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*****          ****          ***          ***          ****
```

RESEARCH, INC

FUNCTIONAL SPECIFICATIONS FOR CRAY-1 INTERFACE AND HOST COMPUTER SYSTEMS

GENERAL REQUIREMENTS
TEST DOCUMENTATION
DIAGNOSTIC MESSAGES

PRELIMINARY DOCUMENTATION

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1.0 Introduction

1.1 Scope of specification

This specification outlines the basic minimum required capabilities and features for all offline Host Interface tests. The actual implementation (operator communication, test loading, error reporting etc.) will depend upon the host computer for which the test is written. The test should be written in a manner which makes most sense and follows the philosophy and conventions established for a given host computer.

When writing an interface test to communicate with the Cray-1 computer system it should be assumed that basic operations are functional on the host computer's side.

1.2 Definitions

- Master Loopback - a test program running in a mode which generates and sends data blocks and protocol signals to be turned around(loopbacked) by a host interface.
- Slave Loopback - a test program running in a mode which returns all incoming data and protocol messages to the node which originated them.
- FEI Loopback - a test program running in a mode which tests it side of the interface box by running data blocks and protocol signals thru the interface and back to the originator without communicating with the host computer. (Front-End-Interface)
- Channel loopback - In the case with the Cray-1 computer system this is a test program running in a mode that communicates only with itself by cabling input and output channels together and testing basic channel operations (Ca, Cl, protocol signals, minimal data transfers) in order to assure advanced communications.

1.3 Applicable Documentation

Publication No.	Title/Contents
HM-0588	IBM 360/370 Channel Protocol Engineering Reference Manual
HM-1000	Field Engineering Diagnostic Reference Manual Eclipse based
HM-1001	Field Engineering Diagnostic Reference Manual IOS Subsystem based
HR-0029	Cray-1 S Series Mainframe Reference Manual
HR-0030	Cray-1 I/O Subsystem Hardware Reference Manual
HM-1002	Channel Operating Procedures Hardware FE Manual
2240900	Cray-1/Sperry Univac 1100 Interface
2240950	Cray-1/7600 PPU Interface
2240951	Cray-1/SEL 32/55 HSD Interface
2240954	Cray-1/DUAL DWR-70 (PDP-11/70) Interface
2240955	Cray-1/Cyber 70/170 PPS Interface
2240964	Cray-1/Cyber 70/170 Interface
2240965	Cray-1/CDC 7600 or Cyber 76 PPU
2240967	Cray-1/Dual DWR-70 (PDP-11)
2240968	Cray-1/NCAR-TBM Interface
2240970	Cray-1/IBM System/370 Interface
2240972	Cray-1/Honeywell 6080 N PSIA Channel Interface
2240973	Cray-1/Honeywell 6080 N PSIA System 15
2240975	Cray-1/Cyber 70/170 Interface system 14,17
2240976	Cray-1/IBM 370 Channel Interface system 13
2240978	NCAR IBM Interface
2240979	Cray-1/DUAL DWR-70 (PDP-11) Interface System 16

2240980 Cray-1/SEL 32/55 HSD Interface
System 16

2240981 Cray-1/CDC 7600/Cyber 76 PPU

2240983 Cray-1/IBM System 360/370
Interface Systems 12,17,19

2240986 Cray-1/IBM System 360/370
Interface Systems 14,29

2240987 Cray-1/Cyber 70/170 Interface
Interface Systems 14,17,20,21

2240991 Cray-1/IBM System 360/370
Interface Systems 1,11

2240992 Cray-1/Honeywell 6080N PSIA
Interface Systems 15,26

2240995 Cray-1/IBM System 370 Channel
Interface Systems 26,27

2240996 Cray-1/IBM System 370 Channel
Interface Systems 28

2240997 Cray-1/IBM System 370 Channel
Interface Systems 23,24

2240998 Cray-1/S100 Interface Channel

2240999 Cray-1/IBM System 370 Channel
Interface Systems 8

2.0 General Requirements

This section outlines the basic requirements for software in general terms.

2.1 Test Sections

Each test section is given a number. This section number when selected executes a specific type of interface tests.

Section 0 executes Master Loopback which is described in definitions (1.2) illustration in appendix A figure 1

Section 1 executes Slave Loopback which is described in definitions (1.2) illustration in appendix A figure 1

Section 2 executes Channel Loopback which is described in definitions illustration in appendix A figures 2,6,and 7

Section 4 executes FEI Loopback which is described in definitions (1.2) illustration in appendix A figures 3,4 and 5

When any given test section is started, counters, error indications and all other aspects pertaining to the test section should be initialized.

When an interface test is initially loaded,it should be by default set up to run test section 0 with default parameters.

2.1a Master Loopback

An interface test in Master Loopback should first initialize the interface that allows communication between computer systems by sending a master clear (MC) to the interface. The originator should then be able to transfer random data at random word counts across the interface to the host computer.

the following is the default sequence of Master Loopback operations

```
:-----:
:Initialize the      :
:interface box(MC)   :
:-----:
:-----:
:Sync computers      :
:together usually    :
:slave sends init word:
:-----:
:-----:
:generate random     :
:data pattern        :
:-----:
:-----:
:generate random     :
:word counts         :
:data length=1-512   :
:decimal 64 bit words :
:-----:
:-----:
:transmit data and   :
:protocol signals    :
:-----:
:-----:
:wait for response   :
:check timing        :
:-----:
:-----:
:input data and      :
:protocol signals    :
:-----:
:-----:
:compare data        :
:contents and length :
:-----:
```


2.1b Slave Loopback

An interface test in Slave Loopback should respond to the data transfers and functions sent by the interface box via Master loopback computer, turn the data around and send it back to the originator.

the following is the default sequence of Slave Loopback operations

```
:-----:
:Sync computers      :
:together usually   :
:slave sends init word:
:-----:
:-----:
:receive data and   :
:protocol signals   :
:-----:
:-----:
:accept disconnect  :
:check timing       :
:-----:
:-----:
:output data and    :
:protocol signals   :
:-----:
```

2.1c FEI Loopback (Front-End-Interface)

An interface test in FEI Loopback should send and receive data and protocol signals allowing communication between the interface box and the originator.

the following is the default sequence of FEI Loopback operations

```
:-----:
:Initialize the      :
:interface box(MC)  :
:-----:
:-----:
:generate random     :
:data pattern       :
:-----:
:-----:
:generate random     :
:word count         :
:data length=1-512  :
:decimal 64 bit words :
:-----:
:-----:
:transmit data and   :
:protocol signals    :
:-----:
:-----:
:wait for response   :
:check timing        :
:-----:
:-----:
:input data and      :
:protocol signals    :
:-----:
:-----:
:compare data        :
:contents and length :
:-----:
```

2.1d Channel Loopback

An interface test in Channel Loopback should respond to the data transfers and protocol signals sent and received by originator thru cabled channels without communicating with a foreign interface.

the following is the default sequence of Channel Loopback operations

```
:-----:
:generate      :
:data pattern  :
:-----:
:-----:
:generate minimal :
:word count    :
:decimal 64 bit words:
:-----:
:-----:
:transmit data and :
:protocol signals  :
:-----:
:-----:
:wait for response :
:check timing     :
:-----:
:-----:
:input data and   :
:protocol signals :
:-----:
:-----:
:compare data    :
:contents and length :
:-----:
```

2.2 Selectable Options

The following options should be selectable by the test operator.

Stop on Error

If this option is selected, the test will stop when an error occurs.

Loop on Error

If this option is selected, the current test section is repeated until an error occurs (if Stop on Error is selected) or stopped by the operator.

Scope Loop on Error

If this option is selected, the current test section has found an error and has formed a tight loop on minimal instructions to isolate by scoping.

2.3 Information Available

The following information should be readily available for the test operator. Care should be taken so that memory locations assigned to hold this information do not change with subsequent versions.

Pass Counter

This counter is incremented every time a test section is executed once (not if an error occurs)

Error Counter

This counter is incremented every time an error is sensed.

Error Code

This field is set to an error code number indicating the failure which occurred

Input Buffer

This buffer should hold the last data received from the foreign interface.

Output Buffer

This buffer should hold the last data sent to the foreign interface.

Options and Parameters

All options (Loop on Error, Scope Loop on Error, etc.) should be readily available to the test operator.

Failure Information

When a failure occurs sufficient information should be available to the test operator to isolate the failure. Care should be taken so that memory locations assigned to hold this information do not change with subsequent versions. Information included should be:

- * last operation attempted
- * last function issued
- * amount of any incomplete data transfers(residual counts)
- * characteristics of data last transferred(length,pattern)
- * error count

2.4 Input Parameters

Care should be taken so that memory locations assigned to hold this information do not change with subsequent versions. The test operator should be able to input the following parameters:

- * input/output channel numbers
- * equipment/unit number
- * data block length
- * data pattern
- * selectable options
- * other relevant operational parameters

2.5 Data Block Characteristics

The test should act as much like an operating system in respect to:

- * random block lengths 1-512 decimal word blocks 64 bits per word.
- * random data that simulates actual data being transferred.

```

-----
: HOST      :                               : INPUT  : OUTPUT
: COMPUTER  :                               :        :
:           :                               :        :
:           :                               :        :
:           :                               :        :
:           :                               :        :
-----

```

```

-----
: IOP      : *                               *
: COMPUTER : INPUT *                       *
:           : -----*                       *
:           : -----*                       *
:           : OUTPUT *                       *
-----

```

CRAY-CRAY/IOP END-TO-END CONFIGURATION
 ****FIGURE 1****

```

-----
:           :---INPUT---: -----:
:           :---OUTPUT---: -----: CRAY/HOST :
:           :---protocol---: -----: INTERFACE :
:           :           :         : BOX       :
:           :           :         :
: HOST      :           : INPUT  : OUTPUT
: COMPUTER  :           :        :
:           :           :        :
:           :           :        :
:           :           :        :
:           :           :        :
-----

```

```

-----
: IOP      : *                               *
: COMPUTER : INPUT *                       *
:           : -----*                       *
:           : -----*                       *
:           : OUTPUT *                       *
-----

```

HOST LOOPBACK CONFIGURATION
 ****FIGURE 2****

