TIMED GENERAL INSTRUMENT INTERFACE SPECIFICATION

Section 2.0
Electrical Interface

TECHNICAL CONTENT APPROVAL (PAGE 1 OF 2)

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TIMED GENERAL INSTRUMENT INTERFACE SPECIFICATION

Section 2.0
Electrical Interface

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REVISION APPROVAL (PAGE 1 OF 5)

TIMED Spacecraft Approval Page

Rev #	Date	D. Kusnierkiewicz	K. Heffernan	G. Seylar	G. Dakermanji
A					
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C					
D					
E					
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I					
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A					
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TIMED GENERAL INSTRUMENT INTERFACE SPECIFICATION

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REVISION APPROVAL (PAGE 2 OF 5)

GUVI Instrument Approval Page

Rev #	Date	B. Ogorzalek	W. Crain		
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TIMED GENERAL INSTRUMENT INTERFACE SPECIFICATION

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SABER Instrument Approval Page

Rev #	Date	M. Vanek	S. Brown	M. Jensen	
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TIMED GENERAL INSTRUMENT INTERFACE SPECIFICATION

Section 2.0
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REVISION APPROVAL (PAGE 4 OF 5)

SEE Instrument Approval Page

Rev #	Date	G. Ucker	J. Westfall		
A					
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TIMED GENERAL INSTRUMENT INTERFACE SPECIFICATION

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TIDI Instrument Approval Page

Rev #	Date	T. Clausen	C. Cooper		
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2. ELECTRICAL INTERFACE REQUIREMENTS

2.1 GENERAL

This section describes the electrical interface between the payload instruments and the TIMED spacecraft. Figure 2.1-1 shows a typical block diagram of the TIMED spacecraft electrical interfaces.

2.2 SYSTEM GROUNDING

System grounding will be addressed in the TIMED EMC Control Plan and EMI Performance Requirements Specification, Document Number 7363-9038.

2.3 MAIN AND SURVIVAL POWER

The payload instruments (non-essential loads) will be supplied with unregulated +28 volt DC power from two (2) separate, switched power busses. The main bus provides electronics and operational heater power, while the survival bus provides survival heater power. Each instrument is allocated two power relays: one relay to be used for both main and operational heater power, and a second relay to be used for survive heater power. The spacecraft power distribution block diagram is shown in Fig. 2.3-1.

Power will be distributed to the instruments by relays in the Power System Electronics / Distribution Unit (PSE/DU). Each relay in the PSE/DU may be controlled by either of the two redundant C&DH components. Control of the relays is redundant, through the use of redundant coil drivers; the relay contacts used to switch power are also redundant. The power switched by the relays will be provided over redundant wires to each instrument. Figure 2.3-1 illustrates a typical instrument power interface.

2.3.1 Power Interface Characteristics

The power interface characteristics will be discussed in the Component Environmental Specification, Document Number 7363-9010.

2.3.2 Component Generated Power Bus Load Characteristics

The component generated power bus load characteristics will be discussed in the TIMED Component Environmental Specification, Document Number 7363-9010.

2.3.3 Instrument Survival Requirements

The component survival requirements will be discussed in the Component Environmental Specification, Document Number 7363-9010.

Figure 2.1-1. Typical Electrical Interfaces

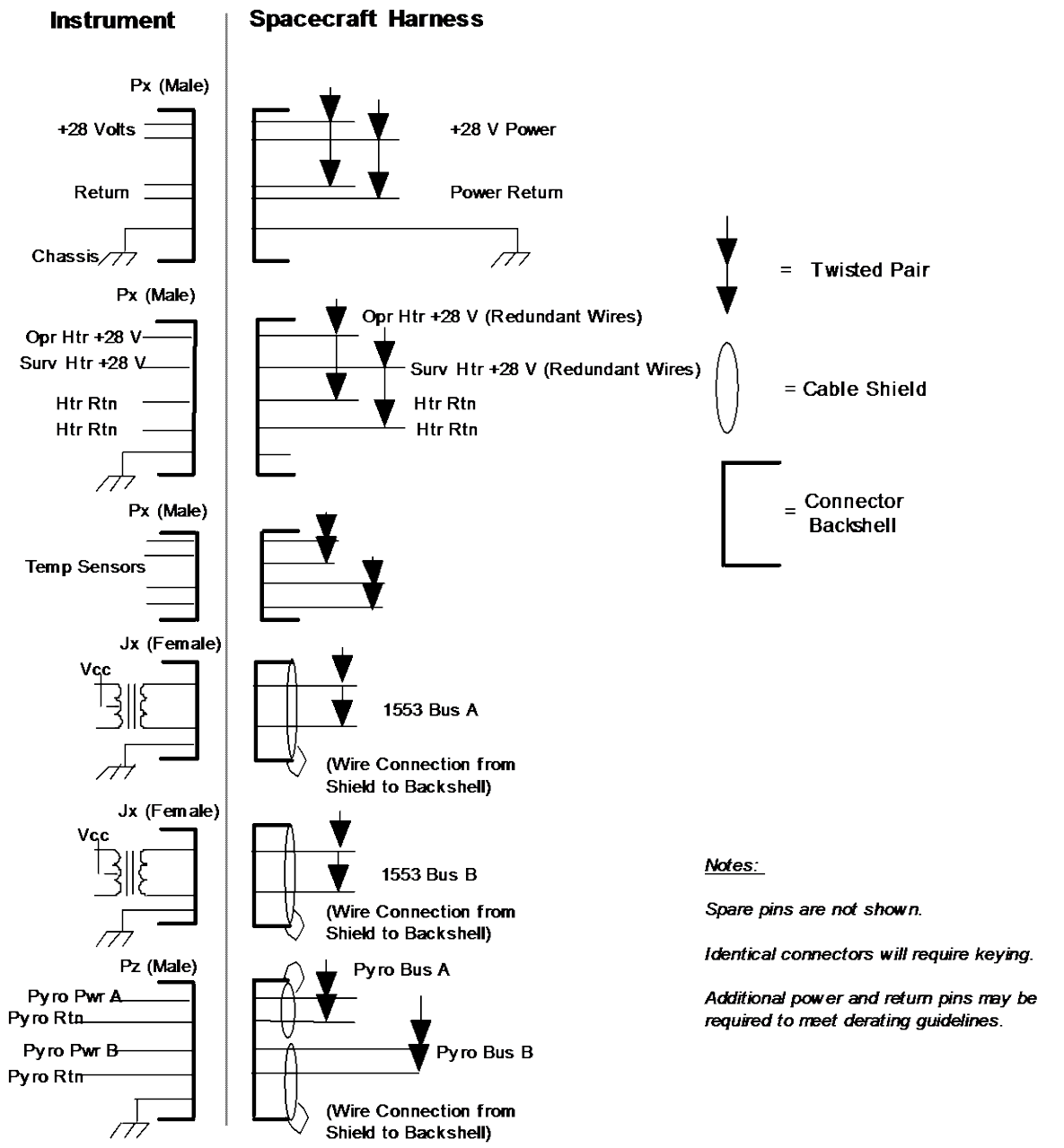

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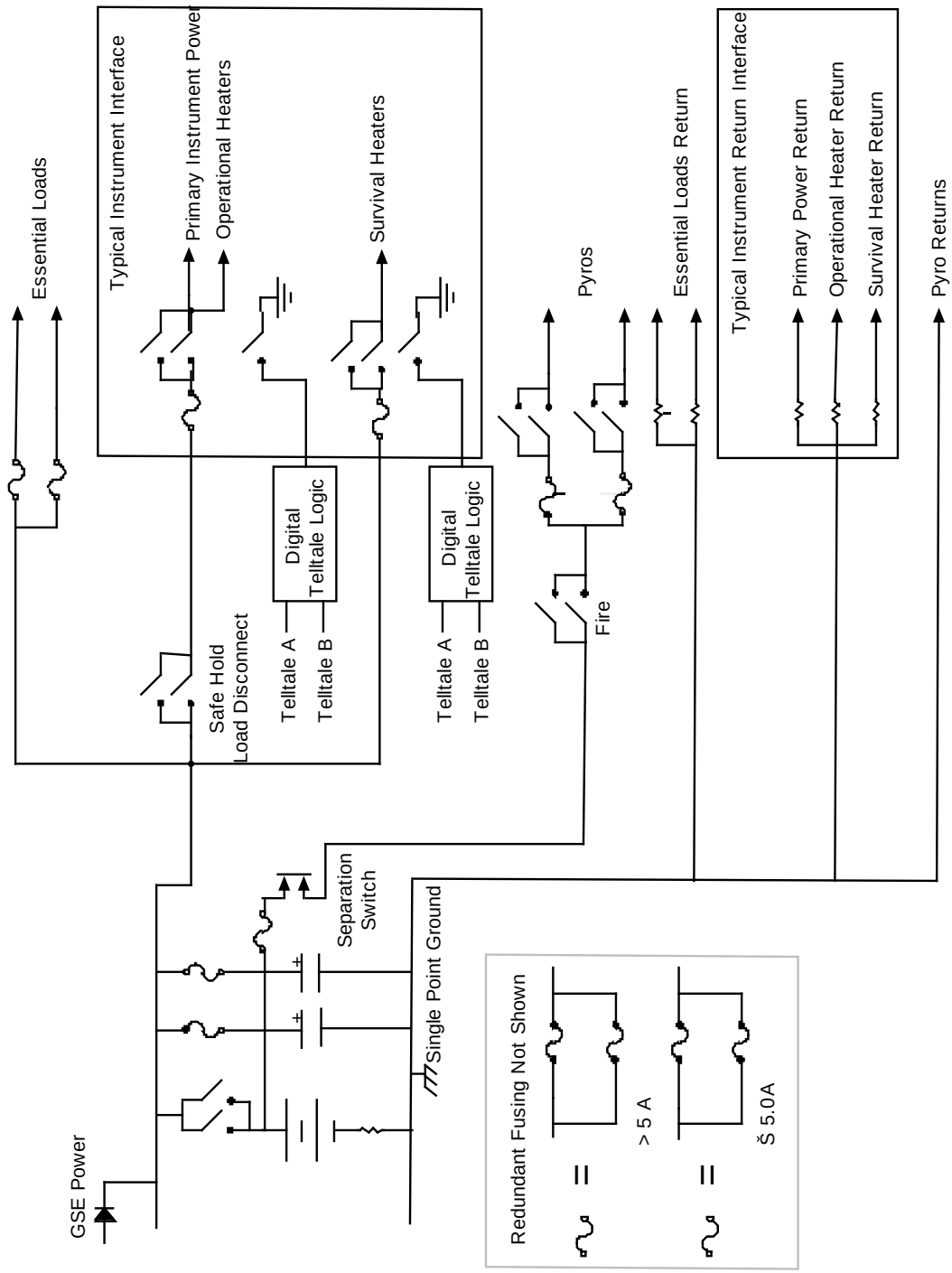
Figure 2.3-1. TIMED Spacecraft Power Distribution Block Diagram



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2.3.4 Fusing

Each payload instrument shall be fused to the spacecraft power busses with two sets of redundant fuses. One set of redundant fuses will serve the main power bus including operational heaters. The second set of redundant fuses will serve the survival heater power bus. The minimum fuse size for each instrument is given in the appropriate SIIS.

2.3.5 Current Monitors

APL will provide three current monitors for each instrument. These current monitors shall monitor the current for the instruments' primary power, operational heaters, and survival heaters. The resistor size and current range will be defined in the appropriate SIIS.

2.3.6 Anomalous Condition Power Shutdown

The payload instruments are considered non-essential loads on the main power bus. In the event that the battery voltage falls below the low voltage limit, a power shutdown warning will be sent over the 1553 bus to allow each instrument time to safe itself. Power will be removed from the instrument ten seconds after the warning.

However, situations may arise (e.g., the MIL-STD-1553b may go down) which preclude advance warning of an impending power shutdown. Instruments should be designed so that they can safely recover from an abrupt power shutdown.

2.3.7 Main Bus Component Power Dissipation

The orbit-averaged main bus not-to-exceed power allocations for the payload instruments are given in Table 2.3.7-1. This power includes both electrical and operational heater power dissipation. The instrument average and peak power dissipation, itemized by assembly, for each instrument operating mode are given in the SIIS documents. The instrument orbit average power, itemized by assembly, is also given in the SIIS documents.

2.3.8 Survival Bus Power Dissipation

Each instrument is allocated peak and average power for survival-mode heaters. These allocations are not to be exceeded without APL's permission. Payload instrument survival mode peak powers are given in the appropriate SIIS.

TABLE 2.3.7-1

PAYLOAD INSTRUMENT NOT-TO-EXCEED ORBITAL AVERAGE POWER ALLOCATIONS (INCLUSIVE OF OPERATIONAL HEATER POWER)

Instrument	Orbit Average Power (W)
SABER	69.8
GUVI	31.5
TIDI	25.3
SEE	27.9

2.4 INSTRUMENT ELECTROMAGNETIC CONTROL

The spacecraft shall conform to MIL-STD-461B, Part 3, Class A2a, tailored for the TIMED mission. The specific requirements are given in the TIMED EMC Control Plan and EMI Performance Requirements Specification, Document Number 7363-9038. The instruments must comply with this EMC control plan. The spacecraft shall be tested in accordance with MIL-STD-462, tailored to the TIMED mission.

2.5 HARNESS

2.5.1 Spacecraft/Instrument Interface Harness

The spacecraft-to-instrument interface harness design must meet the requirements called out in TIMED Spacecraft Harness Design Requirements, Document Number 7363-9022 and the Electrical Harness section in the TIMED EMC Control Plan and EMI Performance Requirements Specification, Document Number 7363-9038. This document details connector type, wire type, shielding requirements, chassis and signal ground pinout requirements, etc. The spacecraft is responsible for providing each of the interface harnesses (primary power, MIL-STD-1553b, survival heaters and survival temperature sensors) to the instrument.

A detailed definintion of the interface harness including pin numbers, signal names, wire types, connector part numbers, shielding, and the first circuit interface for each interface connector is given in the appropriate instrument SIIS.

2.5.2 Intra-Instrument Harness

The instrument provider is responsible for providing the intra-instrument harness. APL will provide a spacecraft mock-up at APL that can be used to lay out the intra-instrument harness to check for proper length, bend locations, bend radii, keep-out areas, etc., as required. Specification 7363-9022 contains guidelines (not requirements) for intra-instrument harnesses.

2.6 CONNECTORS

2.6.1 General

2.6.1.1 Payload Instrument Interface and Test Connector Selection

Interface and test connectors shall be aerospace/military designs for severe environmental applications. In order to minimize program connector types and reduce cost, it is desirable that standard connectors be used for all new equipment designed for the TIMED program.

The preferred connector types are rectangular connectors meeting the requirement of GSFC S-311-P-407, S-311-P-409, or S-311-P-10 (HD and HDD "D" type connectors).

If an instrument experimenter uses a connector not listed above, the experimenter shall provide JHU/APL with three (3) sets of mating connectors for all spacecraft interfaces.

2.6.1.2 Magnetic Properties

The payload instrument interface connectors shall be made of non-magnetic materials in order to limit magnetic contamination of the TIMED spacecraft.

2.6.1.3 Connector Marking

The instrument provider is responsible for marking all instrument connectors, both internal and interface, with “J” numbers on the instrument chassis.

2.6.2 Interface Connectors

The nomenclature for each spacecraft-instrument interface connector, the connector type, keying (if applicable) and the drawing number that details the pinout / harness design are given in the instrument SIIS. The instrument provider is responsible for providing all instrument-side spacecraft-instrument interface connectors including connectors for interfacing to operational heaters, survival heaters and temperature sensors. The instrument provider is responsible for providing to the TIMED Program with three (3) sets of connectors for each spacecraft-instrument interface if the connector is not of the APL recommended type.

2.6.2.1 Primary Power Interface Connector

Primary power shall be supplied to the instrument through a separate, dedicated connector through which there are no signal or other secondary lines. At least one pin in the primary power connector shall be internally connected to chassis ground and provide a resistance from pin to chassis not to exceed 10 milliohms. The recommended primary power interface connector type is GSFC-S-311 series "D" connectors (see section 2.6.1.1).

2.6.2.2 MIL-STD-1553b Interface Connector

The MIL-STD-1553b interface shall be supplied to the instrument through a separate, dedicated connector through which there are no power or other secondary lines. The recommended MIL-STD-1553b interface connector type is a 9-socket subminiature D-connector. Two connectors shall be required, one for each of the 1553 busses (see Figure 2.1-1).

2.6.2.3 Heater and Temperature Sensor Connectors

Connectors for the operational heater and survival heater input and temperature sensor output will be determined by the instrument teams and documented in the respective SIIS.The recommended interface connector type is GSFC-S-311 series “D” connectors (see section 2.6.1.1). The instrument provider is responsible for providing the harness from the heaters and temperature sensors to the interface connectors.

2.6.2.4 GSE Access Connectors

If a component requires GSE access while installed on the spacecraft, connectors reserved for that purpose shall be provided. The GSE-access connectors shall be different from power, signal, and data connectors. If these signals are required during spacecraft thermal-vacuum testing, the signal drive capability will be such as to monitor these signals through a minimum of 90 feet of GSE cables provided by the instrument teams.

2.6.2.5 Connector Savers

The instrument provider is responsible for delivering connector savers (using flight connectors) for each spacecraft-instrument interface connector at the time of the instrument delivery.

2.6.2.6 Breakout Boxes

The instrument provider is responsible for delivering breakout boxes for each spacecraft interface connector that is not an APL-recommended connector at the time of instrument delivery.

2.6.2.7 Flight Dust Covers

The instrument provider is responsible for delivering a flight-qualified, metallic, EMI-type dust cover for each connector that will not have a harness connected to it in flight. This cover shall be a "Green Tag" item and it shall be installed by the IDT prior to launch close out.