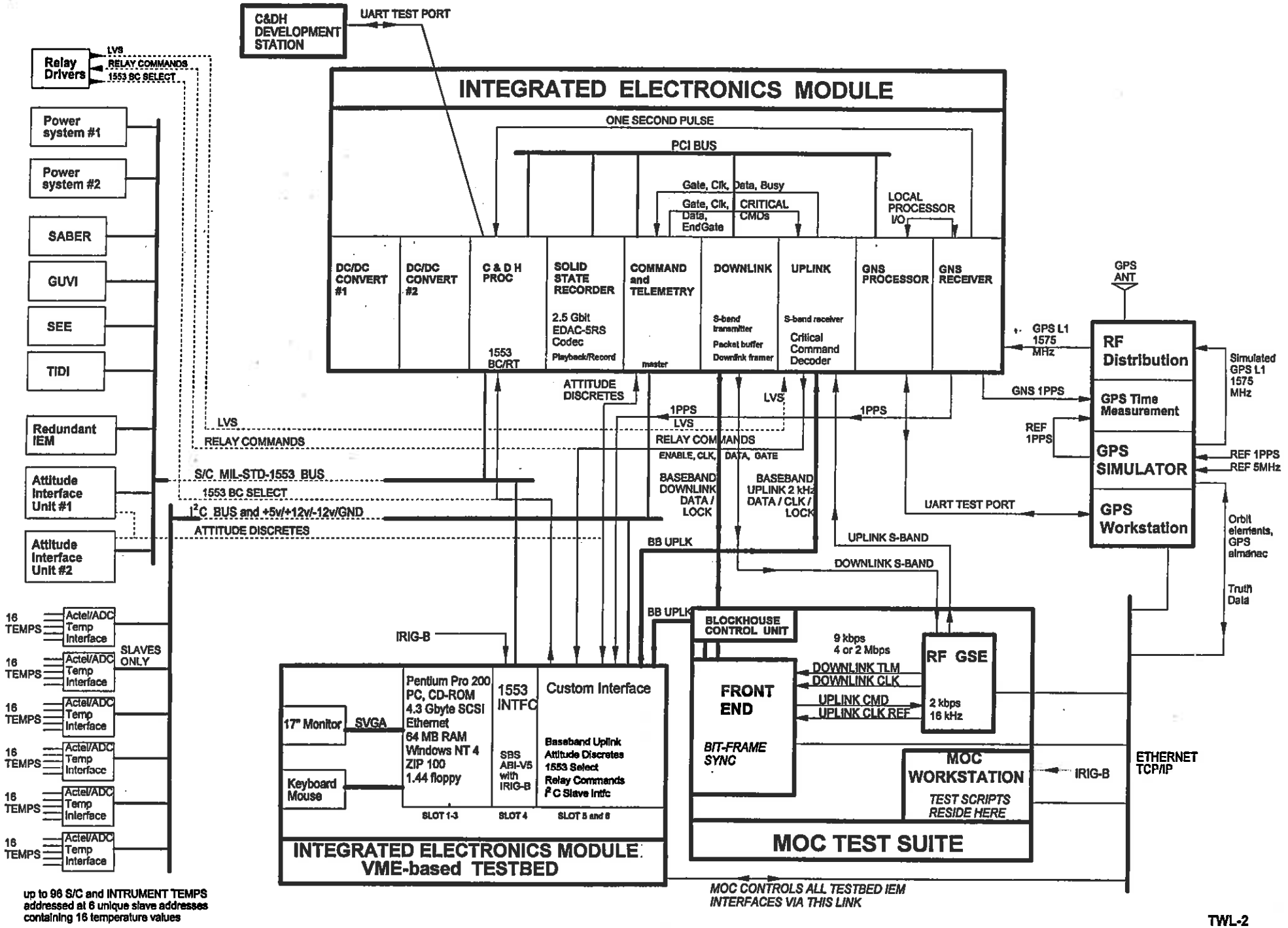
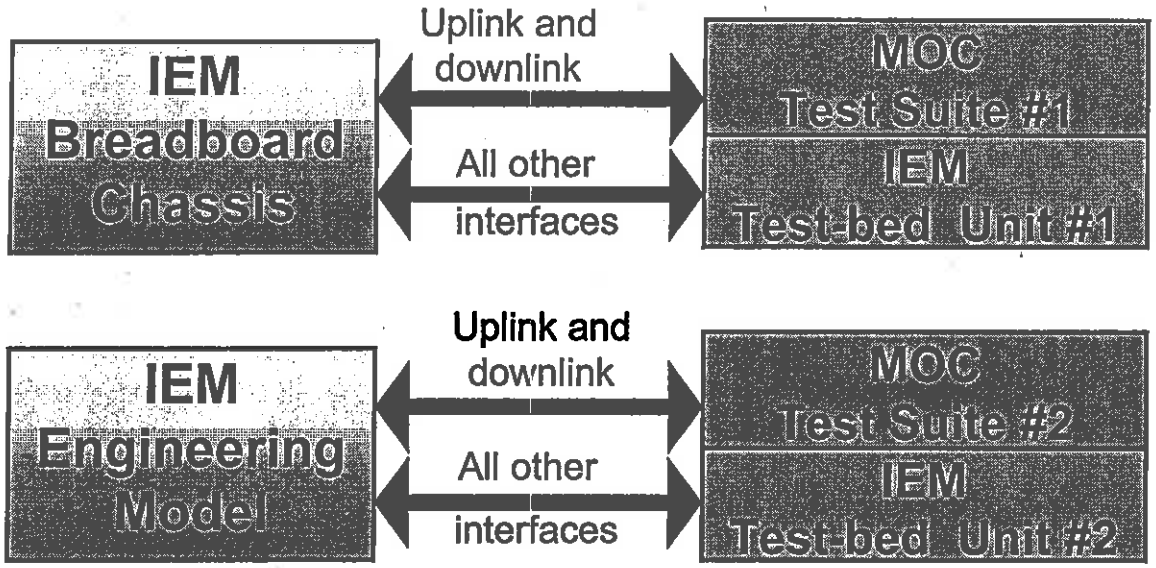

C&DH DEVELOPMENT STATION
UART TEST PORT
INTEGRATED ELECTRONICS MODULE
ONE SECOND PULSE
PCI BUS
Gate, Clk, Data, Busy
Gate, Clk, Data, EndGate
CRITICAL CMDs
LOCAL PROCESSOR I/O
DC/DC CONVERT #1
DC/DC CONVERT #2
C & D H PROC
1553 BC/RT
SOLID STATE RECORDER
2.5 Gbit EDAC-5RS Codec
Playback/Record
COMMAND and TELEMETRY
master
DOWNLINK
S-band transmitter
Packet buffer
Downlink framer
UPLINK
S-band receiver
Critical Command Decoder
GNS PROCESSOR
GNS RECEIVER
GPS ANT
GPS L1 1575 MHz
RF Distribution
GPS Time Measurement
GPS SIMULATOR
GPS Workstation
Simulated GPS L1 1575 MHz
REF 1PPS
REF 5MHz
GNS 1PPS
REF 1PPS
UART TEST PORT
Orbit elements, GPS almanac
Truth Data
Relay Drivers
LVS
RELAY COMMANDS
1553 BC SELECT
Power system #1
Power system #2
SABER
GUVI
SEE
TIDI
Redundant IEM
Attitude Interface Unit #1
Attitude Interface Unit #2
S/C MIL-STD-1553 BUS
1553 BC SELECT
I2C BUS and +5v/+12v/-12v/GND
ATTITUDE DISCRETES
ATTITUDE DISCRETES
1PPS
LVS
1PPS
LVS
RELAY COMMANDS
ENABLE, CLK, DATA, GATE
BASEBAND DOWNLINK DATA / LOCK
BASEBAND UPLINK 2 kHz DATA / CLK / LOCK
BB UPLK
UPLINK S-BAND
DOWNLINK S-BAND
BB UPLK
IRIG-B
BLOCKHOUSE CONTROL UNIT
9 kbps
4 or 2 Mbps
DOWNLINK TLM
DOWNLINK CLK
UPLINK CMD
UPLINK CLK REF
RF GSE
2 kbps
16 kHz
FRONT END
BIT-FRAME SYNC
MOC WORKSTATION
TEST SCRIPTS RESIDE HERE
IRIG-B
ETHERNET TCP/IP
16 TEMPS
Actel/ADC Temp Interface
SLAVES ONLY
17" Monitor
SVGA
Keyboard
Mouse
Pentium Pro 200 PC, CD-ROM 4.3 Gbyte SCSI Ethernet 64 MB RAM Windows NT 4 ZIP 100 1.44 floppy
1553 INTFC
SBS ABI-V5 with IRIG-B
Custom Interface
Baseband Uplink
Attitude Discretes
1553 Select
Relay Commands
I2C Slave Intfc
SLOT 1-3
SLOT 4
SLOT 5 and 6
INTEGRATED ELECTRONICS MODULE VME-based TESTBED
MOC TEST SUITE
MOC CONTROLS ALL TESTBED IEM INTERFACES VIA THIS LINK
up to 96 S/C and INTRUMENT TEMPS addressed at 6 unique slave addresses containing 16 temperature values

IEM Test-bed Configurations

- *Two* IEM Test-beds with associated Mission Operation Center test suites being built to support *two* IEM development units and *two* IEM flight units.
- MOC test suite consists of
  - MOC workstation
  - Bit and Frame Sync Front End
  - Blockhouse Control Unit
  - RF Ground Station rack(s)
- Capable of functionally testing **all input** and **output interfaces** of an IEM.
- Supports
  1) **Software development**
  2) **Environmental qualification**
  3) **Autonomy rule verification**
- MOC workstation will control the **test scenarios** via MOC resident **script files**. The IEM Test-bed acts as a slave to the MOC via Ethernet.
- All baseband and RF ***uplink commanding*** and ***downlink telemetry*** will be controlled by the MOC.



Two ***IEM Test-beds / MOC Test Suites*** are shared by four ***IEM units*** being developed.

IEM Test-bed Features

- VME-based chassis with embedded Pentium PC, 4 Gbyte disk drive, Ethernet, 64 Mbyte RAM running Windows NT 4.0.
- MIL-STD-1553 dual-redundant interface card.
- Custom wire-wrap card containing all interfaces to the IEM except Uplink/Downlink/GPS RF and MIL-STD-1553 bus.
  Custom interfaces include:
  1) Serial Relay Command interface to Power Switching Unit (PSU)
  2) Low Voltage Sense discrete signals from PSU
  3) Serial spacecraft temperature bus
  4) MIL-STD-1553 Bus Controller Select
  5) Attitude Interface Unit discrete signals
  6) Uplink baseband port (local or MOC controlled)
- The Test-bed ***does not*** support emulation of missing cards during system integration, i.e., internal PCI-bus emulation of GPS card, internal temperature sensors, etc.)

IEM Test-bed Features (cont'd)

- PC-based MIL-STD-1553 bus analyzer is used to debug 1553 traffic.
- CCSDS formats will be composed and decomposed within the MOC
- Verification of proper test scenario telemetry response is handled by the MOC scripting language and logged in the MOC.
- Baseband uplink may be directed to originate from the Test-bed in the form of **pre-composed CLTU files**. These files allow low-level testing of IEM uplink, i.e., **bad commands, missing bits, bad CRC, bad code blocks**.
- The MOC ***Command*** and ***Telemetry dictionaries*** are populated and exercised early in IEM development phase.
- **No porting** effort involved with dictionaries since they always reside on the MOC workstation throughout the program.

IEM Test-bed Status

- **Two Test-beds** with their custom interface cards are available for use.
- **Cabling** to the breadboard chassis from either Test-bed is complete.
- Uplink baseband **testing of the Critical Command Decoder** using Test-bed resident files has been completed.
- **All serial Relay Commands** have been verified by the Test-bed.
- **Serial temperature interface** is presently being verified on the Test-bed using a stand-in for the IEM circuitry.
- Main **graphical user interface window** and 11 sub-windows have been identified and some controls implemented.

IEM Test-bed Status (cont'd)

- **Test-bed 1553 interface has been exercised** and awaits fuller definition of message parameters.
- The **IRIG time code interface** has been verified.
- **MOC to Test-bed command and telemetry** Ethernet socket connections have been established.
- Test-bed command and telemetry **database entry is underway**. IEM command and telemetry database entry is awaiting definition.
- **Front-End Processor** has arrived with its uplink channel presently being cabled and verified.
- **Test-bed Requirement Document** (APL/JHU #7363-9326) has been written.
- **Custom Interface Board Specification Document** has been written.