SPECIFICATION

DATA ACQUISITION AND CONTROL SYSTEM

1.0 Introduction

The Naval Research Laboratory requires a distributed; Windows based data acquisition and control system for use in performing large-scale fire fighting and damage control research to replace its existing system. At a minimum, the data acquisition and control system should include; (1) two centralized servers, (2) five monitors, (3) distributed acquisition and control modules capable of collecting and logging 600 channels of data, (4) acquisition and control software, (5) security software, (6) the ability to access and broadcast information and data over both local area networks and the Internet using communication protocols such as; Transmission Control Protocol (TCP), User Datagram Protocol (UDP), File Transfer Protocol (FTP), Internet Mail Access Protocol (IMAP), Hypertext Transfer Protocol (HTTP), Post Office Protocol (POP), (7) the ability to be addressed remotely from the Internet and, (8) uninterruptible power supply (UPS) back-up for all components. The system must be modular and capable of being expanded to increase the number of data channels being collected. The system must be designed to reduce or isolate the effects of radio frequency interference (RFI) and electromagnetic interference (EMI) environments from data input signals and system control commands.

A baseline system requirement is defined below. Additional options are included, in sections 8.1 and 8.2, to allow for expanding the number of data channels the system can collect. The baseline system must meet or exceed the following minimum specifications:

a. Two (2) network servers
b. Installed, licensed, software to include;
    i. Windows Server 2003
    ii. A package to perform network communication control
    iii. A package to provide network security and server security
    iv. A package to perform data acquisition, transfer, display and storage
c. Five (5) flat panel monitors
d. Two (2) UPS back-up units for system servers
e. Sufficient UPS back-up units for five (5) flat panel monitors
f. Remote acquisition and control modules for collecting 600 channels of data. The modules will be sufficient to outfit 6 node rooms with 100 channels each
g. Licensed Software installed in the remote modules to perform required data acquisition, storage and transfer functions
h. UPS back-up units for the acquisition and control modules

i. System, component and software documentation
j. Component warranties
k. Software training
l. Hardware training
m. Technical support

A more detailed description of NRL's requirements, including details of the environment in which NRL plans to install the system, is provided in the following paragraphs.

2.0 Background

2.1 General Facility Description

The required data acquisition and control system will be installed aboard the Navy's Advanced Fire Research Laboratory, ex-USS SHADWELL (LSD-15). The 141 m (464 ft) WWII vintage amphibious support vessel is moored on the northern end of Mobile Bay at Little Sand Island, Mobile, Alabama. Access to the facility is by boat only.

Ex-Shadwell is an industrial environment used by the Naval Research Laboratory to perform Research, Development, Test and Evaluation (RDT&E) tasking for the United States Navy. The ship is constructed entirely of steel and is highly compartmentalized. The spaces within the ship are used for: offices, laboratory control, work centers, storage, machinery and power equipment for facility support, and, test support and execution. The office and laboratory control spaces, comprising approximately 10% of the total available ship spaces, are air conditioned. The remainder of the ship spaces are not air conditioned.

2.2 Environmental Considerations

Note: Sections 2.2 and 2.3 represent environmental considerations unique to the ex-USS Shadwell. Offerors are required to ensure that their equipment will work effectively under these conditions.

2.2.1 Temperature and Humidity

Of the twelve (12) node rooms in which the required acquisition system components may be installed, ten (10) are not air conditioned. The centralized servers, monitors, data acquisition software and Internet access will be located within an air conditioned node room. One remotely located data acquisition and control module will also be located in an air conditioned node room. The remaining components will be installed in un-air conditioned node rooms. During summer months aboard the test facility, these un-air conditioned spaces can reach temperatures in excess of 38°C (100 ^{o}F). The un-air conditioned node room spaces are also capable of experiencing high humidity levels and are, on

occasion, exposed to air entrained particles of soot and dust. The two (2) node that are air conditioned are maintained at approximately 21 ^{o}C (70 ^{o}F). Humidity levels within the air conditioned node rooms are low. There is limited exposure to dust and soot in the air conditioned node rooms. The two air conditioned node rooms are part of the base requirement.

2.2.2 Electromagnetic and Radio Frequency Interference

Electromagnetic interference (EMI) is a recognized problem aboard the test facility. Large, high-current draw pumps, large variable frequency drives, large current electrical feeds from shore and, 250/120V distribution systems throughout the ship have been shown to generate measurable, sometimes, significant, noise levels on top of low voltage instrumentation signals. EMI has also been shown to interrupt telephone service during start-up current draw for specific pumps.

Use of hand-held portable radios is routine aboard the test facility. During test execution it's not uncommon for more than eighteen (18) hand-held radios to be distributed throughout the facility to support safety requirements and test logistics. Activation of the hand-held radio, in proximity to low voltage instrumentation, has regularly resulted in short term, spurious instrumentation signal oscillations. These spikes have been attributed to radio frequency (RF) interference.

2.2.3 Vibration

Levels of vibration are typically of low intensity and fairly short term in duration. These levels of vibration are regularly experienced due to ventilation or fluid pumping equipment operation, slamming of heavy metal doors and, metal to metal impact resulting from construction activities that may occur in close proximity to the node rooms.

2.3 Ships Power

The ship is supplied with 2400 amps of 3-phase, 460V A/C power at 60 Hz through a shore tie. In general, the power supplied to the ship is stable in both voltage and frequency. However, loss of one or more phases of power and precipitous loss of all power has occurred.

Once inside the ship, shore power passes through step-down transformers to produce 208/120 VAC power. In addition, power is passed at 208 VAC through a D/C rectifier to produce 250/120 VDC power. Systems aboard the ship use 460 VAC, 208 VAC, 120 VAC, 250 VDC and 120 VDC power. Armored electrical cables run through the overhead of the ship in open cable trays. Power cables and electric motors have, historically, generated EMI fields aboard the ship that have caused noise problems with installed low voltage data signals.

The ship is also capable of generating approximately 350 amps of single phase A/C power, at 60 Hz, using its diesel engine driven, 400 kW emergency generator. In general, power supplied by the emergency generator is stable.

However, loss of the voltage regulator has, historically, resulted in oscillations of both voltage and frequency in the generated power.

The 120 VAC electrical distribution system aboard the ship is unlike those found in a typical shore side installation. The 120 VAC circuits have no neutral. Both legs coming to any given receptacle have power. Ground is not carried within the power cable. Instead, ground is provided by bonding receptacles to the ship's hull. Ship's ground is referenced to earth through one of the shore power ties. Grounding of both 120 VAC electrical circuits and low-voltage instrumentation circuits has been a problem that results in moderate to high levels of noise in some data signals

2.4 Test Environment

2.4.1 Blown Optical Fiber Gigabit Ethernet System

The existing Gigabit Ethernet System aboard the ex-USS Shadwell consists of an optical fiber plant (system backbone), and routing and distribution equipment that manages Ethernet data between ten Node Rooms. The backbone of this system operates at Gigabit speeds and handles large volumes of standard/fast 10/100 Mbps Ethernet data with an RJ-45 interface. The Sumitomo FutureFlex Air Blown fiber cable plant is constructed using a 7-tube backbone connected through 10 tube distribution units (TDUs). Each TDU is installed in or near the ten Node Rooms. Switching and distribution hardware is installed in each of the Node Rooms to form the Ethernet backbone and to route data on the system.

The Gigabit Ethernet system consists of two types of routing switches. These are the Accelar 1100 and the Accelar 1200. Two (2) Accelar 1200 switches are configured with five (5) 1000 Mbps fiber optic modules to function as backbone switches. These routing switches are located in node room #1. Ten (10) Accelar 100 switches are configured with a 1000 Mbps fiber optic module to function as edge switches. One of these edge switches is located in each of the ten node rooms. The Accelar 1100 routing switches are dual-homed or routed separately to each of the two (2) Accelar 1200 routing switches.

A Windows NT 4.0 workstation is used to configure and control the Gigabit Ethernet system. The workstation is a 500 MHz Pentium III computer with a 10 Gb hard drive, 64 Mb of RAM, a CD drive, 3.5" floppy drive and a 17" monitor. The workstation is located in node room #1 and contains all of the Accelar management tools.

Access to the Gigabit Ethernet system is accomplished via sixteen (16) RJ-45 communications ports located in each of the ten (10) node rooms. Data is transmitted using standard Network Interface cards and equipment based Ethernet drivers. The system conforms to the IEEE 802.3 network specification using the 10/100 Base-T(X) for 10 Mb/s and 100 Mb/s transmission rates. Category 3 (CAT-3) or better unshielded twisted pair cable, with RJ-45 connectors, is required when using the 10 Mb/s transmission rate. Category 5 (CAT-5) unshielded twisted pair cable, with RJ-45 connectors, is required when using the 100 Mb/s transmission rate. The maximum cable length for both the 10 Mb/s and 100 Mb/s transmission rate is 100 m (328 ft).

Users of the Gigabit Ethernet system can use standard 10/100 network interface cards, with RJ-45 connectors, in computers. All remaining equipment must be configured with Ethernet compatible interfaces. The IEEE 802.3 Ethernet protocols will be used.

2.4.2 Physical Layout

Plan and elevation views of the test facility are provided for review and familiarization (Figs. 1-8). References to node room designations are in accordance with the facility fiber optic system and data trunk schematics (Fig. 9).

2.4.2.1 Node Room 1

The main laboratory control space is identified as compartment 02-36-0, is located on the 02 level and is designated as node room #1 (Fig. 2). This space is air conditioned. This space contains the current data acquisition system, audio/video equipment, gas analyzer equipment, and system controls for installed fire suppression systems, ventilation systems and pumping systems. In addition, this node room also contains components of the existing Gigabit Ethernet system. Those components include rack mounted back bone routing switches, an edge switch with sixteen (16) 10 base-T ports, a 96 port fiber optic patch panel, a rack mounted uninterruptible power supply (UPS) and an MPEG video encoder. The Windows NT network/video workstation, used to monitor video cameras and manage network switch routers, is also located in this node room.

2.4.2.2 Node Room 2

Node Room #2 is located in compartment 01-22-2 (Fig. 3). The space can be isolated from the surrounding environment through a fume tight door access. Cable ways passing into the space are sealed with fire-rated multi-cable transits (MCTs). The space is under constant, positive pressure ventilation to reduce smoke and soot entrainment, however, the space is not air conditioned. This compartment contains an Accelar 1100 routing switch, fiber optic edge switch #2 with sixteen 10 base-T ports, a 12-port fiber optic patch panel, a UPS, and an

MPEG video encoder. Node room #2 also contains the copper/copper and chromel/alumel terminal boards for copper wire signal cabling and dissimilar metal thermocouple wire, from the 02 level test area between FR22 and FR29.

2.4.2.3 Node Room 3

Directly below Node 1 is a compartment identified as 01-43-2. This space is the existing main data acquisition signal trunk and is designated as Node 3 (Fig 3). This node room is air conditioned. Exposure to smoke and soot is limited to non-existent. The environment of this node room is in direct contact with surrounding compartments. The compartment contains an Accelar 1100 routing switch, fiber optic edge switch #3 with sixteen 10 base-T ports, a 12-port fiber optic patch panel, a UPS, an MPEG video encoder. This node room also contains the main copper/copper and chromel/alumel terminal boards. These boards allow all copper wire signal cabling and dissimilar metal thermocouple wire, through-out the entire facility, to be routed to the existing data acquisition system.

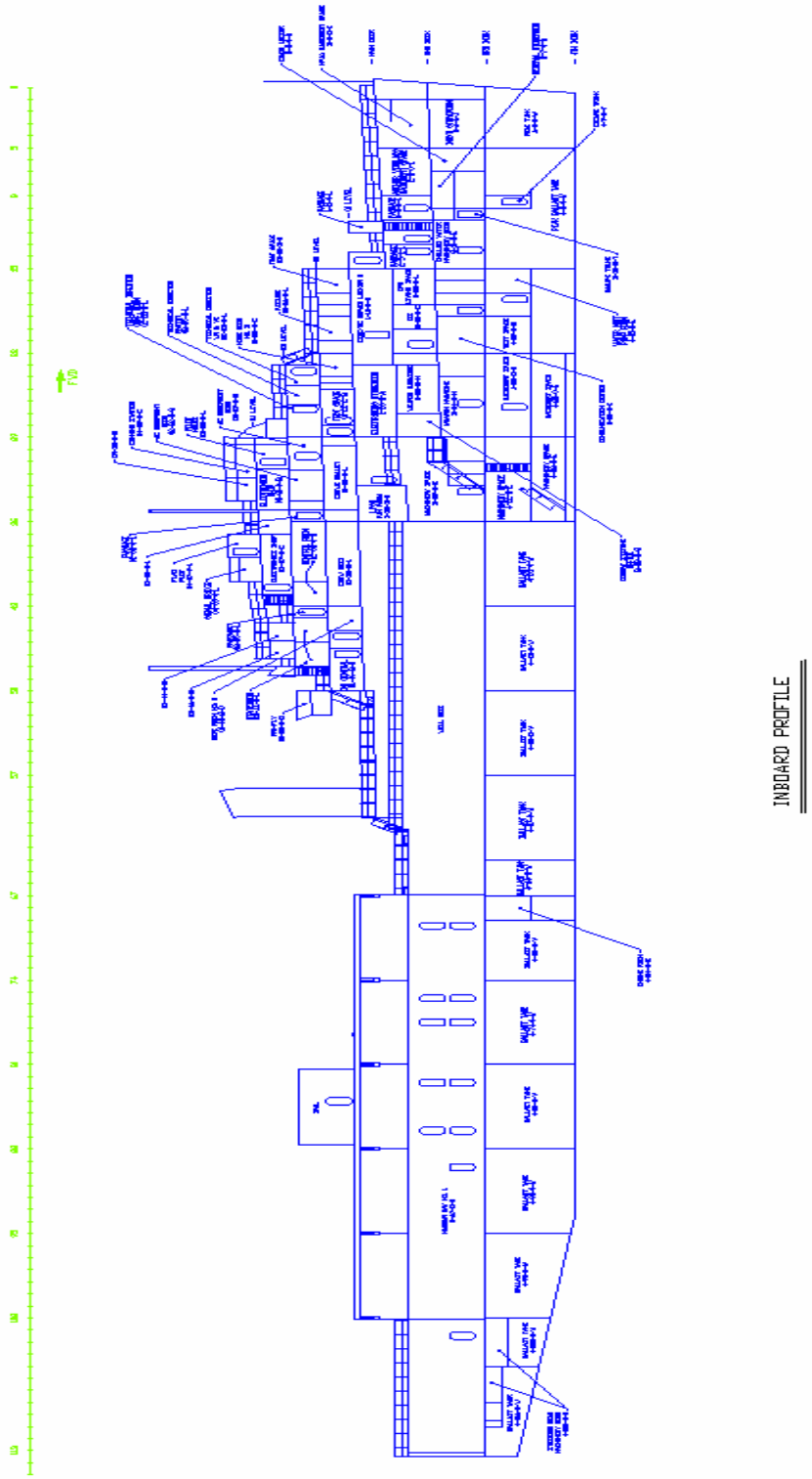

Fig. 1 Elevation View of ex-Shadwell

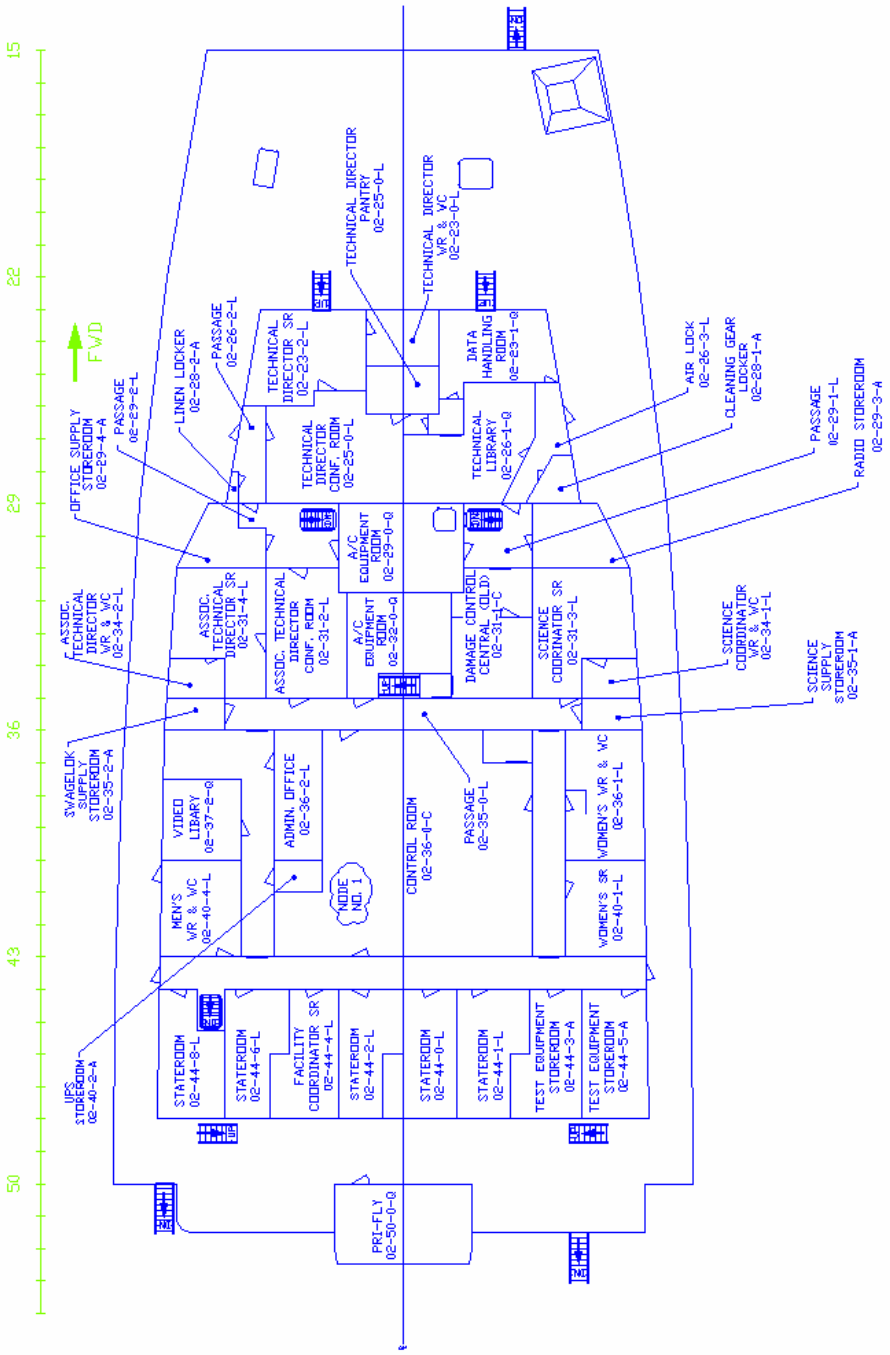

Fig. 2 Plan View of 02 Level FR15-FR51

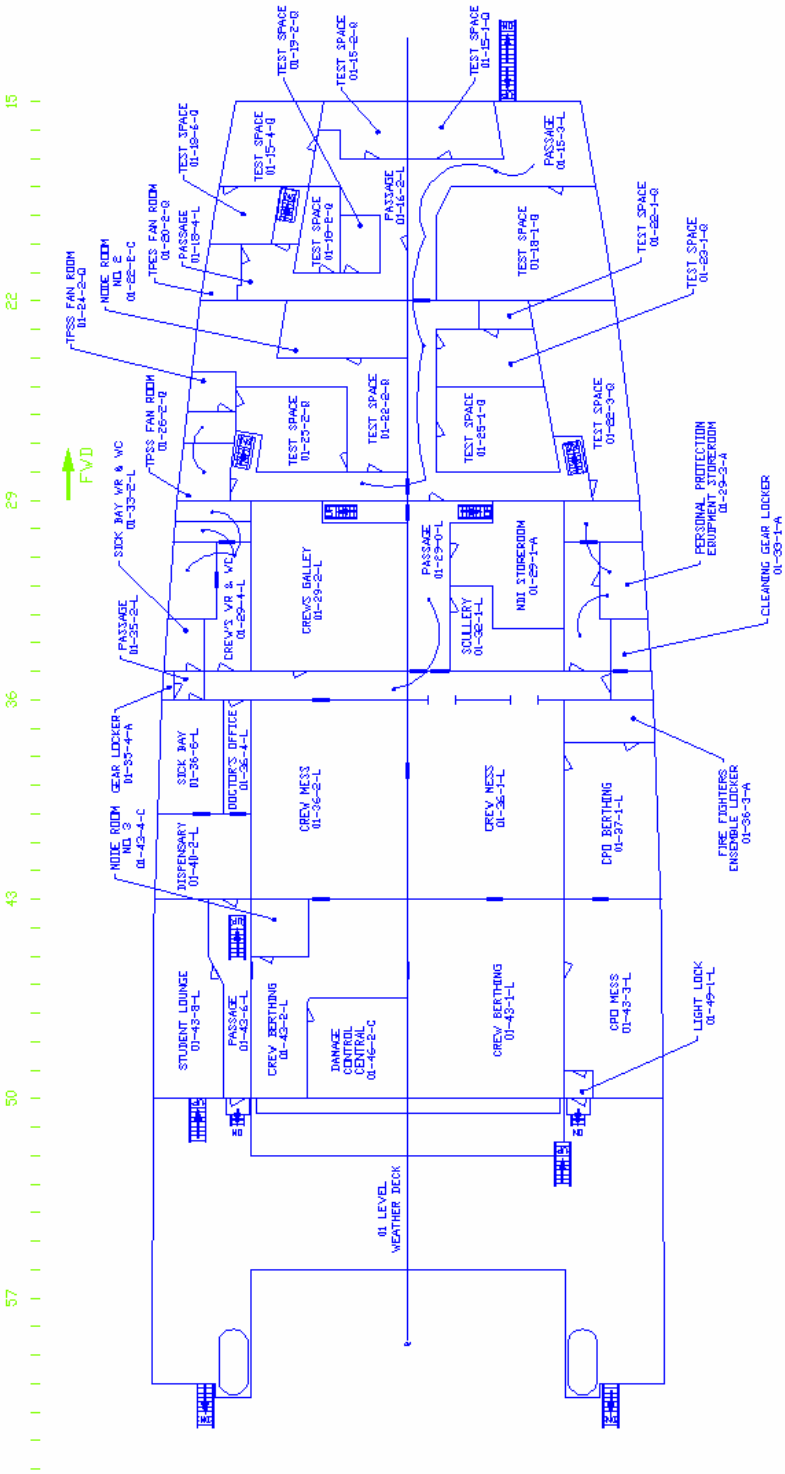

Fig. 3 Plan View of 01 Level FR15 – FR60

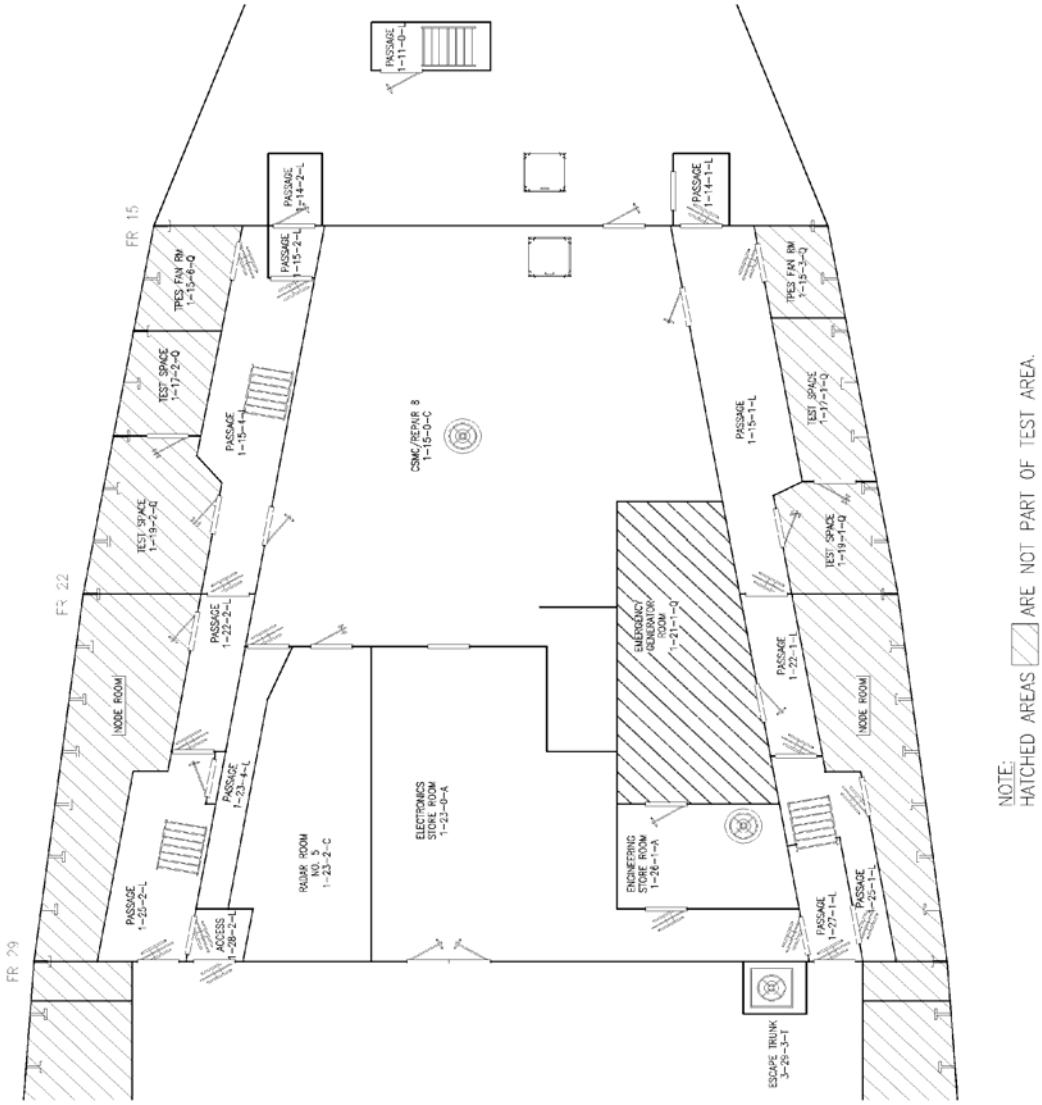

Fig. 4 Plan View of Main Deck Test Area FR15 – FR29

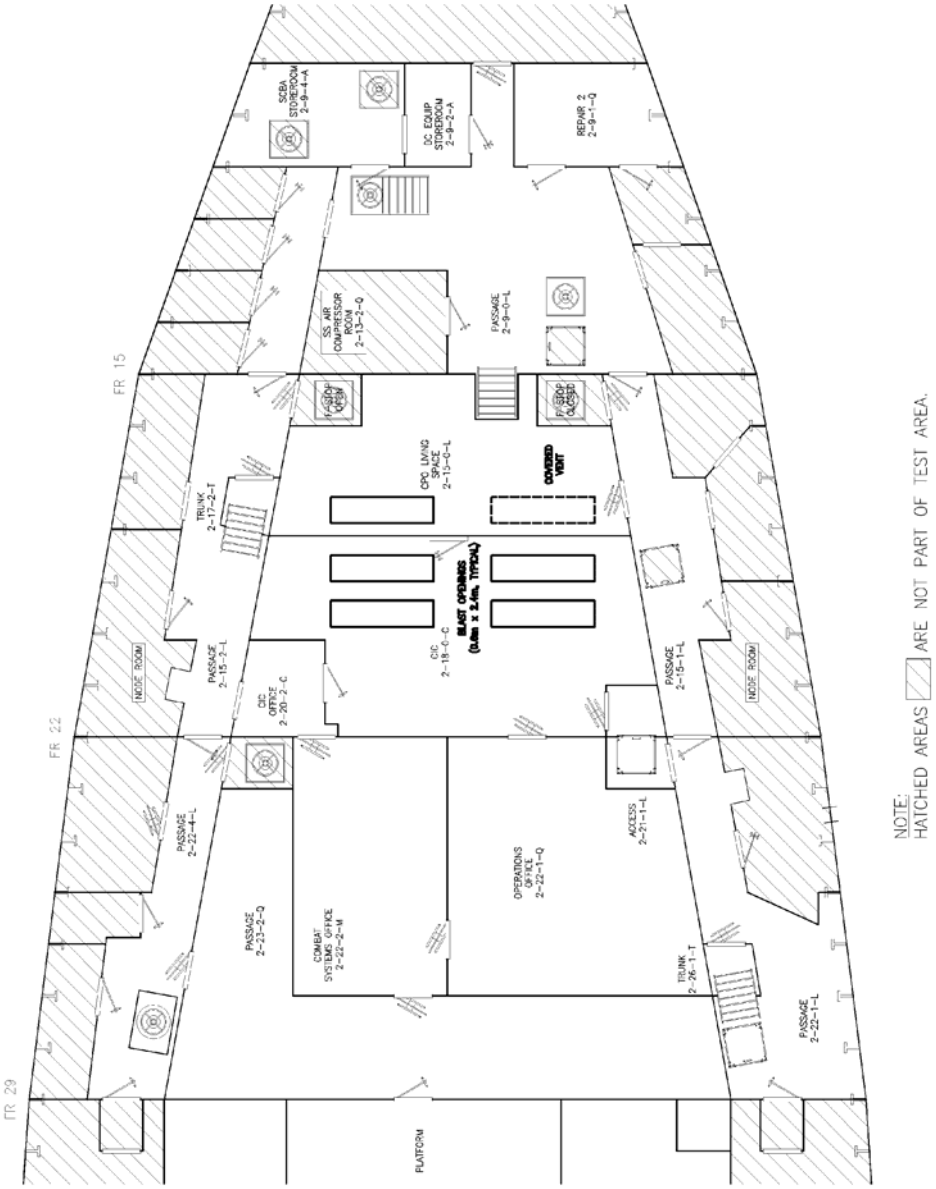

Fig. 5 Plan View of Second Deck Test Area FR8 – FR29

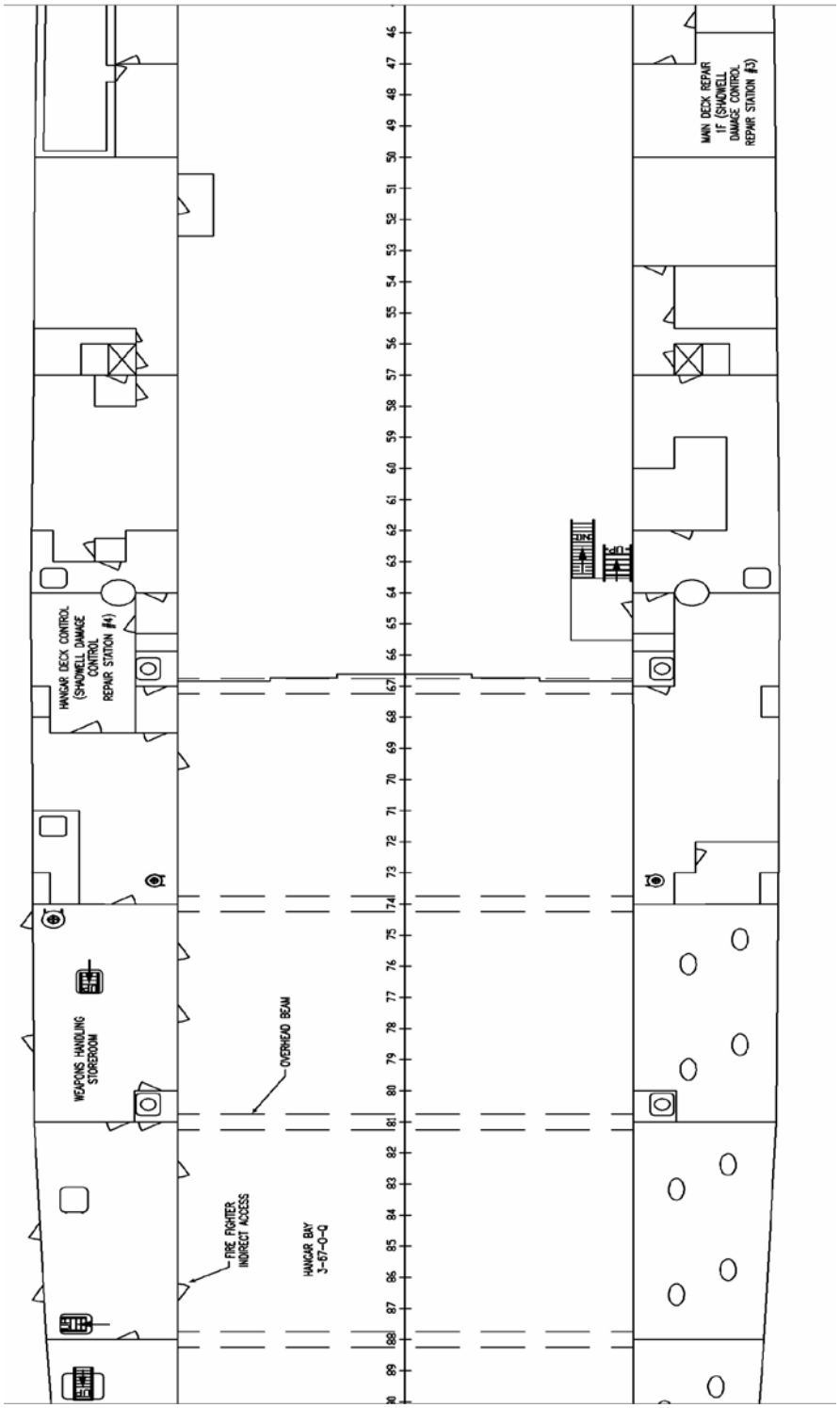

Fig. 6 Plan View of Well Deck Test Area FR45 – FR100

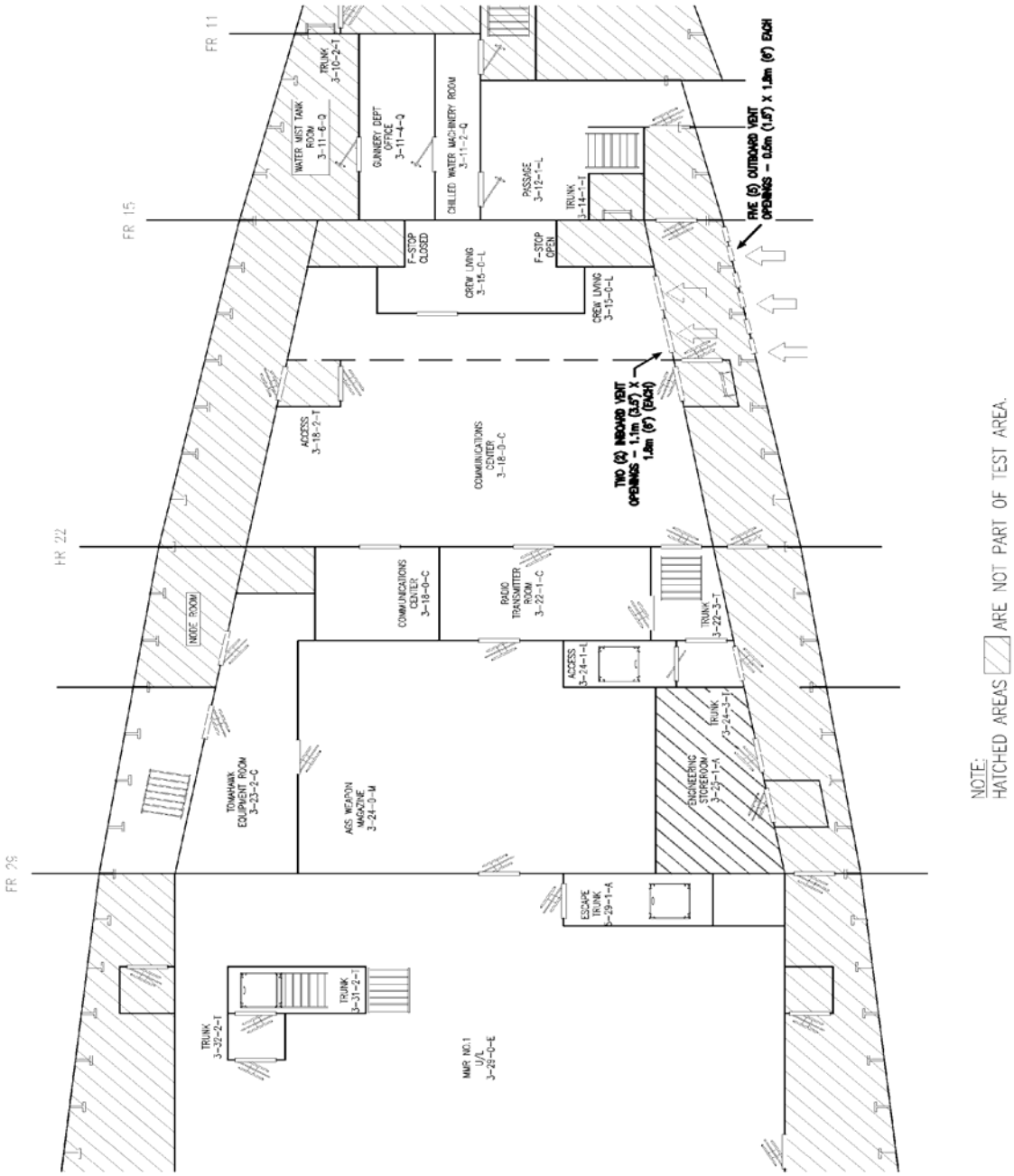

Fig. 7 Plan View of Third Deck Test Area FR11 – FR35

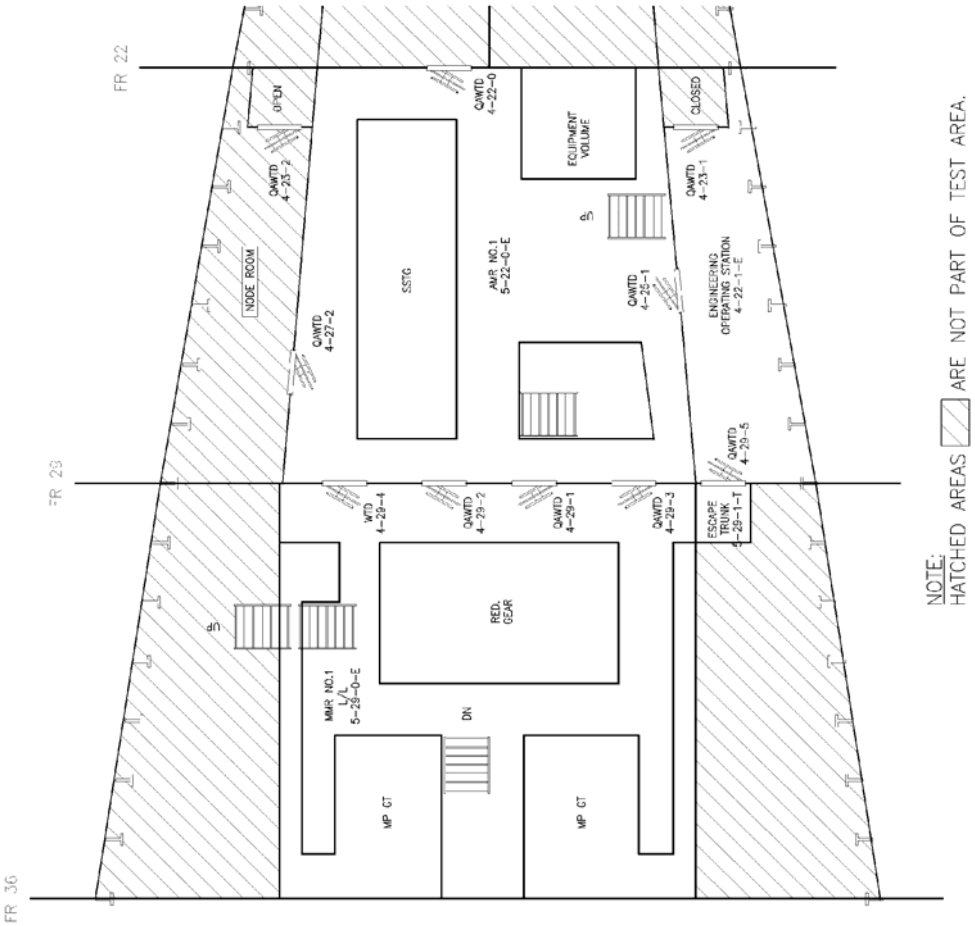

Fig. 8 Plan View of Fourth Deck Test Area FR21 – FR36

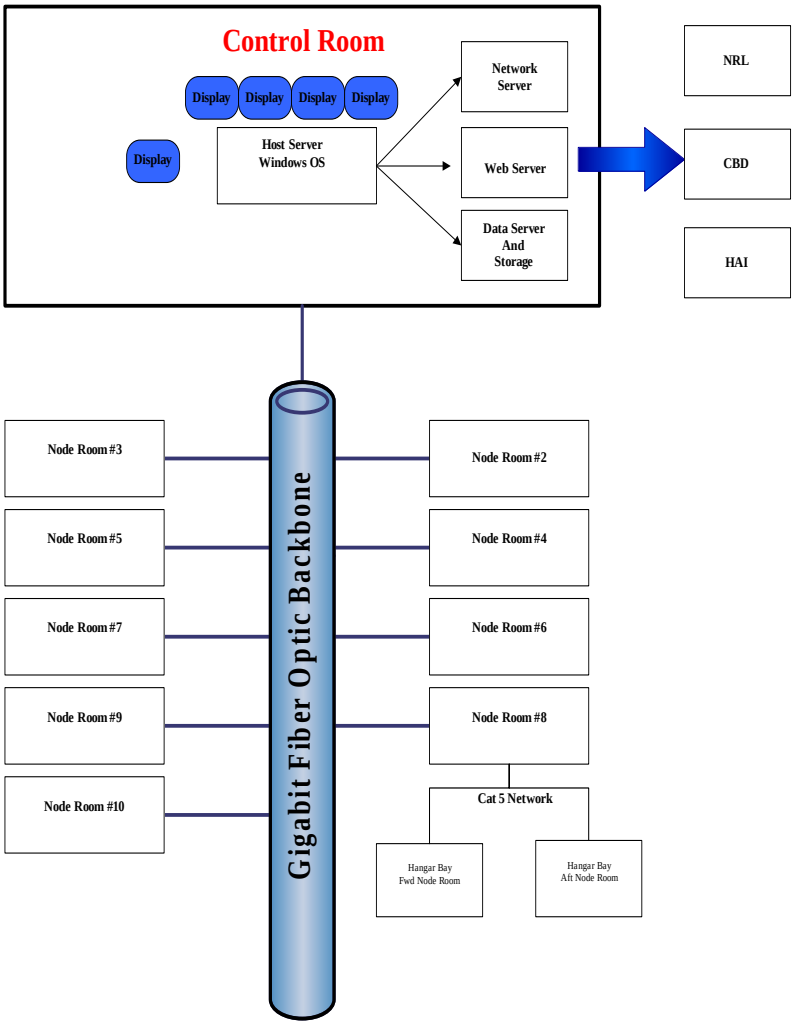

Fig. 9 Schematic of Proposed Data Acquisition System

2.4.2.4 Node Room 4

Node Room #4 is located in compartment 1-22-1 (Fig. 4). The space can be isolated from the surrounding environment through a fume tight door access. Cable ways passing into the space are sealed with fire-rated multi-cable transits (MCTs). The space is not air conditioned. This compartment contains an Accelar 1100 routing switch, fiber optic edge switch #4 with sixteen 10 base-T ports, a 12-port fiber optic patch panel, a UPS, and an MPEG video encoder. Node room #4 is outfitted with the copper/copper and chromel/alumel terminal boards for instrumentation from the starboard side main deck test area between FR15 and FR29.

2.4.2.5 Node Room 5

Node Room #5 is located in compartment 1-22-2 (Fig. 4). The space can be isolated from the surrounding environment through a fume tight door access. Cable ways passing into the space are sealed with fire-rated multi-cable transits (MCTs). The space is not air conditioned. This compartment contains an Accelar 1100 routing switch, fiber optic edge switch #5 with sixteen 10 base-T ports, a 12-port fiber optic patch panel, a UPS, and an MPEG video encoder. Node room #5 contains the copper/copper and chromel/alumel terminal boards for instrumentation from the port side main deck test area between FR15 and FR29.

2.4.2.6 Node Room 6

Node Room #6 is located in compartment 2-19-1 (Fig. 5). The space can be isolated from the surrounding environment through a fume tight door access. Cable ways passing into the space are sealed with fire-rated multi-cable transits (MCTs). The space is under constant, positive pressure ventilation to reduce smoke and soot entrainment, however; this space has a history of being dirty. The space is not air conditioned. This compartment contains an Accelar 1100 routing switch, fiber optic edge switch #6 with sixteen 10 base-T ports, a 12-port fiber optic patch panel, a UPS, an MPEG video encoder and several PC's being used to support various research efforts. Node room #6 is outfitted with the instrumentation support hardware for all copper/copper and chromel/alumel instrumentation from the port side of the 2nd deck test area between FR15 and FR29.

2.4.2.7 Node Room 7

Node Room #7 is located in compartment 2-19-2 (Fig. 5). The space can be isolated from the surrounding environment through a fume tight door access. Cable ways passing into the space are sealed with fire-rated multi-cable transits (MCTs). The space is under constant, positive pressure ventilation to reduce smoke and soot entrainment. This compartment has a history of remaining fairly clean. The space is not air conditioned. This compartment contains an Accelar 1100 routing switch, fiber optic edge switch #7 with sixteen 10 base-T ports, a 12-port fiber optic patch panel, a UPS, an MPEG video encoder. Node room #7 also contains the copper/copper and chromel/alumel terminal boards to which copper wire signal cabling and dissimilar metal thermocouple wire, from the port side main deck test area between FR15 and FR29, is directed.

2.4.2.8 Node Room 8

Node Room #8 is located in compartment 3-70-2 (Fig. 6). The space can be isolated from the surrounding environment through a single quick acting water tight door and a quick acting water tight scuttle. Cable ways passing into the space are sealed with fire-rated multi-cable transits (MCTs). The space is not air conditioned. This compartment has a history of remaining fairly clean. This node room contains an Accelar 1100 routing switch, fiber optic edge switch #8 with sixteen 10 base-T ports, a 12-port fiber optic patch panel, a UPS, and an MPEG video encoder. Node room #8 serves as the routing point for copper wire signal cabling and dissimilar metal thermocouple wire, from the port side aft test area between FR64 and FR95. This node room further serves as a link to recently constructed node rooms that serve the forward and aft portions of the hanger bay test area.

The two hanger bay node rooms are connected to node room #8 with a CAT 5 ethernet cable network. These additional node rooms are not air conditioned. The distance from node room #8 to the furthest of the two new node rooms is approximately 38 m (125 ft). Outfitting of the hanger bay node rooms is limited to thermocouple and signal support hardware. Access to the fiber optic network will be through the CAT 5 ethernet cable and the sixteen (16) RJ-45 connectors located in the edge switch installed in node room #8.

2.4.2.9 Node Room 9

Node Room #9 is located in compartment 3-24-2 (Fig. 7). The space can be isolated from the surrounding environment through a single quick acting water tight door. Cable ways passing into the space are sealed with fire-rated multi-cable transits (MCTs). The space is not air conditioned. This compartment has a history of remaining fairly clean. This node room contains an Accelar 1100 routing switch, fiber optic edge switch #9 with sixteen 10 base-T ports, a 12-port fiber optic patch panel, a UPS, and an MPEG video encoder. Node room #9 serves as the routing point for all instrumentation for the 3rd deck test area between FR15 and FR29.

2.4.2.10 Node Room 10

Node Room #10 is located in compartment 4-22-2 (Fig. 8). The space can be isolated from the surrounding environment through a single quick acting water tight door. Cable ways passing into the space are sealed with fire-rated multi-cable transits (MCTs). The space is not air conditioned. The space is immediately adjacent to the facility's machinery space fire test compartment. This compartment has a history of remaining fairly clean. This node room contains an Accelar 1100 routing switch, fiber optic edge switch #10 with sixteen 10 base-T ports, a 12-port fiber optic patch panel, a UPS, and an MPEG video encoder.

Node room #10 serves as the routing point for the 4th deck test area between FR15 and FR29.

3.0 Operational Requirements

3.1 General System Description

The required data acquisition and control system must be modular and capable of being distributed throughout the facility. The facility is 6 levels tall with a total floor space of approximately 18,580 m^2 (200,000 ft^2). The system servers will be located on the 02 level (Fig. 2). The remote acquisition and control modules will be installed in node rooms from the 01 level down to the 4th deck level (Figs. 3-8). The distance between the system servers and the most remote acquisition and control module will be approximately 152 m (500 ft.). The distance between individual node rooms will be a minimum of 37 m (120 ft) and as much as 91 m (300 ft). Instrumentation will be hard wired into data acquisition and control modules. Instrumentation wiring, connecting the acquisition and control module electronics to any specific instrument or component, could be 31 m (100 ft) in length.

Reliability of the components and servers within the proposed system will be in accordance with MIL-HDBK-217F.

The system must be capable of transmitting and receiving control commands and test data over both fiber optic and copper wire networks, must interface with existing copper/copper and chromel/alumel test instrumentation, must interface with an existing Field Point network and be designed for real-time local viewing, remote viewing, and remote and local data logging capability. Data must be accessible from the primary server throughout the test, real-time, via an Ethernet interface. The selected system must be capable of controlling test critical hardware, collecting, processing and distributing data prior to, during and after test completion. The system must incorporate redundancy to eliminate single point of failure problems and have open architecture platforms to interface with third-party software and hardware devices.

The system must be adaptable to both common industry and prototype hardware. The system should further be compatible with command and control protocols such as; Data Socket Transfer Protocol (DSTP), File Transfer Protocol (FTP), Hypertext Transfer Protocol (HTTP) and Ole Process Control (OPC). The system will be capable of accepting instrumentation voltage inputs in the ±5mVDC to ±30VDC range and input currents of 0 to 20 mA. The system must not be susceptible to RF or EM interference. The system must be designed with UPS back-up to provide a minimum of 15 minutes of power.

3.1.1 System Servers

Design of the data acquisition and control system must allow for redundant system servers. One server will be designated as primary and will perform all data acquisition and system control functions. The second server, designated as the back-up, must run concurrently with and in the background with respect to the primary server. The back-up server must maintain all functionality of the primary server, be unaffected by operational problems with the primary server, and continue to perform all data acquisition and control functions should the primary server fail during operations. Both servers must be designed with dual, high speed processors as specified below.

Both of these components will be located in Node room #1, compartment 02-36-0 (Fig. 2). The servers must be capable of being located at least 213 m (700 ft) from any given remote data acquisition module. They must be capable of interrogating all remote acquisition modules over either fiber optic or copper wire networks to acquire specific packets of data based on requirements of the program investigator. The servers must have the ability to issue commands to all remote acquisition and control modules so that the remote module can activate and monitor peripheral systems such as ventilation fans, ventilation system dampers, fluid system pumps and fluid control valves.

The servers must be capable of accessing data across the network in real time or mean real time. The servers should be able to control data transfer across the entire network to preclude excessive transfer collisions. Both servers will have the ability to store large volumes of transferred data and have the capacity to download data onto portable storage media such as a DVD. Both servers will be compatible with software designed to collect, log, plot, print and graphically display data.

The servers should be capable of being addressed via keyboard or mouse from its centralized location. The servers must allow for remote access and data transfer over the Internet.

Each server must meet or exceed the following minimum performance specifications:

a. Dual Core Intel® Xeon Processor, 2x2 Cache, 2.8 GHz, 800 FSB, 64 bit
b. Dual port Gigabit Network Adapter
c. 8GB DDR2, 400 MHz (4x2GB), Single Ranked DIMMS
d. Riser with ROMB and PCI-E support
e. Multiple PCI and PCI-E expansion slots
f. Multiple disc drives, each 250 gigabyte minimum capacity.
g. On-Board RAID 5, Split Backplane, 5 drives connected RAID
h. Minimum of 4 ports, USB 2.0

i. Video capability for 5 simultaneous displays, PCI Express (not repeated but 5 different displays, simultaneously)
j. DVD Read/Write drive
k. CD Read/Write drive
l. 3.5” Floppy drive
m. Windows XP
n. UPS back-up

3.1.2 System Monitors

The required data acquisition and control system must accomplish display of collected data in real-time. The monitors chosen for this system must be capable of accepting assignments for specific data fields such that no two monitors will display the same information. This would allow one monitor to display specific channels of temperature data, in tabular form, while other monitors will be capable of displaying time dependent, two-dimensional plots of other data. The monitors must be capable of continuous, real-time updates of all selected data so that investigators can view time-dependent evolutions of specific variables and physical phenomena.

The monitors shall be LCD flat panel, full color type. The government will install these monitors in Node room #1. Monitors must meet or exceed the following minimum specifications:

a. 21 inch viewable screen size
b. TFT Active matrix display
c. 700:1 contrast ratio
d. 1600 x 1200 active native resolution
e. 0.25 mm pixel pitch
f. 170°/170° viewing angle
g. Analog and digital video inputs
h. 16 ms response time
i. Scanning frequency of 30-81 kHz horizontal and 56-75 Hz vertical
j. Panel capable of 90° pivot

3.1.3 Remote Data Acquisition and Control Modules

The required data acquisition system must be distributed throughout the facility. The system design must be such that a single point of system failure is eliminated. The distribution will require the Government to install satellite acquisition and control modules in eleven (11) node rooms, if all of the options are exercised. The distributed acquisition and control modules must be capable of on-board program storage and data logging.

Each node room must be equipped with satellite collection modules capable of 100 channels of data input with expansion capacity to 200 channels.

The remote modules must be capable of being configured for 75% dissimilar metal thermocouple input and 25% copper/copper signal input. Channel connection hardware must be configured as a differential type where, each negative lead is separate of and isolated from all other negative leads within the module. All satellite modules must be designed with internal clocks that can be synchronized with the servers, and each other, to the milli-second.

Design of the system must allow for any of the remote data acquisition and control modules to function independently of each other, and the system servers, without adverse impact to any component within the system. The remote data acquisition and control modules must be designed so that they may be controlled, configured and operated, at the remote location, by portable computer hardware. It is necessary that configuration options will include variation of sampling rate and variation in format of input or output signal (i.e. analog or digital). The interface with portable computer hardware must have the ability to support both hard wired and optical interfaces. Configuration of the remote data acquisition and control modules must allow for the portable computer to take control ‘at site’ and, perform data acquisition and peripheral component control functions without adversely impacting the remaining remote modules or either server. The remote modules must be capable of operating independently.

The remote acquisition and control modules must have on-board memory and processors capable of loading, storing and running software designed for addressing remote ventilation and pumping systems, associated fluid control hardware, electrically operated solenoid valves and other electrical or electronic system hardware using Ethernet, Lonworks or other command and control protocols. The modules must be capable of operating within environments that will regularly experience temperatures of 49 ^{o}C (120 ^{o}F) or greater and humidity levels of 80% or greater. The data acquisition and control modules must be capable of locally manipulating data using installed software. The software and the data acquisition and control module must be capable of storing the manipulated data in flash memory, submitting data to the system server upon command, and allow for localized download of data on DVD or other specified storage media.

The remote data acquisition and control modules must meet or exceed the following minimum specifications:

a. Capable of closed-loop control, data acquisition, signal processing and analysis, data logging and communication
b. Data sampling rates adjustable in the range of 1-100 samples/second
c. Data resolution adjustable in the 12 bit to 32 bit range
d. Built-in signal conditioning
e. Built in conversion circuitry (ADC or DAC)
f. Onboard memory for embedded program operation, program storage and data logging

g. Capable of transmitting data over both fiber optic and copper wire networks
h. Ability to accept signal inputs in the ±5mVDC to ±30VDC range, 0 to 20 mA
i. Compatibility with twisted pair copper wire, solid copper core coaxial cable, CAT 3 and CAT 5 ETHERNET cable
j. Built-in temperature compensation to accommodate dissimilar metal thermocouple instrumentation.
k. Capable of both analog and digital signal inputs and outputs
l. Format of the output signals should be variable and adjustable using installed system software
m. Capability to vary sampling rates and data resolution, using installed system software
n. Ability to reduce, isolate or eliminate the effects of RFI and EMI environments from data input signals and system control commands
o. Ability to reduce or eliminate noise due to grounding problems
p. NIST-traceable calibration
q. UPS back-up

4.0 Documentation and Warranty

a. A full set of all written documentation customarily provided to the public with a commercial item shall be provided. This shall include users manual(s) or equivalent as well as copies of any software, and any manuals for the software included with the system, if customarily provided. This documentation must be received at NRL with the system hardware, unless other arrangements are agreed to by the authorized Government representative. In addition to the above documentation which is customarily provided, the following specific documentation is required, and shall be included in the price of the data acquisition and control system:

    1. At least two copies of the user's manual(s), for the servers, monitors, remote control and acquisition modules and all installed, licensed software. Documentation should include appropriate instructions on the set-up, operation, maintenance and trouble shooting of the computer, monitors, remote control and acquisition modules and any software included with the system. The documentation must allow a typical operator to understand the behavior and limitations of the system and to operate the system in an optimal manner.

b. The contractor shall offer the Government at least the same warranty terms, including offers of extended warranties, offered to the general public in customary commercial practice. These warranty terms must be included in the system price. The period of the warranty shall begin upon acceptance.

5.0 Acceptance

Final acceptance of the system is contingent upon 30 hours (6 hours per day for 5 consecutive days) of rated performance with no malfunctions of an electrical, electronic, or software nature. If a malfunction occurs, the acceptance procedure will be repeated (i.e. start at zero hours) after the malfunction is corrected.

6.0 Installation and Training

a. The price of the data acquisition system must include delivery of the instrument to the Navy Technology Center For Safety & Survivability, Mobile, AL. The Government will accomplish installation.
b. At the completion of the installation and the acceptance testing, the successful offeror must provide on-location hardware training at the Navy Technology Center for Safety & Survivability, Mobile, AL., for 5 people for a minimum of two days to familiarize the operators with proper operation and care of the data acquisition system.
c. Prior to the completion of the installation and the acceptance testing, the successful offeror must provide software training for 3 people for a minimum of 5 days to familiarize programmers and administrators with the abilities, limitations and programming techniques necessary to successfully operate the data acquisition system. This training can occur at the Mobile, Al. facility or at a mutually agreeable and suitable location within 300 miles of the Mobile, Al. facility.

7.0 System Service and Maintenance

The data acquisition and control system must include hardware and software system support, and readily available telephone and computer based technical support. Telephone and computer based support must be available from 0700 to 1630 Central time, Monday through Friday for a period of at least one year. Manufacturing engineering support shall be designed so that replacement or upgrade components have off-the-shelf availability.

8.0 Specifications for Option Items

Offerors are required to propose on a base system as outlined by the specifications set forth in paragraphs 1 though 7 above. In addition, offerors are required to propose on options 1 and 2 as outlined below for expansion of the system. Any option items, if exercised, will be exercised at time of award.

8.2 Option 1 – CLIN 0002

a. Remote acquisition and control modules sufficient to outfit 2 additional node rooms to collect 100 channels of data each
b. Licensed software installed in the remote modules to perform required data acquisition, storage and transfer
c. Component and software documentation
d. Component warranties
e. UPS back-up units for the acquisition and control modules

8.3 Option 2 – CLIN 0003

a. Remote acquisition and control modules sufficient to outfit 4 additional node rooms to collect 100 channels of data each
b. Licensed Software installed in the remote modules to perform required data acquisition, storage and transfer
c. Component and software documentation
d. Component warranties
e. UPS back-up units for the acquisition and control modules