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UTILITY CONTROL SYSTEM, FIRST INCREMENT
MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

OPTIONAL FORM NO. 10
5010–103

UNITED STATES GOVERNMENT

Memorandum

TO :

DATE: 9 February 1977

FROM : Assistant Resident Officer in Charge of Construction, Jacksonville, North Carolina Area

SUBJECT: Computer Sciences Corporation - Proprietary Notice

1. To date, a final decision on the priprietary limits to which the contractor is entitled has not been made by NAVFACENGCOM.

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M.D. Moore

M. D. MOORE
Lieutenant (jg), CEC, USN

CSC

COMPUTER SCIENCES CORPORATION

UTILITY CONTROL SYSTEM, FIRST INCREMENT
MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

VOLUME 1
TECHNICAL PROPOSAL

Prepared for
DEPARTMENT OF THE NAVY
Atlantic Division
Naval Facilities Engineering Command
Naval Station
Norfolk, Virginia

In Response to
REQUEST FOR TECHNICAL PROPOSAL
N62470-75-B-5437

12 AUGUST 1976

7-6451

CSC
COMPUTER SCIENCES CORPORATION

6

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PROPRIETARY NOTICE
(See Reverse)

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COMPUTER SCIENCES CORPORATION

INDUSTRIAL AND UTILITY SYSTEMS CENTER

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SECTION 1 - INTRODUCTION

1.1 SCOPE

Computer Sciences Corporation (CSC) is pleased to submit our Technical Proposal for the Utility Control System, First Increment at the Camp Lejeune facilities. This proposal is in response to the Department of the Navy, Naval Facilities Engineering Command Request for Technical Proposals N62470-75-B-5437, dated 26 May 1976 and Amendments No. 1, 2, 3 and 4 dated 30 June, 14 July, 21 July and 23 July 1976, respectively. The proposal is functionally responsive in all areas identified as the bidder's responsibility.

CSC is a systems "turnkey" contractor experienced in programming, engineering design, installation and startup of sensor and terminal-based computer systems similar to the system specified for Camp Lejeune.

1.2 ORGANIZATION OF PROPOSAL

Our Technical Proposal consists of ten sections and three appendices. Section 1 outlines the organization of the Technical Proposal, describes CSC's overall approach to implementing the proposed Utility Control System, and contains the Specification Compliance Cross-Reference Table. The Specification Compliance Cross-Reference Table provides a cross-reference between the technical aspects of the specification and specific responses contained in CSC's Technical Proposal. Section 2 describes the functional capability of the proposed system and includes the system equipment list, field devices, and an analysis of the system availability. Section 3 contains a description of the training and testing to be provided. Section 4 outlines the installation design, installation plan, and specific installation responsibilities. Section 5 describes the system documentation to be provided. Section 6 presents the proposed project organization and staffing for the project, the relationship of the Project Manager to CSC corporate management, the project management procedures to be employed, the project implementation plan and schedule, subcontractor to be employed and the subcontractor's responsibilities. Section 7 describes the expansion capability of the proposed system. Section 8 describes the maintenance aspects of the First Increment. Section 9 describes various system enhancements and

Section 10 discusses CSC's background and facilities and includes a description of CSC's experience in related computer-based data acquisition, control and reporting systems. Appendix A contains software packages available for use in the First Increment. Appendix B contains other software packages available for use with future increments. Appendix C contains the System Design Handbook for the proposed MODCOMP computer system and various manufacturers' brochures on equipment that CSC proposes to utilize.

1.3 SUMMARY OF APPROACH

CSC proposes to assume total systems (i.e., turnkey) responsibility for the Utility Control System for Camp Lejeune, North Carolina. This responsibility includes:

- Procurement, receipt, and check of equipment and materials as set forth in the Technical Proposal ✓
- Software system design, system generation, and programming of the applications routines
- Fabrication of CSC-furnished equipment
- Factory integration and testing of the system hardware and software
- Communication system design
- Installation planning
- Field installation of computer hardware, RTU, communication and interface equipment, and interconnection and installation of cabling
- Field integration of computer hardware/software, interface equipment, check-out, and system startup support
- Demonstration of Control System requirements and capabilities as defined in the specification
- Training of Camp Lejeune personnel in the operation and maintenance of the system
- Documentation of the total system.

CSC proposes to provide a system based on Modular Computer Systems Inc. (MODCOMP) mainframe and peripherals, supplemented by remote terminal units (RTUs) manufactured by F&M Systems Co. The system configuration, both hardware and software, makes maximum utilization of existing, field-proven components. The sensors and alarm devices proposed, representing offerings from several different manufacturers, were selected on the basis of reliability, maintainability, and "approach" compatability. The preliminary communication system was developed based on the specifications, site survey, and in-depth discussions with Camp Lejeune base communication personnel. It features utilization of existing telephone circuits and new cabling for both digital and tone transmission as well as RF communications links. System installation will be based on a preapproved installation plan designed to minimize utility outages and interruptions of normal base procedures. Consideration of future expansions are reflected in the overall system architecture, both at the computer and field level allowing "building block" type additions. The proposed architecture does not utilize unique or one of a kind devices which contributes to the overall availability and maintainability of the system in the Camp Lejeune operating environment.

1.4 SPECIFICATION COMPLIANCE

Table 1-1 contains required technical data to be utilized for technical review and evaluation.

Table 1-1. Required Technical Data Paragraph Number to CSC Proposal Cross-Reference Table

Required Technical Data Paragraph No.	Location of Response in CSC Proposal	Brief Description
1C.11 (a)	All Sections and Appendices	Overall Technical Data
1C.11 (b)	See List of Illustrations	Drawings
1C.11 (c) (1)	2.11.1	Equipment Schedule
1C.11 (c) (2)	2.11.2	Catalog Data
1C.11 (c) (3)	2.11.3	Overall System Maintenance
1C.11 (d) (1)	Section 3	Experience of Base Operators and Maintenance Personnel
1C.11 (d) (2)	8.2	Preliminary PM Schedule
1C.11 (d) (3)	8.3	Test Equipment
1C.11 (d) (4)	2.11.4	Spare Parts
3A.1	All Sections and Appendices	General Guidelines
3B.1	N/A	One of a Kind
3B.2	Section 9	Options
3B.3	Section 2, Appendices	Combination Manufacturers
3B.4	2.8	Application Software
3C.1	Section 7	Future Growth
	Section 10	Proposer's Competence
3C.2 (a)	4.5.6	Communication Subsystem Approach
3C.2 (b)	4.5.6	Types of Systems
3C.2 (c)	4.5.6	Recommendations
3C.3	N/A	Additional Data Required
3D.1	6.1.2	Proposed Project Organization
	10.2.1	Personnel Experience
3D.2	10.4	Facility Location
3D.3	N/A	Classified Information
3D.4	10.3	Similar Work
3D.5	6.4	Subcontracting
3D.6	6.3	Time Frame

SECTION 2 - DESCRIPTION OF UTILITY CONTROL SYSTEM - FIRST INCREMENT

2.1 GENERAL DESCRIPTION

The proposed system will permit remote monitoring and control of certain building, air conditioning and heating systems, monitoring of various sewage lift station operations, monitoring certain manned steam boiler operations, and monitoring base electrical power usage and peak demand at Camp Lejeune, North Carolina. The system is capable of future expansion in all hardware areas to support additional monitoring and control and has been designed to utilize standard, field-proven components. The applications software for this system will be programmed in FORTRAN wherever possible to facilitate future expansion of the monitoring, control and reporting functions.

2.2 COMPUTER SYSTEM FOR FIRST INCREMENT

The Computer System Hardware (Figure 2-1) will consist of a Modular Computer Systems MODCOMP II computer with 64,000 words of core memory, a real-time clock, a moving-head disk subsystem with 1.3 million words capacity, two terminals, three asynchronous communications interfaces for remote RTUs and one communication interface for a local RTU. The MODCOMP II computer features hardware multiply/divide, memory parity, executive and memory protect features, power fail/restart, and direct memory port.

2.2.1 CPU and Memory

The MODCOMP II is a 16-bit computer and has a large instruction set, 15 general purpose registers and protect features which enable it to use the MAX III Real-Time Operating System. The machine is structured around an internal bus linking all the components which comprise the system (Figure 2-2).

Features of the MODCOMP II computer are:

- Memory expandable to 64K words
- All memory directly addressable
- Memory protect and parity

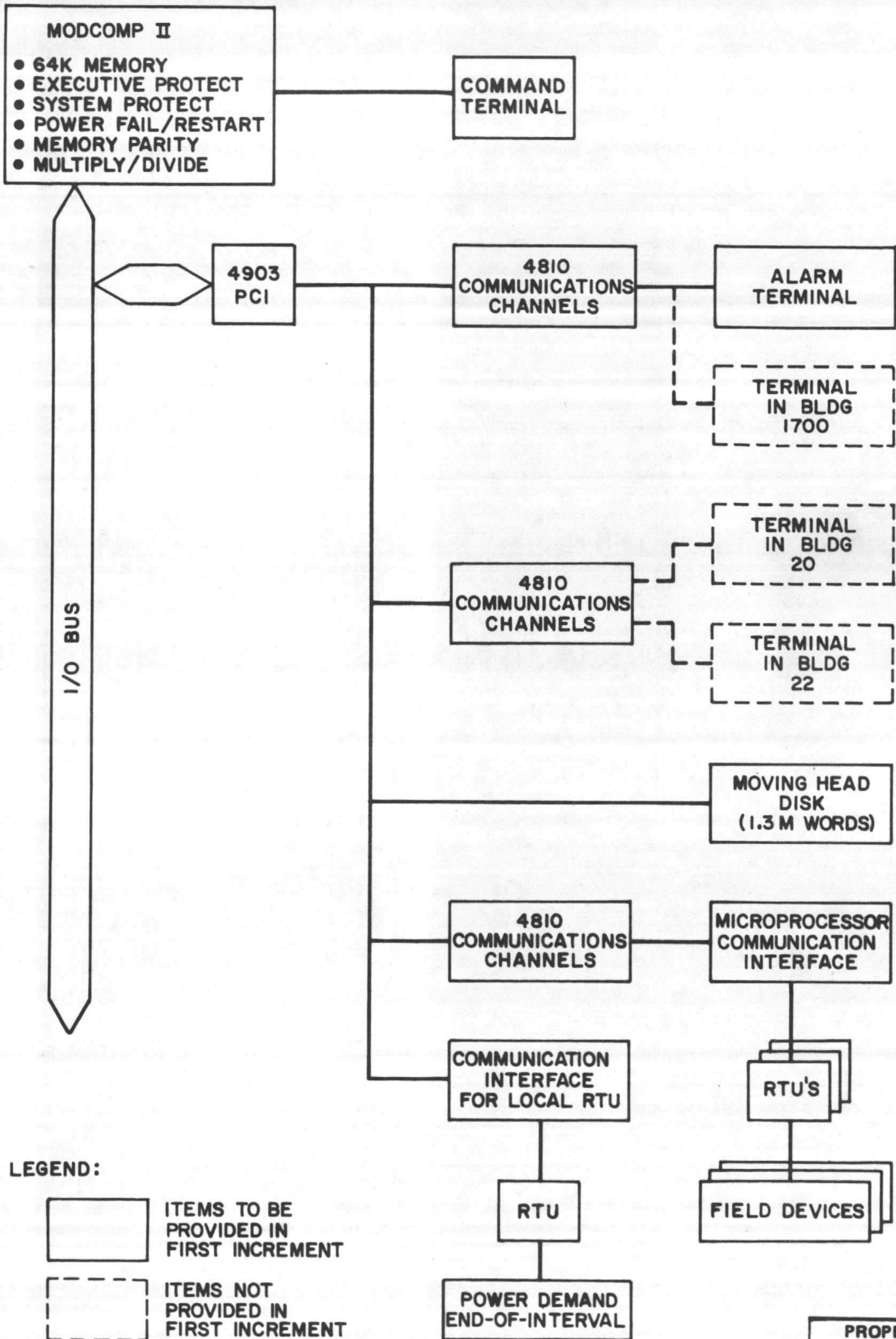

Figure 2-1. Computer System Hardware

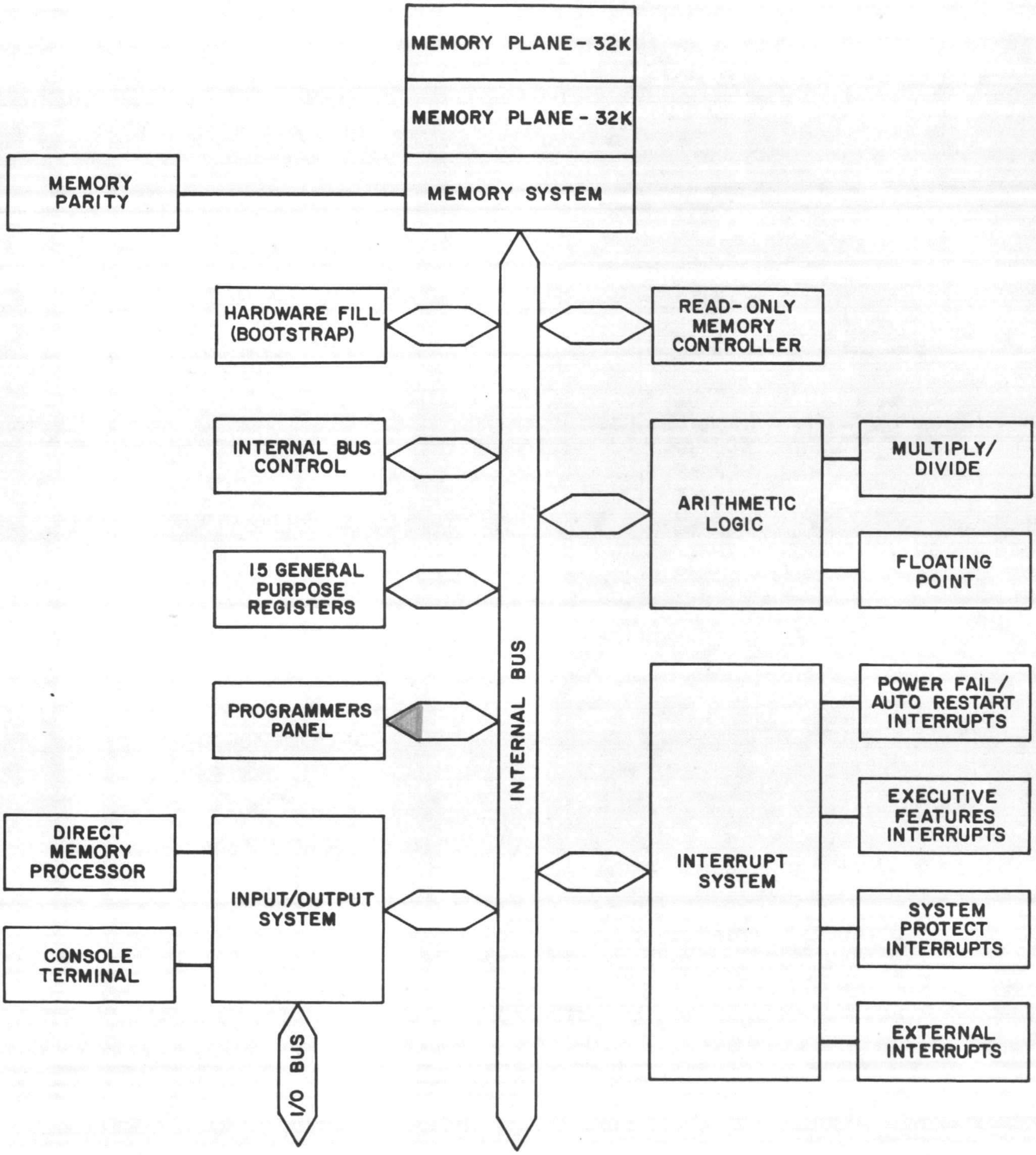

Figure 2-2. Central Processor Unit Components

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- High speed (850 nanoseconds*) read-write core memory containing 65,536 words with parity
- Power fail safe/auto restart
- Real-time clock
- 16 priority interrupt levels
- Hardware multiply/divide
- Floating point hardware.

2.2.2 Disk Storage

The Model 4126 proposed by CSC includes a controller and one disk drive; the controller is capable of driving three additional disk drives.

The moving head disk controller is connected to the computer by means of a Direct Memory Processor channel to provide automatic block transfer capability between the computer memory and disk.

The major hardware features, performance specifications and physical characteristics are listed in the Section 27 of MODCOMP's Systems Design Handbook, which is contained in Appendix C.

2.3 CONSOLE AND TERMINALS

The control room equipment will consist of two 19" relay racks containing the CPU and disk, storage and writing space, a digital clock display, a command terminal and an alarm terminal. Figure 2-3 depicts the equipment layout and rack elevations.

*Memory is overlapped when a second 3670 module (32K core memory) is added to the system. This technique reduces the effective memory cycle time to 850 nanoseconds from 1 μs.

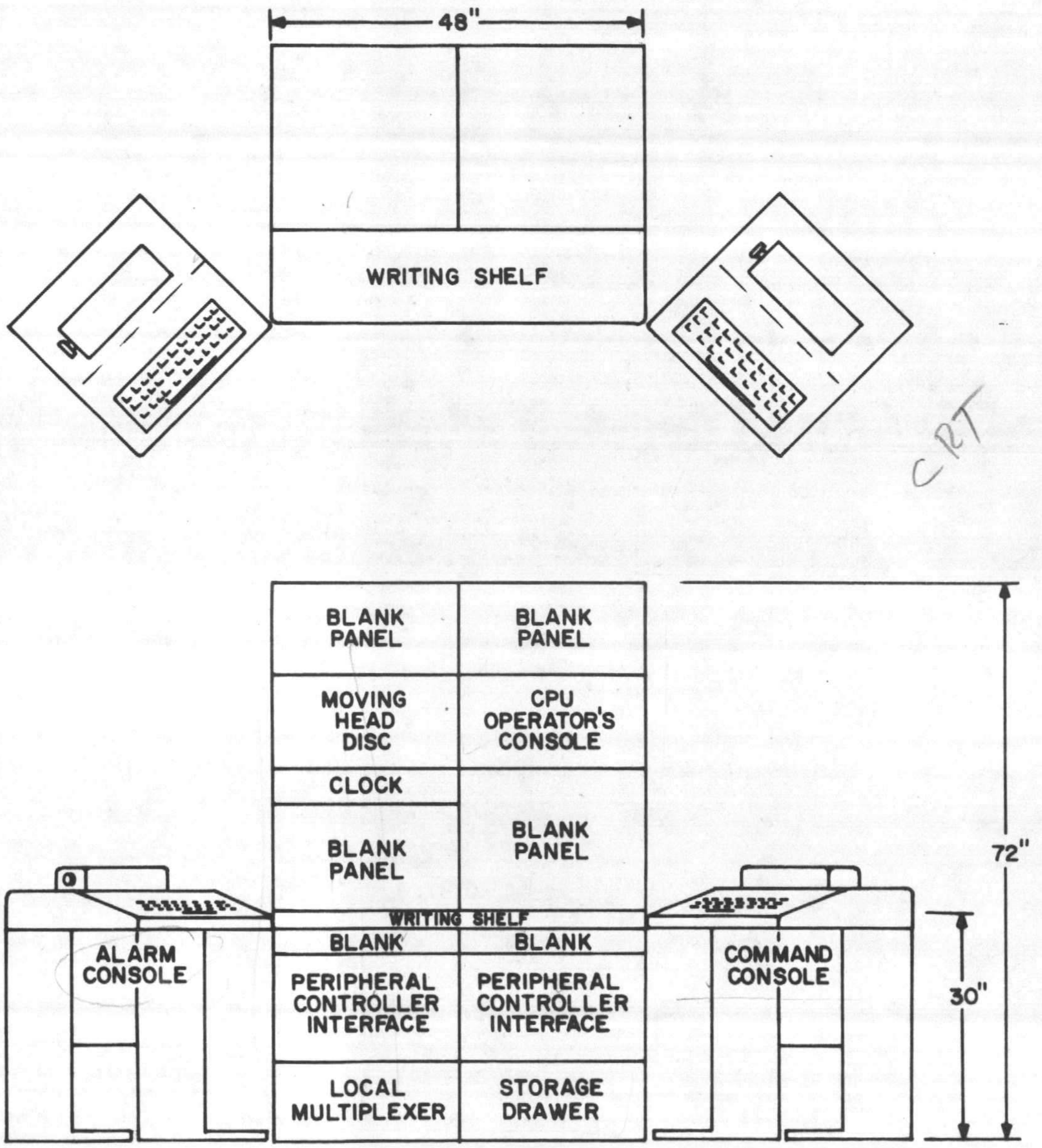

Figure 2-3. Elevation and Layout of Control Room Equipment

2.3.1 Terminals

The terminal, LA-36 DECwriter II, to be utilized was selected for three reasons. First, they are field proven devices which offer cost-effective performance for a broad application area. Second, use of these units permit all of the terminals, including those procured later, to be the same, thereby permitting interchanging of units. Third, the DECwriters are standard terminal devices and, as such, are fully software supported.

Features of the LA-36 terminal are:

- True 30-character-per-second effective printing throughput
- Pad or fill characters not required
- Lowest price, highest reliability in its class
- Office-standard keyboard minimizes operator training
- Full, 128-character ASCII keyboard, including 96 upper and lower case letter, number, and symbol printing set, plus 32 control characters
- Full, 132-character line length (10 characters per inch) allows use of standard line printer forms
- Positive tractor feed advances paper precisely without slipping or misalignment of multipart forms
- Movable left tractor lets you position forms horizontally for precise column alignment
- Movable right tractor lets you use forms as narrow as 3 inches and as wide as 14-7/8 inches
- Manual print gap adjustment produces uniform image density with single or multipart forms
- Multipart forms can be up to 20 thousandths of an inch thick, with up to five copies plus the original

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- Vernier vertical adjustment permits exact print head/form registration
- Unique print head design offers excellent readability and print quality over long product lifetimes with heavy duty cycles
- New ribbon mechanism eliminates smudging
- Quiet operation
- Integral 20-milliampere current loop is standard interface. EIA RS-232C interface is optional.

2.4 UNINTERRUPTIBLE POWER SUPPLY (UPS)

2.4.1 General Description

An Uninterruptible Power Supply (UPS) will be furnished. It will be sized to meet the continuous steady-state and power inrush requirements of the computer system. The UPS will be configured as shown in Figure 2-4 and will consist of a static battery charger, battery bank, static inverter, static switch, and associated controls and protective circuits.

Under normal operating conditions, the ac load is fed through the battery charger which supplies regulated dc to the inverter while float-charging the dc battery. Upon loss of the input ac line (208V), the inverter continues to furnish the computer system with uninterrupted ac power by drawing its energy from the battery bank. This battery bank will consist of lead-calcium cells with sufficient reserve to provide continuous power to the inverter for up to 4 hours. The battery will be mounted on earthquake proof racks.

Since the battery bank is always connected to the inverter as well as to the battery charger, there is no switchover time. The ac output frequency from the UPS is phase-locked to the input line under normal conditions. When there is no input voltage available, the output frequency is automatically determined by a stable internal oscillator. The static switch is used to transfer the inverter out of or into the circuit during maintenance or repair service. Additionally, this switch allows uninterrupted switchover to the utility line in order to supply fault clearing and inrush currents as required.

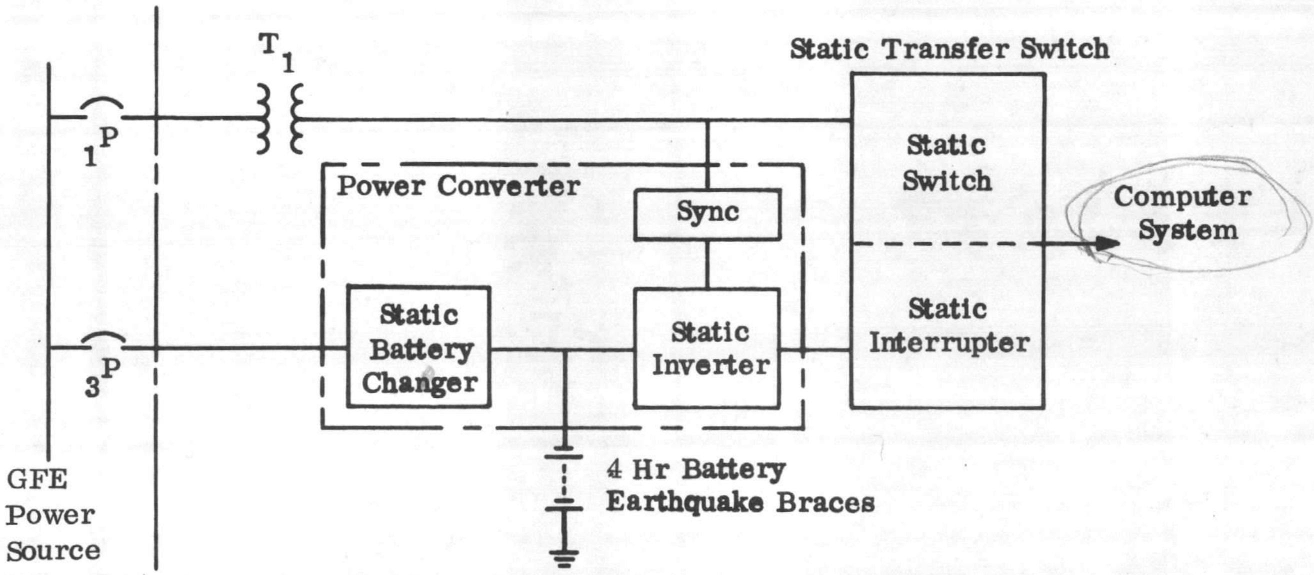


Figure 2-4. UPS Configuration

2.4.2 Supervisory Equipment

The UPS will be provided with all necessary supervisory equipment required to control and monitor its performance. Circuit breakers and/or disconnect switches will be provided to isolate each major assembly and provide protection against internal and external faults. An input ac breaker will be provided to open all conductors of the ac input circuit to the battery charger.

The battery charger control panel will have, as a minimum:

- Dc output voltmeter
- Dc output ammeter
- Ac input voltage pilot light.

The inverter control panel will have, as a minimum:

- Dc input voltmeter
- Ac output voltmeter
- Ac output ammeter
- Ac output frequency meter.

In addition, dry contacts will be provided to allow remoting any of the following alarm failure conditions:

- Battery charger - low dc output
- Battery charger - low ac input
- Static inverter - low ac output.

2.4.3 Detail Description

1. Battery Charger

   The battery charger is an SCR-regulated unit which has the advantages of good line and load regulation ($\pm 1\%$). The output voltage and current limit setting is adjustable. Its nominal output voltage setting will be 125 Vdc. The unit is very efficient (over 90%) which reduces the UPS room cooling requirements. The voltage output from the charger will "float charge"

the battery sufficiently to compensate for internal losses, prevent sulphation, and maintain the specific gravity at its proper level (1.210). Thus, the battery is kept in full readiness to provide current to supply the inverter for a 4-hour interval in case of power failure.

2. Battery Bank

The battery bank consists of lead calcium type batteries used as the emergency source of power to the inverter. The battery bank is sized for a 4-hour reserve including both the computer load and the internal losses of the inverter. —? ENVOIRMENT

The battery bank will be mounted on two-tier, earthquake-braced, battery stands. High impact polystyrene plastic spacers that fit between the cells, locking them securely together on the steel battery rack, will be provided. These spacers hold the cells together as a unit and prevent them from moving off the rack. A special flange fits between the rack rails to prevent side movement and clamps at each end to eliminate longitudinal movement.

3. Inverter

The static inverter consists of three functional elements: an elementary power stage that converts the dc input into a crude ac output, an ac output filter that eliminates unwanted harmonics generated by the power stage, and logic to provide sequential control over the power stage. These elements perform the following functions:

- Dc to ac power conversion
- Conversion to a fixed frequency and output voltage
- Provides a sinusoidal wave shape with minimum distortion
- Regulates the output for variations of both dc input and ac load including power factor
- Protects the inverter circuitry from overloads and short circuits
- Synchronizes the output frequency with the bypass line (utility).

The output specifications of the inverter are:

- Voltage: 120V $\pm 2\%$
- Frequency: 60 Hz $\pm 0.5\%$
- Rating: 15 kVA continuous
- Harmonic Distortion: 5% maximum
- Efficiency: 80% minimum.

4. Static Switch

The static transfer switch uses SCRs as the high-speed switches with one set employed between the utility and the load (the static switch) and the second switch between the inverter and the load (static interrupter). The SCR can be turned on and off in times as short as 50 microseconds. The total switching time of less than 1/4 cycle (4.2 milliseconds) includes the time required to sense an out-of-tolerance condition and complete the transfer. The sensing is accomplished under two conditions:

- The inverter output voltage or frequency falls outside the nominal steady state tolerance specified in Item 3.
- A "look ahead" diagnostic signal is received from the inverter logic observing short circuit or overload conditions or the dc link voltage falls below cutoff.

2.4.4 Manufacturer

The manufacturer of the UPS will be Elgar Corporation.

2.5 DATA ACQUISITION AND CONTROL HARDWARE

2.5.1 System Overview

The Data Acquisition and Control System is the communication media between the computer and the field sensors. Basically, this communications subsystem can be classified into four groups:

- Microprocessor Communications Interface (MCI) Unit - Handles communications protocol between the computer and up to 124 remote terminal units (RTUs)
- Modems - Allow communication between the MCI and the RTUs over long distances
- Communication Circuits - Existing telephone circuits, CSC-supplied cabling and RF links
- RTUs - Digitize and transmit field data (status and analog signals) to the MCI, process commands received from the MCI and convert these commands to either digital or analog outputs.

CSC proposes to utilize standard F&M Systems' hardware for the communications subsystem.

The proposed overall configuration for the Utility Control System is shown in Figure 2-5.

2.5.2 Microprocessor Communication Interface

Communications between the computer master station and F&M Systems' Supervisory Control and Data Acquisition (SCADA) RTUs are handled at the master station by F&M Systems' MCI.

Configuration of the MCI will provide for single port CPU interface and two communications links each. Each communications port is a serial RS-232-C compatible channel capable of data rates up to 9600 bits per second (bps). A serial CPU interface is provided for the CPU. Each of the communications link ports are also RS-232-C compatible for connection to tone equipment or to standard modems.

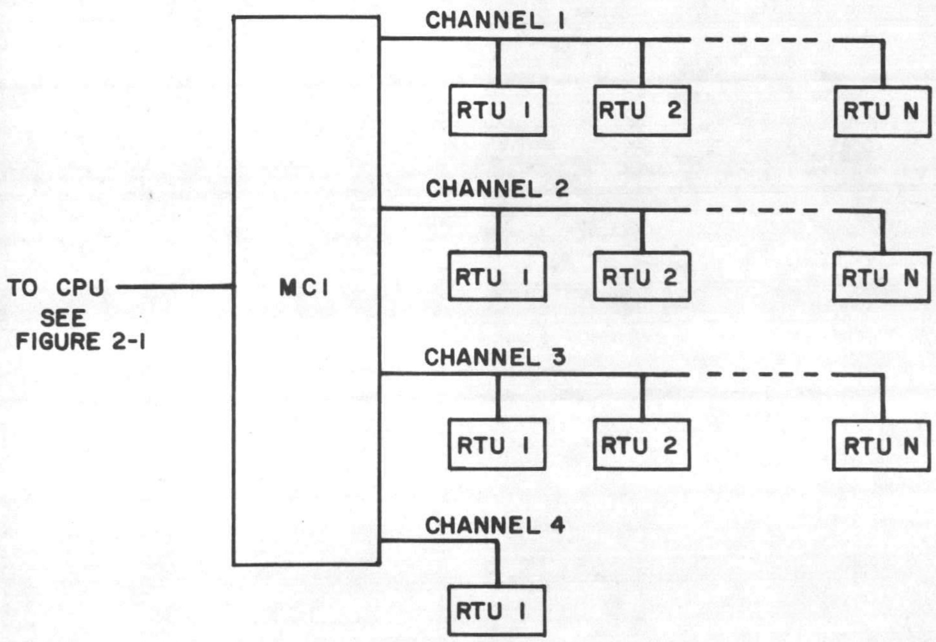


Figure 2-5. Proposed Configuration

Normal data rates provided by the MCI for communication link ports are 2N times 37.5, where N is an integer, up to a maximum of 9600 bps.

The proposed RTUs are designed for party-line operation. Each RTU on a party line is polled by the master station in turn to acquire data or to transmit control commands to it. The function of the MCI is to process outgoing and incoming messages and hand off data to the CPU. The following general description of the MCI will provide more details of its operation.

The MCI utilizes an Intel 8080 microprocessor together with a Read Only Memory (ROM) program and Random Access Memory (RAM) data storage to accomplish all necessary functions to convert from an 8-bit parallel or serial master station interface to a maximum of four modem interfaces. The command data received from the CPU is interpreted, formatted, and transmitted serially through the modem to the proper SCADA party line. The RTU reply is tested for validity and transferred to the CPU along with error and status data.

The message format utilized by the MCI is controlled by a program stored in ROM. Multiple formats may be programmed; however, only one format per party line is permitted.

All data is transferred between MCI and CPU in 8-bit bytes.

The serial CPU interface is EIA RS-232-C compatible. The following signal lines are used:

- TX Data
- RX Data
- Data Terminal Ready
- Data Set Ready
- Request to Send
- Clear to Send.

Data rates for the serial MCI to CPU interface are 9600 bps.

E st

The MCI communications link ports utilize F&M Systems' standard modems. The model modems operate in the asynchronous mode and for this application will provide data rates at 1210 bps.

The format of the MIC required for communication with the RTUs is:

- Sync — 3-bit, primary 010

  The SCADA 8000/80 concept requires a 3-bit sync code with an initial "0". Options will allow the following codes.

  001

  010

  011

  With the MCI, transmit and receive sync may be different

- Data Field — 16 bits; all information is transmitted in 16-bit fields in the SCADA 8000/80 format. Byte transfer to/from the CPU is bit ordered relative to the RTU format requirements.

2.5.3 Remote Terminal Units

The SCADA 80 RTU manufactured by F&M Systems was selected as the most cost-effective and versatile unit for the Utility Control System. The RTU is specifically engineered for locations where the number of control and monitoring points are limited.

The SCADA 80 is a digitally-multiplexed, polling remote terminal which, through modern technology, provides secure communication and reliable control and data acquisition at very small remote sites.

State-of-the-art CMOS integrated circuits allow the base RTU to operate on 1.0-watt average power, making possible operation from batteries in extremely remote locations. Communication will be provided over private communication lines.

The basic unit includes control logic, error detection, four pulsed checkback-before-execute controls, and eight status points. Transient and lightning suppressors and four interposing relays are also included in the basic unit.

A 6-bit BCH and parity check code is generated on each transmitted communication word and checked on each received work to monitor communications integrity.

2.5.3.1 Physical Characteristics

The SCADA 80 is enclosed in a drip-proof, weather resistant case measuring 20 inches wide, 20 inches high, and 8 inches deep (see Figure 2-6), which will be wall mounted.

When the front cover is opened, two switches (S1 and S2), an ac power indicator, and a main power fuse are visible. Switch S1 controls the main power, and switch S2 controls power to the interposing relays. Directly above these controls is a hinged panel which contains a window at the upper left to allow visual monitoring of the LED indicators on the modem.

To fold down the hinged panel, it is necessary to loosen a knurled knob on each side near the top. A finger hole near top center facilitates pulling the panel out and folding it down on the hinge. Retaining cables hold the panel horizontally positioned.

The panel contains drilled holes to allow mounting of two four-card capacity card files. The card file on the left is the base card file and contains the modem, the timing and control card, and the base I/O card. The card file mounting provisions on the right allow installation of an expander card file to allow optional use of 16-point status cards; 2-point, 16-bit accumulator cards; or 4-point analog input (ADC/MUX) cards. Behind the hinged panel, at the rear of the RTU, are mounting provisions for termination cards.

The basic SCADA 80 RTU contains a termination card which is attached in the second horizontal mounting location from the top. A ribbon cable connects this termination card to the base I/O function card in the base card file. The normally unused mounting provisions are for terminations used with optional I/O cards located in the expander card file.

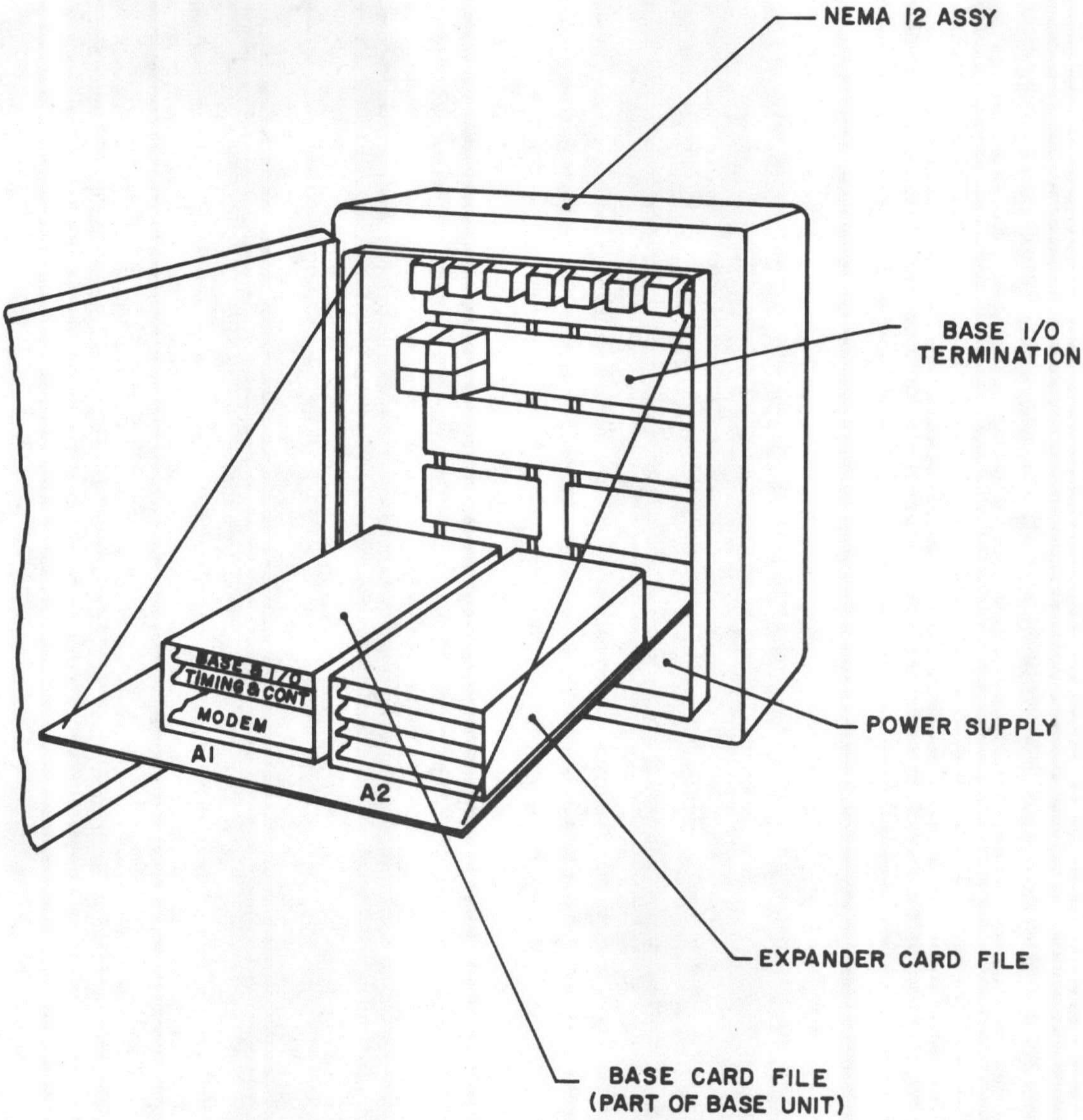


Figure 2-6. RTU with Expander Card File

The SCADA 80 RTU operates efficiently with a temperature range of -20° to +75° centigrade and 95% non-condensing relative humidity. The enclosure is constructed to provide maximum protection from dust, water, corrosive materials, and seasonal environmental conditions.

2.5.3.2 Analog Input Card

The SCADA 80 ADC/MUX card assembly receives four independent differential analog signals from termination card 220070-01 which must be used with this card. Each input is buffered with solid state operational amplifiers which provide offset and gain adjustments to condition the selected signal for input to the analog-to-digital converter (ADC). The conditioned analog signals are multiplexed into the ADC using FET switches. Specifications are as follows:

- Analog Input

- Number of Inputs:	4, differential
- Analog Input:	0.1 to +5.5 volts adjustable
- Common Mode Voltage Range:	+40 volts
- Common Mode Rejection Ratio:	60 dB, 0 to 50 Hz 80 dB, 50 to 1 MHz
- Frequency Response:	0 to 7.5 Hz (down 6 dB/octave above 7.5 Hz)
- Input Resistance:	160K ohm
- Input Overvoltage Protection:	±200 volts, continuous differential or ±115 volts, continuous common mode

- Digital Output
  - Output Code: 11 bit binary
- ADC (only)
  - Conversion Technique: Dual slope
  - Conversion Time: 10 milliseconds
  - Accuracy: 0.01% of full scale

    Full Scale Input is 11111111111

    "0" Input is 00000000000

    Linearity $\pm$0.05% reading $\pm$1 LSB

    Range Temp. Coefficient $\pm$50 PPM/^{o}C reading

    Offset Temp. Coefficient $\pm$1 microvolt/^{o}C
  - ADC/MUX

    Offset Temp. Coefficient $\pm$75 microvolt/^{o}C

    Accuracy Temp. Coefficient +200 PPM/^{o}C

    Gain and Offset Error Adjustable to $\pm$1/2 LSB

    Power Required +12V +10% @ 375 mA
- Environmental
  - Temperature: 32°F 0^{o}C to +70^{o}C
  - Humidity: 95% (non-condensing)

2.5.3.3 Status Input Card

The 220056-01 card assembly allows 16 status points to be monitored as an optional addition to the SCADA 80 RTU. The expander card file can accommodate four of these cards to expand the eight status points monitored by the base unit to a maximum of 72. Termination assembly 220060-01 must be used with this card assembly. Specifications are as follows:

- Electrical
  - Input Source: Isolated contacts 2K ohms (or less) to logic common
  - Detection Threshold: Logic "0" +3 volts
    Logic "1" +9 volts
  - Contact Excitation: +12 Vdc, approximately 1 milliampere
  - Input Noise Filter: A low pass filter suppresses contact bounce and induced noise and accepts 100-millisecond closure
  - Input Voltage Protection: +130 Vdc continuous without damage: +600 volt 1 millisecond with gas discharge lightning protectors
  - Power Required: +12 Vdc at 50 milliamperes
- Environmental
  - Temperature: $-20^{o}C$ to $+75^{o}C$
  - Humidity: 95%

2.5.3.4 Relay Output Card

The 220049-01 Control output board and the accompanying 220053-01 Termination Assembly provide an additional eight points of relay output capability. This assembly requires a 220041-01 optional I/O card file. Specifications are as follows:

- Electrical
  - Number of Outputs: 8
  - Output Capability: 10 amps, 115 Vac
  - Relay Initial Breakdown Voltage: 1500 volts rms 50 Hz between all elements; 500 volts rms between open contacts

- Power Required:

220049-01	50 ma + 12 Vdc
220053-01	100 ma + 12 Vdc momentary

- Environmental

  - Temperature: -25^{o} to $+75^{o}$ centigrade
  - Humidity: 93% non-condensing

2.5.3.5 RTU Locations and I/O Counts

Table 2-1 contains the RTU locations and the I/O counts.

Table 2-1. RTU Locations and I/O Counts

Bldg. No.	Status Inputs	Contact Outputs	Analog Inputs
6	1	1	–
8	2	2	2
10	2	2	–
12	2	2	2
101	2	2	–
105	2	2	2
109	2	2	–
111	2	2	2
118	8	8	4
120	6	6	3
226	10	10	5
204	6	6	4
202	2	2	–
217	2	2	–
213	2	2	2
209	2	2	–
205	2	2	2
312	4	4	2
318	4	4	2
309	4	4	2
327	8	8	4
404	4	4	2
407	4	4	2
410	4	4	2
415	4	4	2
420	4	4	2
426	2	2	2
502	2	2	2
514	2	2	2
511	4	4	4
517	4	4	4
59	1	1	1
60	1	1	1
63	1	1	1
FC304	2	2	–
FC305	2	2	–
FC306	2	2	2
FC309	2	2	–
FC310	2	2	–
FC311	2	2	2
FC411	2	2	–

Table 2-1. RTU Locations and I/O Counts (Cont'd)

Bldg. No.	Status Inputs	Contact Outputs	Analog Inputs
FC412	2	2	-
FC413	2	2	-
FC414	2	2	-
FC415	2	2	-
FC416	2	2	-
FC300	4	-	8
M625	24	-	13
PP2615	15	-	9
G650	21	-	13
RR15	18	-	7
BB-9	25	-	11
M231	2	2	1

2.6 CSC-SUPPLIED FIELD DEVICES

2.6.1 Sensors

2.6.1.1 Temperature

Since thermocouples will not meet the stated accuracies and platinum RTDs were not an economical solution, CSC proposes to utilize standard thermistors. Thermistors are inherently sensitive, stable, and fast acting. Neither polarity nor lead length is significant and no reference temperature or cold junction compensation is required, as with thermocouples. Due to the large voltage outputs provided and the short distances, most thermistors can be wired directly to the input of the analog section of the RTU. The unit will be a uni-curve type as manufactured by Omega Engineering with Industrial Grade Probe assemblies as required.

2.6.1.2 Pressure

Guage pressure transmitters will be utilized for boiler steam, water and steam atomization pressure measurements. The units will be Model 1144GO as manufactured by Rosemount. See Appendix C for complete specification.

2.6.1.3 Boiler Tank Level

Boiler tank level sensors will be differential pressure transmitter Model 1151 DP as manufactured by Rosemount. Complete specifications are included in Appendix C.

2.6.2 Temperature Transmitter

The temperature transmitter will convert the high level voltage output signal of the thermistor to a current (4-20 Ma) for transmissions where the distance to the RTU exceeds 1000 feet. The unit will be a Model 511 BX manufactured by ACROMAG, Inc. See Appendix C for detailed specifications.

2.6.3 HVAC Interface Unit

The HVAC interface unit is the hardware between the equipment being controlled and/or monitored and the RTU. In the proposed system there are two different types -- one for

barracks having central air conditioning and one for barracks having separately condensing units. Both units contain the same type hardware with the only difference being quantity of relays.

Table 2-2 is a list of major components utilized in the HVAC unit proposed for use in barracks having central cooling facilities. Figure 2-7 depicts the interface unit in block diagram form.

2.6.4 Alarm Devices

2.6.4.1 Fuel Tank Level

The fuel tanks to be monitored are all underground except at Plant G-650. These underground tanks are presently equipped with liquidometer guages which are inoperative. CSC proposes to replace the inoperative meters with a National Sonic level alarm Series 501. The same unit will be utilized at Boiler Plant G-650 but in a different mounting configuration. These units are approved for use with hazardous material. See Appendix C for complete specifications.

2.6.4.2 Pressure Switch

A pressure switch is required on the fuel oil line to sense low fuel oil pressure. The unit will be a Model 152 Type J7 as manufactured by United Electric. Complete specifications are included in Appendix C.

2.6.4.3 Tank Level

A differential pressure switch is required to sense condensate tank low levels. The unit will be a Model 455 Type J300K as manufactured by United Electric. Complete specifications are included in Appendix C.

2.6.4.4 Smoke Detector

The smoke detector will be manufactured by BRK Electronics. Complete specifications are included in Appendix C.

Table 2-2. HVAC Interface Unit Major Components

Quantity	Description	Manufacturer	Type
1	Enclosure	Hoffman	NEMAIZ
2*	Relay	Potter-Brumfield	KRP
1	Voltage Regulator	Lambda	LAS
1	Hand-Off-Auto Switch	GE	-
2	Resistors	Vishay	-
1	Terminal Strip	Jones	-

*Quantity increases to 6 for barracks having 10 separate condensing units.

5 — for 4 & 5 T ACCU
1 — " 8 window units

4/

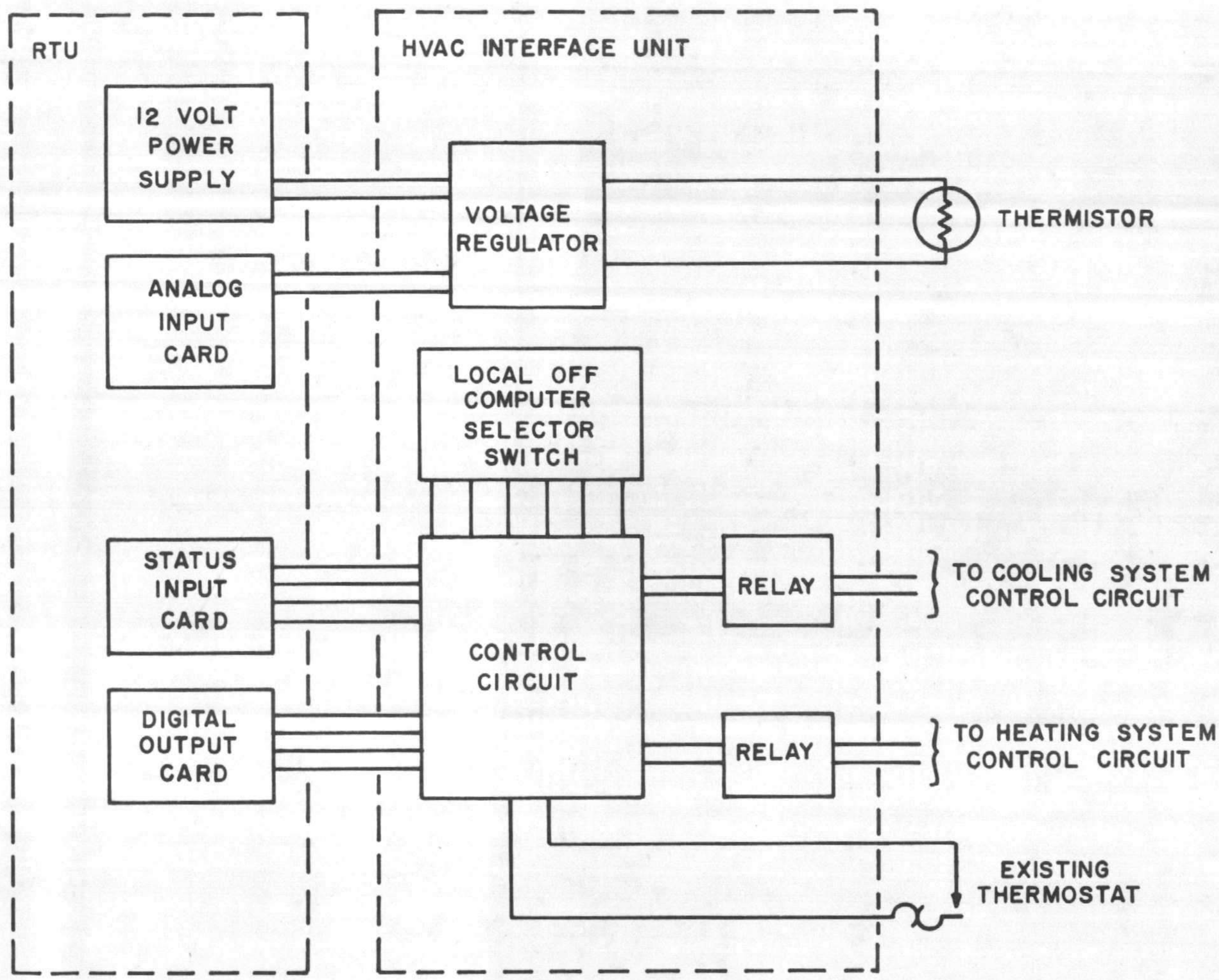


Figure 2-7. HVAC Interface Unit Block Diagram

2.6.4.5 Intrusion Detector

Intrusion detectors will be installed on each outside door at the Boiler Plants. Each door will contain a magnet and switch set.

2.6.5 RF Systems

CSC will furnish Motorola's standard alarm display and alarm reporter RF system. The RF equipment will be operated between 136 and 174 MHz. Selection of the actual frequency will be a coordinated effort between base communications and CSC. Application for Government frequency allocation per DD Form 1494 will be made as soon as system design provides the proper information. Specification sheets are included in Appendix C.

2.6.6 Voice Communications

CSC will furnish recommendations for a future voice communications system between the CCE and Buildings 20, 22 and 1700.

2.6.7 Peak Power Demand and End-Of-Interval Interface

As with any Utility Control System, peak power demand and end-of-interval signals must be available 100% of the time to continually forecast load control within each time interval. CSC, therefore, proposes to handle these signals somewhat differently than the barracks and steam plant data. The discrete signal (contact closures) from CP&L sensors, will be transmitted to the computer room in Building 1202 via tone transmission over two pair of wires. Utilization of CP&L furnished contact closures will eliminate potential errors in calibration of duplicate sensors. (CSC has contacted CP&L to verify this approach and to determine that CP&L will make any necessary modifications to their demand meter at a nominal cost.) At the computer room, the tone signals will be converted to contact closures. These contacts will be wired directly to a local multiplexer. Figure 2-8 depicts the proposed transmission scheme.

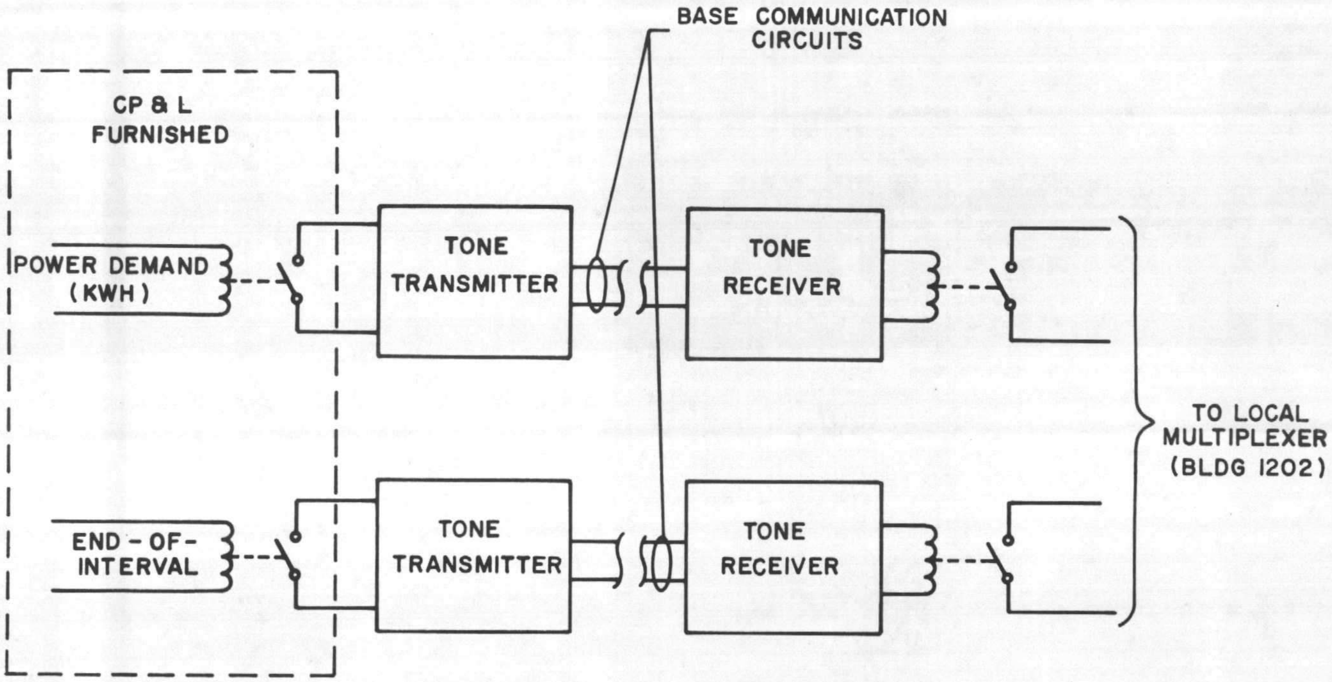


Figure 2-8. Power Demand and End-of-Interval

2.6.8 Digital Calendar/Clock

The Series 70,000 Chrono-Log Digital Clock/Calendar is designed to provide time of day and date information to the computer system. It features an attractively shaped-character LED digital display which is clearly legible from 15 feet away. Complete specifications are included in Appendix C.

2.6.9 Local Multiplexers

The Computer Products RTP system provides a standard, economical off-the-shelf approach to interfacing. All communication functions including mode conversion, control decoding, and interrupt handling are executed by an I/O expander connected directly to the data bus of the computer.

The remote units consist of common equipment racks uniquely designed to accept 16 of any standard plug-in input or output module in any combination. The chassis will be loaded with the proper interface cards to accept the various signals present in the Utility Control System. The common equipment rack and termination panels are housed in the control room cabinets. Complete specifications are included in Appendix C.

2.7 OPERATING SYSTEM SOFTWARE

The operating system proposed for the Utility Control System is Modular Computer System's (Modcomp) MAX III.

2.7.1 General

MAX III is a real-time multiprogramming system having foreground/middleground/background capabilities. It is a task-oriented system that can handle up to 256 active tasks (128 foreground, 127 middleground and one background).

Features of the MAX III Operating System include:

- A real-time clock for maintaining the time-of-day, timing task delays, and updating system "watchdog" timers
- A CPU execution control executive, driven by the clock and by external event interrupts, which permits the efficient execution of system-connected tasks on up to 128 unique foreground priority levels
- Optional execution of more than one task at each priority level
- Tasks may be activated by hardware interrupt, by operator request, by a request from another active task, by elapsed time, or by time-of-day
- Re-entrant executive services available to all system-connected tasks -- for critical response requirements
- Queued Input/Output services which may be performed concurrently with task execution or with the calling task suspended. Error recovery may be automatic or may be under complete control of the calling task
- An Input/Output device may be assigned exclusively to a privileged task so that only that task can use the device

- Off-line system-generation program for configuring the resident elements and tasks of the system
- Transient core allocation of any remaining core not used for the resident elements
- Important (or frequently-used) library subroutines may be declared resident at system-generation time. If they are re-entrant, they may be made global (accessible to multiple tasks). Core tables and variables may also be made global in this manner and provide a convenient method for intertask communication.

The FORTRAN IV run-time package is an example of a global re-entrant subroutine resulting in core savings of 2.7K words of core per additional FORTRAN written task.

2.7.2 Taskmaster

In the MAX III multiprogramming environment, many tasks can compete for computer time. Order is maintained by the Taskmaster, a resident system element which transfers CPU control to the highest priority task and threads new requests for CPU time into a queue according to priority. The Taskmaster is directly connected to the lowest priority interrupt level. All tasks are assigned software priority levels below the lowest hardware level.

More than one task can be assigned to each software priority level. These software priority levels can be scheduled and controlled by operator request, external or internal hardware interrupt, elapsed time, time-of-day, or by another task.

2.7.3 Operator Communications

The Operator Communication Dispatcher provides on-line control of MAX III operations. The operator can assign devices to logical files, create logical files, assign tasks to priority levels, control the execution of tasks, establish disk-resident tasks as core-resident, and even add his own control commands. The user's control commands can be implemented for entry on a dedicated terminal device or they can be entered through the basic Operator Communication file.

2.7.4 Task Execution

Tasks may execute under MAX III in either of two modes: privileged or unprivileged.

The privileged mode is the "supervisory mode" where the task has absolute control over memory and system resources. The task may write over any core area, branch to any core address and execute all instructions including I/O and interrupt handling instructions.

The unprivileged mode is the "user mode" where the task has absolute control within its own memory boundaries and must utilize executive services to perform I/O or other system resource manipulation. In addition, the task can write into the unprotected GLOBAL COMMON area.

Execution modes are assigned as follows:

- FOREGROUND - privileged or unprivileged, depending upon execution priority
- MIDDLEGROUND - always unprivileged
- BACKGROUND - always unprivileged.

2.7.5 Memory Protection and System Security

Memory protection is implemented under MAX III to allow secure system operation with minimum system overhead. Memory is dynamically protected and unprotected according to the execution mode of each task.

Three hardware boundaries are provided to implement this memory protection scheme.

Foreground tasks running in the privileged mode always have memory allocated in the protected state, allowing these tasks to access any memory area.

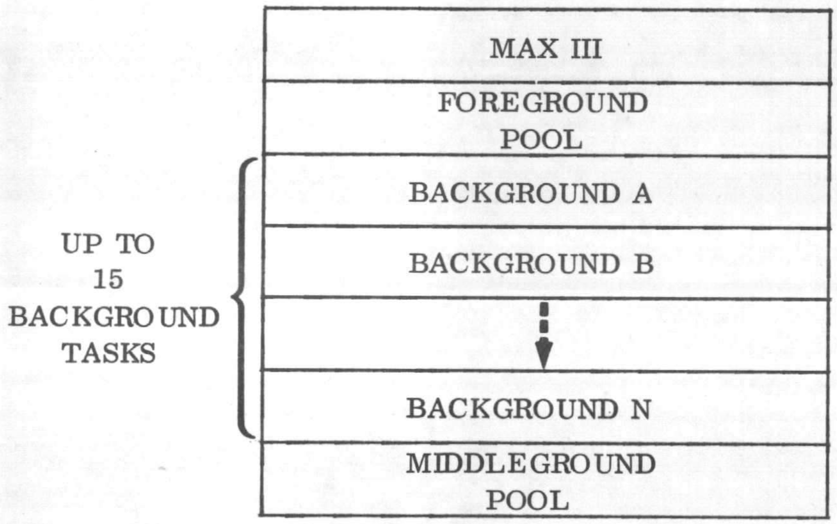
Unprivileged tasks (foreground, middleground or background) always run with memory allocated in the unprotected state with the rest of core memory (except unprotected GLOBAL COMMON) set in the protected state. This operation insures that unprivileged tasks will not alter any other tasks in core in case of faulty internal task logic.

2.7.6 Round Robin Task Scheduling

This optional feature causes all tasks of equal priority to have their execution times shared on a cyclic basis. When the taskmaster encounters a group of tasks of like priority, it will transfer control to the task just below the task in the group that last used the CPU. Switchover to another task within the group will occur at each system event which causes context switching.

2.7.7 Multiple Backgrounds

At Sysgen time, MAX III users may specify up to 15 non-resident background tasks. These tasks will be assigned to fixed partition areas starting at the middleground boundary.



2.7.8 Other Support Software

2.7.8.1 FORTRAN

The MODCOMP FORTRAN IV Compiler will be provided. It has the following features:

- American National Standards Institute (X3.9,1966) specifications
- Efficient code through subscript optimization, block level optimization, and the utilization of all machine capabilities
- Direct access I/O to disk files is provided through DEFINE FILE statements

- Compilations take place in background
- A Direct Maintenance Processor provides the utility functions for the creation and deletion of disk files to be used
- The programmer can write source programs, incorporating in-line assembly language coding including macro directives
- All MAX executive services can be called through in-line assembly language coding for maximum run-time efficiency
- FORTRAN run-time package contains a set of CALL subroutines which are compatible with process control industry recommendations based on the proceedings of the Workshop on Standardization of Industrial Computer Language, Purdue University, 1970
- Freedom of using any arithmetic expression as an array subscript
- Comprehensive diagnostic capability.

15 30
8:30
9 hr

2.7.8.2 Assembler

The MODCOMP II Assembler is a language processor which enables instructions, addresses and other program parameters to be written in an efficient symbolic language. The assembler is designed to operate under MODCOMP's real-time operating system.

The features of the Assembler are the following:

- Both absolute and relocatable object format
- Free field assembly format
- Extensive set of directives for aiding in expressing constants, allocating storage, inter program communications and listed output formatting
- Complete error diagnostics
- Object listing including the source statements and the object code produced by each

- Symbolic addressing which allows a symbol rather than absolute values to be used for memory locations, registers, bit assignments, and short displacement addressing
- Mnemonics for representing each MODCOMP instruction
- Ability to define new instructions implemented in the ROM Controller
- Capable of accepting constants both as operands in an immediate instruction and in data statements. The types of constants recognized are: decimal integer, hexadecimal integer, character string, address constant and compressed alphanumeric character string.

2.7.8.3 Utilities

Utility processors execute under the MAX III operating systems as a batch processing function. These utility processors are:

- DEBUG EXECUTIVE
- SOURCE UPDATE
- SOURCE MAINTENANCE CONTROL
- LIBRARY UPDATE
- LINK EDITOR
- CATALOGER
- DIRECT ACCESS MAINTENANCE PROCESSOR.

2.7.8.3.1 Debug Executive

The Debug Executive provides an easily used program debugging service. It is controlled through the use of debug directives which are similar in form to the standard job control statements. All debug directives are entered at program execution time, thus eliminating the need to assemble in any special calls for debug services. The functions available under control of the Debug Executive are:

- Snapshot dumps of any memory location
- Mnemonic trace of any program segment

- Pause for operator action at any specified location
- Modification of memory or general registers
- Transfer of control to any specified location
- Display of memory and/or general registers
- Setting of specified memory locations to a constant
- Modification of logical file assignments.

2.7.8.3.2 Source Update

Source Update allows user manipulation of source files by adding, deleting, and listing individual or blocks of records.

Source files may be on any supported media such as cards, paper tape, magnetic tape, or disk storage.

Source Update commands may be entered through the command input file which may be assigned to the console typer or disk storage.

2.7.8.3.3 Source Maintenance Control

The Source Maintenance Control processor is designed for users who maintain source files on disk storage. It provides a directoried disk file for source programs and a comprehensive set of commands for adding, deleting, listing, and compressing the source modules.

In addition, a set of simplified JOB CONTROL STATEMENTS are provided for ease of operation in compile, assembly, link-edit, cataloging and execute sequences.

2.7.8.3.4 Library Update

LIBRARY UPDATE provides the user with the capability to manipulate object records on any supported media. Input commands are available to add, delete, list, compress, and retrieve binary records.

2.7.8.3.5 Link Editor

The LINK EDITOR allows the linking of object modules which have been assembled separately. In addition, external references to GLOBAL COMMON areas or GLOBAL SUBROUTINES are satisfied at link-edit time, allowing for maximum flexibility since its actual addresses need not be defined at assembly time.

After a successful link edit operation, an optional map is printed with the starting and ending location of every named module. Diagnostic messages for linking errors and missing modules are also generated.

2.7.8.3.6 Cataloger

The CATALOGER is the maintenance processor for the load module files. Its main function is to catalog object or link-edited modules in preassigned disk files.

The CATALOGER maintains a directory of all cataloged modules on every load module file. Ancillary functions include:

- Creation of directories on any preassigned file
- Listing of directory entries
- Compression of files
- Reassignment of system files
- Deletion of cataloged modules.

2.7.8.3.7 Direct Access Maintenance Processor

The DIRECT ACCESS MAINTENANCE PROCESSOR provides the utility functions required to maintain data files in disk storage. A directory is maintained in the standard RAD file which contains information on the data file name, size and starting sector address. Input commands are provided to create directory entries, allocate, delete, and compress files.

2.7.9 MAXNET (Not included in First Increment)

A MODCOMP II computer utilizing the MAX III operating system can be interconnected with other MODCOMP II or IV computers using MAXNET software. Paragraph 7.3 provides a detailed description of MAXNET software capability.

2.8 APPLICATIONS SOFTWARE

2.8.1 Applications Software Proposed for the First Increment

Applications software refers to that software which is written to meet the specific applications requirements. It does not include modifications or extensions to the real-time operating system. The applications software to be provided for the Utility Control System will be written primarily in FORTRAN. Exceptions to this general rule will be made for software modules which, by virtue of their function, must be small in terms of memory requirements and/or very fast in execution. These routines will be written in Assembly language. The following paragraphs define the major software functional areas to be handled by the CSC-supplied applications software.

2.8.1.1 Data Acquisition Function

The overall requirement is to acquire system measurements in the form of analog values and status points from remote locations and maintain a system data base in computer memory reflecting the current state of the utility system.

- System Data Base

  The system data base is the common data interface for the entire set of application programs and resides in part in both core and bulk memory.

  The system data base includes all information necessary for the proper operation of the application programs and includes data acquired from field transmitters, contact closures, computed data and operator entered data. The system data base will have a logical structure and will be sized so that it will accommodate all of the First Increment data.

  The data will be stored in a table in memory engineering units, where applicable, hence the table is called the Engineering Units (EU) Table. The EU Table is resident in core memory. Its size is set at system generation time.

Each entry in the EU Table is identified by a point ID number, a name and a descriptor. This association is fixed at system generation time, and can be altered with a new system generation. However, new points can still be added without going through a new system generation by: 1) reserving spare capacity and 2) updating PTIDs, name and descriptor from the programmer's console via the update program.

The name is a mnemonic aid to the operator. Names are assigned to PTIDs at update and may be altered at any time by Update or operator command.

The following commands are used to display and modify system data.

DAN	Display a name
MAN	Modify a name
DEU	Display EU value
MEU	Modify EU value.

- Analog Data Acquisition, Conditioning and Conversion

Analog data acquisition is the service function which acquires, converts and stores analog data. Each input channel is associated with an entry in the EU Table in ascending order of channel address. A single service function program handles all analog scan services.

The scan interval will be 1 minute. The raw signal will be converted from voltage to engineering units via a look-up table and stored in its EU Table location. The active/inactive status of each point can be displayed and/or changed from the operator's console.

The following commands will be provided to enable display and/or modification of analog scan functions.

DSS	Display scan status
MSS	Modify scan status
DIP	Display inactive/error points

DVA	Display values of all analog points
ADN	Display values of all analog points associated with device no. N
ARN	Display values of all analog points associated with RTU no. N
DAI	Display value of a particular analog point.

- Digital Input Scan

The digital input scan service program will scan and process digital inputs. Typical inputs will be from contact closures, limit switches, pumps, and alarm sensors. The current state of each digital point will be stored in a core resident table. On each scan, the current state of each point will be compared with the previous state. If a change has occurred, two other tables will be examined to determine if the point is valid and to determine its active/inactive status. If it is valid and active, the appropriate program will be "queued" to take action. All digital inputs are scanned once each minute. Scanning will take place whether points are active or inactive. If a point is inactive, the normal action will be ignored.

Each digital point will be identifiable by channel and bit number. An application program will access the table to determine its current state.

The following commands will be provided to enable display and/or changes to digital status information.

DVD	Display status of all digital points
DDN	Display status of all digital points associated with device no. N
DRN	Display status of all digital points associated with RTU no. N

DDI	Display status of a particular digital point
CDS	Change digital status.

2.8.1.2 Alarm Monitoring

Two types of alarm servicing will be provided.

- Analog alarm: Absolute alarms on any EU Table value
- Digital alarm: Alarm conditions sensed externally and conveyed via digital input points.

Either type of alarm will cause the following to occur:

- Hardcopy output on the alarm or command terminal
- Audible alarm.

Three levels of alarm annunciation will be provided to meet the specified requirement for Central Control Equipment (CCE).

Alarm points may be set active or inactive from the command terminal.

The following commands will be provided relative to the alarm monitoring function.

DAS	Display alarm status
MAS	Modify alarm status
CAL	Change alarm limits
PAA	Print all alarms
DIA	Display inactive alarms.

2.8.1.3 Totalization

The computer will be programmed to sum KWH pulses (i.e., counts) over designated time periods. The operator can request totalization to be stopped or to be reinitialized from the command terminal.

2.8.1.4 Control of Air Conditioning and Heating Units

The control function will provide the following capabilities:

- Air conditioning systems will be turned on and off based on the power demand control program. Not all units will be turned on at the same time to minimize power surge. Units will be turned on on a per building basis. Units will be turned off at the same time, if necessary
- All heating systems will be turned on and off based on either a program timer or upon operator request.

2.8.1.5 Logs and Alarms

All logs and alarms will be in English language text and no unduly cryptic abbreviations will be used. Logs will be generated on demand from the command terminal or in the event the command terminal fails from the alarm terminal. Each log will be called by a three-character name. Commands permitted relative to alarms are listed in Paragraphs 2.8.1.1 and 2.8.1.2.

2.8.1.6 Parameter Access Privilege

Three levels of access privilege will be provided via a user privilege code (UPC). The system data base will be structured such that: 1) no changes are possible, 2) operator can access, or 3) only supervisors can access. Level of access privileges of the system parameters will be defined during the system design with Camp Lejeune personnel.

2.8.1.7 Audible Alarm Acknowledgment

The bell routine will be provided to time the duration of audible tone bursts and will activate and deactive the bell system.

2.8.1.8 Communications Between the Computer System and Microprocessor Communication Interface (MCI)

Data communications software consists of the programs and routines necessary to transfer data, commands, messages, and status between the computer and the communications subsystem.

An input/output software driver passes control information and data from the line control modules to the MCI and passes status information and data from MCI to the line control modules.

By using defined control characters, the link protocol (i.e., a formal set of conventions governing the format and relative timing of message exchange between two communicating processes) provides an orderly and efficient way of assuring that the MCI or computer is in a ready condition, and that the MCI will send data when instructed, will receive data when instructed, and will advise the MCI or computer when it receives erroneous data. Since the same physical link carries both data and control characters, the protocol must be capable of distinguishing between the data and control characters available within the code set.

The major functions performed by the link protocol include:

- Controlling data transfers
- Error checking and recovery
- Information coding.

2.8.2 Proof of Existence of Software Packages for First Increment

The following is the list of software routines that are currently available at CSC for use on the Utility Control System for Camp Lejeune. Applications software proposed for the First Increment will be abstracted from these routines.

1. Basic Process Control and Monitoring Software System
    a. Scan Timing and Initiation Module
    b. Periodic Data Acquisition Module
    c. Digital Events Interrupt Server
    d. Raw Data Processor
    e. Periodic Calculation Module (Design held pending review of basic concepts)
    f. Display output module
    g. Dynamic Data Update Module
    h. Display Logging Module

i. Display Data Input Processing Module

j. Alarm Message Output Module

k. Alarm Acknowledge/Delete Processing Module

l. Control Output Module

m. Control Verification Module

2. Laboratory Automation Foreground Executive

Detailed flowcharts and program listings are contained in Appendix A.

2.9 POWER DEMAND CONTROL

An automatic load shedding and restoration program will be provided to meet the specified requirements for Power Demand Control.

For purposes of Power Demand Control, up to 50 sheddable loads* will be controlled. All controllable electric power in a single building will be considered as a single sheddable load for the Power Demand Control System. Up to 50 sheddable loads will be under control at any one time, with each load assigned to a group, each group will have a maximum of 32 loads, with each group having a unique priority. If only one load is assigned to a group, power control actions can, according to priority, be applied to one building. At the other extreme, if 32 loads are assigned to one group, shedding actions will be applied to all 32 buildings simultaneously.

The system will monitor power demand and usage by accumulating pulses from the single existing KWH meter. The end of interval signal (assumed to be a contact closure at the KWH meter location) will also be read in order to maintain synchronism with the power company demand interval.

System operators will have the ability to monitor and control load shed and restoration status through presentation on the Command Terminal. Information contained on this display will include:

- For each Group
  - Current status of group
  - Current priority
  - Current control status (operator may inhibit the shedding or restoring of any group)
  - Identification of each load in the group

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*A load is defined as a complete building.

- For each identified Member Load in a Group
  - Rated KW (operator entered)

Operator actions will be as follows:

- Operator may inhibit or restore the automatic control status of any group or load
- Operator may change the rated KW of any load
- Operator may change the priority of any group.

2.9.1 Load Shedding/Restoration Procedures

The system will maintain a data base table of "target" maximum KW demand as a function of forecasted total plant demand. Demand maximum limits (on peak, off peak) shall be operator enterable and shall also be stored in the system data base.

Once per minute during each demand interval a smoothed and predicted demand will be calculated (for the current demand period) and compared to the appropriate demand limit. KW demand is predicted based on the general form $y = mt + b$, where m is the slope, b is the actual KWH during a demand interval, and t is time in hour. Demand history of the last year is needed for initializing m's. Separate tables for the slopes will be stored for weekdays and weekends including holidays and the stored slopes in the appropriate table will be smoothed once every day by the general form $s = f \cdot s_{i-1} + (1 - f) \cdot s_i$, where f is a weighing factor ($0 < f < 1$), s_{i-1} is the previously stored slope and s_i is the newly calculated slope.

In addition to the automatic smoothing, the operator can update these slopes manually. If the program predicts a demand overshoot, a load group (or groups) will be shed on a priority basis to cause the predicted demand to fall inside the established demand limit. On subsequent 1-minute periods, demand limits comparisons will be made to maintain predicted demand within dead band limits, including additional load shedding, as appropriate. When the predicted demand has returned (within dead band limits) loads will be restored in reverse order (priority).

While the demand interval will be determined primarily by the end-of-interval signal input to the system, the system will maintain an internal offset counter which will be updated by the receipt of the end-of-interval signal. The internal offset counter will have a time difference between a digital clock CSC is providing and the end-of-interval signal. In the event that the end-of-interval signal is not received by the system by the time the interval (software counter) decrements to zero value, the system will assume that the end-of-interval signal has been missed and will terminate the demand interval and start the subsequent interval. This procedure automatically resynchronizes if the end-of-interval signal is received after the counter is started without receipt of the signal. The program will resynchronize end-of-interval after power failure. The program will also maintain a data base which allows each load to be started only after a minimum of M minutes of off-time and to be shed only after N minutes of run time.

2.10 SYSTEM AVAILABILITY

The following paragraphs provide a reliability/availability analysis of the Utility Control System hardware intended to demonstrate the ability of the system to meet the specified operational availability requirements.

2.10.1 Method of Calculation

All parts are assumed to be burned in for a reasonable period, and not to have approached wear-out. Thus it is assumed that parts have a constant failure rate "λ". The behavior of a total system or of any subsystem composed of such components has exponential reliability R(t). That is:

$$R(t) = e^{-\lambda t}$$

with mean time between failures (MTBF) $= \frac{1}{\lambda} = \int_0^\infty R(t)dt$

For a set of components, the failure rate of the set is the sum of individual component failure rates. Thus, for a system:

$$\lambda \text{ system} = \sum_{\iota} \lambda t$$

where the summation is over all components. (This is usually expressed in terms of failures per 10^6 hours.)

However, if a system has a redundant backup, then an effective failure rate is calculated according to the laws of probability. For example, for two identical subsystems in parallel, where one of two is required for the system to function, the possible states are:

$$(R + Q)^2 = R^2 + 2RQ + Q^2$$

where R = Probability of working

Q = Probability of not working.

Since $R + Q = 1$

$Q = 1 - R$

And, the states favorable to one of two working are:

$$\begin{aligned} R(t) &= R^2 + 2RQ \\ &= R^2 + 2R(1-R) \\ &= R^2 + 2R - 2R^2 \\ &= 2R - R^2 \end{aligned}$$

Now, as shown above

$$R(t) = e^{-\lambda t}$$

Thus, for the parallel, redundant system,

$$R(t) = 2e^{-\lambda t} - e^{-2\lambda t}$$

and

$$\begin{aligned} MTBF &= \int_o^\infty 2e^{-\lambda t} dt - \int_o^\infty {-2\lambda t} \\ &= \frac{2}{\lambda} - \frac{1}{2\lambda} \\ &= \frac{3}{2\lambda} \end{aligned}$$

Hence:

$$\lambda eff = 2/3\ \lambda$$

Similar calculations can be made for other redundant combinations.

For some items, a single system module has several channels or other component groupings. Where this occurs, the failure rate is split up and apportioned to several subgroupings. This amounts to an assignment only, as all parts end up being counted.

Availability is based on the classic formula:

$$\text{Availability} = \frac{MTBF}{MTBF + MTTR}$$

As previously mentioned, MTBF for a system or subsystem is given by inverting λ for the system. λ was obtained by summing failure rates for the components of the system. The MTTR for a system is obtained from the formula:

$$MTTR = \frac{\sum_{i} \lambda_{i} MTTR_{i}}{\sum_{i} \lambda_{i}}$$

$$= \frac{\sum_{i} \lambda_{i} MTTR_{i}}{\lambda \text{ system}}$$

where:

$MTTR_i$ = MTTR of a single element

λ_i = λ of a single element

The system downtime per year is calculated as follows:

System Downtime = (1 - Availability) x 8760 hours/year

2.10.2 Assumptions

In deriving the calculated availability of the Utility Control System, we made several assumptions. They are:

1. All repair times are based on module replacement, with component repairs being made off-line.

2. Repair times assume trained personnel and adequate stocks of known working, burned-in spare modules.

3. On-site maintenance during 30-day acceptance test will be conducted on a 24-hour basis. Mean time to repair (MTTR) includes 1/2 hour travel time average for the technician to travel from the central location to the point of repair.

4. 100% availability is assumed for communication channels. The channels include Government furnished channels and those to be added under the contract.

5. All operational functions are included in the availability model. Government furnished contacts, motor operators, and external interlocks are excluded from the model. Therefore, failure of these will not affect the measured uptime of the Utility Control System.

2.10.3 Availability Calculations

Based on the foregoing procedures and assumptions, CSC has calculated the system availability of the proposed Utility Control System. The results of these calculations are summarized in the availability model of Figure 2-9. The theoretical system availability is calculated at 96.63% on an annual basis. Individual component availability calculations which backup the system availability calculations are shown on supporting Tables 2-2, 2-3, 2-4, and 2-5.

Based on the above calculations, and experience with the proposed equipment, CSC agrees to accept the requirement to demonstrate 95% system availability as specified for the acceptance test.

Table 2-3. System Availability for Modcomp Computer

Qty	Item	Description	Failure Rate $x\ 10^{-6}$	MTTR Hours
1	II/26	CPU	213.9	2.5
2	3670	32K Memory	168.3	2.5
2	4903	Peripheral Controller Interface	32.2	2.0
1	3752	Asynchronous Interface	18.07	1.5
2	LA36	DECwriter (assume redundancy)	333.0	2.0
1	4126	Disk Controller	31.9	2.5
1	4126	Disk	281.9	4.5
2	4810	Asynchronous Interface	34.6	2.5
		Total	1113.87	3.05

$$\text{Availability} = \frac{897.7}{900.75} = 99.66\%$$

Table 2-4. System Availability for Average RTU Components

Qty	Description	Failure Rate $\times 10^{-6}$	MTTR
1	Serial Interface	41.97	0.75
1	Universal Common (Power Supply and Mounting Hardware)	28.36	1.2
1	Digital Input Module	5.56	0.66
1	Digital Output Module	8.06	0.66
1	Analog Input Module	5.22	0.66
1	Modem	200	0.7
3	Interposer Relays	3.3	0.6
3	Thermistors	12.4	0.75
	Total	304.87	.75

$$\text{Availability (each)} = \frac{3280}{3280.75} = 99.98\%$$

$$\text{Availability (53 RTUs)} = \frac{\dfrac{1}{50(304.87 \times 10^{-6})}}{\dfrac{1}{50(304.87 \times 10^{-6})} + 0.75} = 98.86\%$$

Table 2-5. System Availability for Remote RF Alarm Acquisition Components

Qty	Description	Failure Rate $\times 10^{-6}$	MTTR
4	Motorola AD-81	249.2	1.0
15	Motorola AR-81	1135.5	1.15
15	Battery Packs	1071	1.5
	Total	2455.7	1.29

$$\text{Availability} = \frac{407.2}{408.49} = 99.68\%$$

Table 2-6. System Availability for Local RTU Components

Qty	Description	Failure Rate x 10^{-6}	MTTR
1	Parallel Interface	26.4	0.7
1	Digital Chassis and Power Supply	19.5	1.0
1	Interrupt Expander	11.81	.68
1	Digital Input Module	8.06	.66
1	Motorola AR-81	75.7	1.25
8	Motorola AD-81	498.4	1.0
2	Tone Transmitters	96.2	0.8
2	Tone Receivers	84.8	0.76
	Total	820.87	0.95

$$\text{Availability} = \frac{121.8}{122.75} = 99.22\%$$

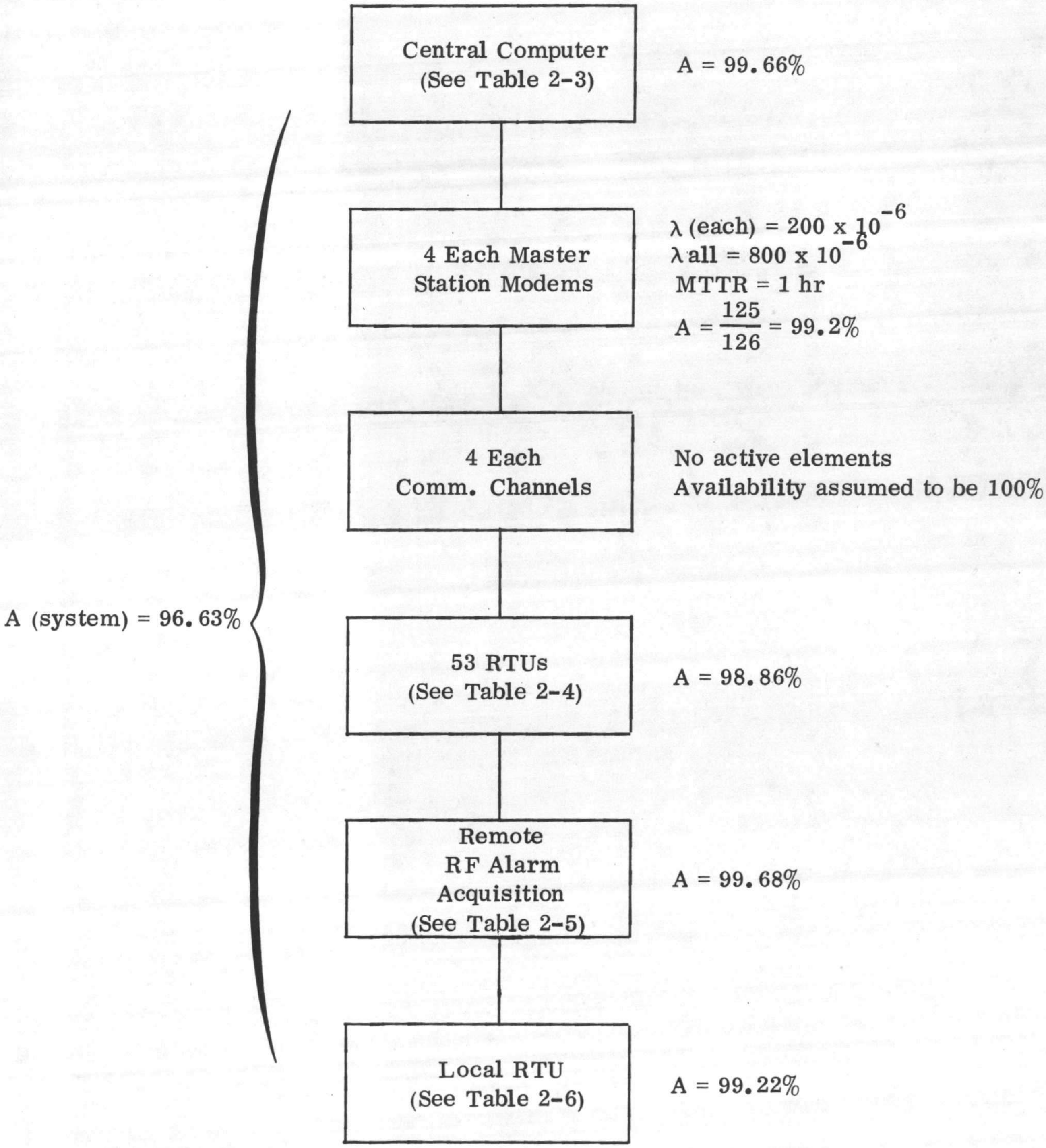

Figure 2-9. Utility Control System Availability Diagram

2.11 EQUIPMENT SCHEDULE

2.11.1 Equipment List

A listing of the major equipment to be utilized in the Utility Control System is shown in Table 2-7.

2.11.2 Catalog Data

Manufacturers catalog data on equipment are contained in Appendix C.

2.11.3 System Maintenance

The overall system maintenance after control system is accepted by the Government can be furnished under separate contract by Computer Sciences Corporation, 6565 Arlington Boulevard, Falls Church, Virginia 22046. CSC will use Modular Computer Systems, Inc. as a subcontractor for the computer system portion.

CSC's qualifications are described in Section 10 and Section 8 contains the maintenance description.

2.11.4 Recommended Spare Parts List

As MODCOMP's service agreement includes all necessary parts, CSC does not feel it would be economical to stock MODCOMP parts at Camp Lejeune. Therefore, Table 2-8 reflects only non-MODCOMP spares.

Table 2-7. Equipment List

Item	Manufacturer	Model or Part No.	Qty	Description	Spec. Paragraph	Proposal Paragraph
1	Modcomp	II/201	1	Computer with 32K words of core memory, 4903 PCI, direct memory processor, executive features, system protect, multiply/divide, hardware fill, power fail safe/auto start, and 3752 console device controller	2B.1.4.4	2.2.1
2	Modcomp	3670	1	32K words of core memory	2B.1.4.4	2.2.1
3	Modcomp	3512	1	Hardware floating point	2B.1.4.4	2.2.1
4	Modcomp	4903	1	Peripheral controller interface	2B.1.4.4	2.2
5	Modcomp	4810	3	Asynchronous communications interface	2B.1.4.4 2B.1.5	2.2
6	Modcomp	4126	1	Moving head disk (1.3M words)	2B.1.4.4	2.2.2
7	DEC	LA-36	2	DECwriter II	2B.1.4.2 2B.1.4.3	2.3.1
8	Equipto	-	2	Cabinet	2B.1.4.2	2.3
9	F&M	SCADA 80	53	RTU	2B.1.1	2.5.3
10	F&M	MCI	1	Interface unit	2B.1.1	2.5.2
11	Omega	Uni-Curve	99	Thermistor	2C.1.2.1 2C.1.2.2 2C.3.2	2.6.1.1
12	CSC	-	77	HVAC interface unit	2C.1.2.3 2C.1.2.4	2.6.3
13	Rosemount	1144GO	27	Pressure transmitters	2C.3.2	2.6.1.2
14	Rosemount	1151DP	13	Differential pressure transmitters	2C.3.2	2.6.1.3
15	ACROMAG	511 BX	8	Temperature transmitters	2C.1.2.1	2.6.2
16	National Sonics	501	11	Level alarm	2C.3.2	2.6.4.1
17	United Electric	152	4	Pressure alarm	2C.3.2	2.6.4.2
18	United Electric	455	9	DP alarm	2C.3.2	2.6.4.3
19	BRK	-	5	Smoke detector	2C.3.2	2.6.4.4
20	United Security	-	16	Magnet and switch set	2C.3.2	2.6.4.5

Table 2-7. Equipment List (Cont'd)

Item	Manufacturer	Model or Part No.	Qty	Description	Spec. Paragraph	Proposal Paragraph
21	RFL	-	1	Two point tone system	2C.4.2	2.6.7
22	Computer Products	RTP7435/42	1	Interrupt input card	2C.4.2	2.6.9
23	Computer Products	RTP7435/33	1	Accumulator card	2C.4.2	2.6.9
24	Computer Products	RTP7435/70	1	Digital input card	2C.4.2	2.6.9
25	Computer Products	RTP7410/37	1	Interface card	2C.4.2	2.6.9
26	Computer Products	RTP7430/20	1	Chassis assembly	2C.4.2	2.6.9
27	Chrono-Log	70000	1	Clock	2B.1.4.2	2.6.8
28	Elgar	UPS	1	UPS	2B.2.3.1	2.4
29	Motorola	C1551*	23	Transmitter	2C.6.3	2.6.5
30	Motorola	CPN6007*	23	Batt pack	2C.6.3	2.6.5
31	Motorola	SU8*	23	RTN converter	2C.6.3	2.6.5
32	Motorola	PD390-7DY**	23	Antenna	2C.6.3	2.6.5
33	Motorola	SP420310-XX	1	Central station equip.	2C.6.3	2.6.5

* Part of Motorola AR-81
**Part of Motorola AD-81

TRANSMISSION CABLE -
TRAINING

Table 2-8. Suggested Spare Parts List

Item	Qty	Model or Part No.	Manufacturer	Description
1	2	A1	F&M Systems	Base card file
2	2	220025-01	F&M Systems	Timing and control card
3	2	220027-01	F&M Systems	Base I/O
4	2	220112-01	F&M Systems	Modem
5	1	220041-01	F&M Systems	Card file expander
6	2	220056-01	F&M Systems	Status 16 PT board
7	4	220031-01	F&M Systems	ADC/MUX board
8	2	220049-01	F&M Systems	Control, 8 PT relay board
9	10	800005-01	F&M Systems	Relay
10	1	MCI	F&M Systems	Microprocessor communications interface board
11	1	1141GO	Rosemount	Pressure transmitter
12	1	1151DP	Rosemount	DP transmitter
13	1	511 BX	ACROMAG	Temperature transmitter
14	4	LAS	LAMDA	Regulator
15	10	KRP	Potter-Brumfield	Relay
16	4	-	Vishay	Resistor
17	1	501	National Sonics	Level alarm
18	1	152	United Electric	Pressure switch
19	1	455	United Electric	DP switch
20	5	-	Omega	Thermistors
21	1	-	BRK	Smoke detector
22	1	-	-	Magnet and switch set
23	1	68T	RFL	Tone transmitter
24	1	68R	RFL	Tone receiver
25	1	RTP7435/42	Computer Products	Interrupt input card
26	1	RTP7435/33	Computer Products	Accumulator card
27	1	RTP7435/70	Computer Products	Digital input card
28	1	RTP7410/37	Computer Products	Interface card
29	1	C1551	Motorola	Transmitter
30	1	CPN6007	Motorola	Batt pack
31	1	PD390-7DY	Motorola	Antenna
32	1	SP420310-23	Motorola	Alarm display
33	1	SP420310-21	Motorola	Decode module

SECTION 3 - TRAINING AND TESTING

3.1 INTRODUCTION

CSC recognizes that a key ingredient of any computer-based system implementation is the degree and quality of training provided the user personnel. To ensure that the training provided will be complete and accurate and that the instructors will be capable of answering student questions as they arise, CSC will use, as instructors, project development personnel intimately familiar with the system and its architecture.

It is assumed by CSC that the base maintenance personnel assigned to the training program will be familiar with basic trouble shooting techniques for electronic equipment.

3.2 OPERATOR TRAINING

This course will familiarize five operators with the operation of the CCE at the site. On-the-job training will be given by members of CSC's technical staff during the checkout phase of the project. The course will cover the operation of the complete system sufficient for an understanding of the overall system operation.

It is assumed that the base operators assigned to this phase of training have attained either a high school education or previous experience with a sensor-based computer system.

3.3 ROUTINE CABLIRATION AND MAINTENANCE OF SENSORS

CSC proposes to conduct on-the-job training for three individuals from the base facility in order that they be qualified to perform routine calibration and modular replacement of field sensors. With sufficient spares available for rapid fault isolation, modular replacement of failed or questionable devices will keep downtime to a minimum.

3.4 MINOR TROUBLE SHOOTING OF COMMUNICATIONS HARDWARE

The three individuals mentioned in Paragraph 3.3 will also receive training to accomplish minor trouble shooting of communications hardware and wiring. Since the communications hardware will be modular, all on-site repair work will be of the board replacement type, with the failed or questionable board or component being returned to the original vendor for repair.

3.5 ACCEPTANCE TEST PLAN

CSC will prepare a complete Systems Test Plan to be used to demonstrate the acceptability of the Utility Control System, First Increment. CSC will complete this plan within 210 days after award of contract and before start of any testing. The Government will have 30 days to review the plan and identify any change they wish to incorporate.

SECTION 4 - INSTALLATION

4.1 OVERVIEW

This section describes the tasks that will be accomplished to translate the final system design into an operational system. The overall intent is to provide a dependable and efficient system in accordance with the specification and as agreed upon between the Government and CSC. Since installation is a major cost element and must be meticulously performed to ensure proper operation of the system, we propose to accomplish the installation design and direct supervision of the installation with CSC engineers. These engineers are technically trained and field-experienced in installation of highly complex automated electromechanical systems.

Local electrical and mechanical contractors will be utilized to furnish the manpower required for device and cabinet mounting, and conduit and cable installation under the direct supervision of CSC field personnel. Final terminations will be accomplished by CSC personnel. Through the use of this combination of skills, rather than relying totally upon general contractors, a technically superior, more efficient, and durable operational system is ensured.

4.2 PRELIMINARY INSTALLATION DESIGN AND COÖRDINATION

During the early stages of the project, it will be necessary to correlate basic design requirements with Government personnel and various equipment vendors and contractors involved with the facility. Interfacing techniques must be mutually defined by the various parties and approved by the Government before detail design work can commence. Availability of space, access to areas, Beneficial Occupancy Date, available communication circuits, routing, etc., must be scheduled/identified to allow work continuity and noninterference with other working groups. Once these basic requirements have been defined and mutually agreed to, detailed design for installation of the system will commence.

4.3 DETAILED INSTALLATION PLAN

During the control system design phase, the installation design effort will produce the installation system criteria, drawings, descriptions and lists. Installation design includes, but is not limited to:

- Point-to-point wire list
- Cable running list and tagging requirements
- Cable routing
- Space requirements
- Penetration requirements
- Grounding requirements
- Power requirements
- Cabinet locations
- Major installation material specification
- Wire specifications by signal type
- Installation drawings (mounting, piping, conduit, routing, etc.)
- Installation instructions (if required)
- Implementation schedule.

Upon completion of this design phase, the installation design package will be submitted to the Government for review and approval.

4.4 INSTALLATION IMPLEMENTATION

After approval of the implementation schedule, CSC will notify the Government, in writing, to confirm the on-site installation start date. Upon approval, installation crews will begin on-site work which will consist of running conduit, signal and power wiring installation, and making the necessary arrangements to have proper equipment and tools on-site to receive and set the various racks and consoles. Transportation of the consoles, racks, and equipment shall be by dedicated van, monitored closely by CSC to avoid any unnecessary delays at the job site. CSC will receive, off-load, and set in place all proposed equipment. As all cables and wiring have been previously installed, terminations can be completed rapidly and the system made ready for preliminary testing.

4.4.1 Materials

Installation materials (i.e., conduit, fitting, enclosure) will be new and of the type required for use in its designated area.

4.4.2 Workmanship

Wiring will be done in a neat and workmanlike manner consistent with good wiring practices. Strain relief shall be provided where necessary. All entries shall be provided with grommets or suitable material to protect wiring. All wire or cable bundles shall be secured to wiring frames or structural members. Sharp bends will be avoided where practical.

4.4.3 Codes and Regulations

The installation of the system proposed by CSC will meet or exceed the requirements of the National Electrical Code, applicable regulations listed under the Occupational Safety and Health Act, state and local codes as specified.

4.5 SPECIFIC INSTALLATION RESPONSIBILITIES

4.5.1 Computer Room

The computer room will be in Building 1202 and will require a minimum space of 12' x 10' for the first increment. CSC will furnish all labor and materials to perform the following tasks:

- Off-load hardware and set in place
- Run power wiring and conduit from GFE breaker panel to computer hardware
- Run ground pigtail #4 AWG or larger from building ground system
- Make final termination of GFE communication lines to the MCI
- Furnish and install all interconnecting cables.

CSC recommends that although space requirements are small for the First Increment, an area with minimum dimensions of 24' x 24' complete with raised computer floor, and underfloor power distribution and grounding system be made available to accommodate future expansion.

4.5.2 Battery Room

The battery backup system will require space in an area designated for batteries. CSC will furnish all labor and material to perform the following tasks.

- Off-load hardware and set in place
- Run power wiring and conduit from GFE power source to backup system
- Run power wiring and conduit from back-up system to GFE breaker panel in computer room
- Run ground pigtail from building ground system.

Space requirements for the battery backup system is 6' x 6'x.

4.5.3 Barracks

4.5.3.1 Hadnot Point

Barracks in the Hadnot Point area generally fall into two classifications -- those with individual window air conditioning units and those with Fan Coil units.

4.5.3.1.1 Barracks 6, 59, 60 and 63

In Barracks 6, 59, 60 and 63, only the capability to load shed the central heating system will exist. CSC will furnish labor and materials to perform the following tasks:

- Install and wire the HVAC interface unit (see Paragraph 2.6.2 for description)
- Install and wire the RTU
- Install the temperature sensor and wire to the RTU

4.5.3.1.2 All Other Designated Barracks in Hadnot Point + 8 wo

The following barracks each have a central heating system and ten separate air conditioning units:

8, 10, 12, 101, 104, 105, 108, 109, 111, 112, 118, 202, 204, 205, 208, 209, 212, 213, 217, 308, 309, 312, 313, 316, 318, 321, 323, 326, 327, 404, 406, 407, 409, 410, 412, 415, 417, 420, 422, 426, 427, 502, 503, 506, 507, 510, 511, 514, 515, 517, 519, 523, 527, 120, 124, 128.

56
8
448 1½
448
224
672 HP

672 4
2400

WINDOW UNITS
will Be Left out!

CSC will furnish labor and material to perform the following tasks on a per barracks basis.

- Install and wire the HVAC interface unit (in the Mechanical Room). A combination of interbuilding and underground wiring will be utilized to connect the control circuit of the air conditioner units to the HVAC interface in the Mechanical Room
- Install the RTU in the Mechanical Room
- Install the temperature sensor and wire to the RTU.

4.5.3.2 French Creek and Montfort Point

The following buildings have centralized heating and cooling facilities.

FC-304, FC-305, FC-306, FC-309, FC-310, FC-311, FC-411, FC-412, FC-413, FC-414, FC-415, FC-416, M231.

CSC will furnish labor and materials to perform the following tasks on a per barracks basis.

- Install and wire the HVAC interface unit (1 per building)
- Install the RTU
- Install the temperature sensor and wire to the RTU.

4.5.4 Boiler Plants

The following steam boiler plants are to be monitored:

- M625
- PP-2615
- G-650
- RR-15
- BB-9.

CSC will furnish labor and material to perform the following tasks:

- Install new analog sensors where required for pressure, level, and temperature measurements and wire to RTU
- Install new alarm devices where required and wire to RTU
- Install RTU
- Terminate GFE communications lines at RTU.

Not what was [illegible]

Table 4-1 details the monitoring requirements at each plant.

4.5.5 Sewage Lift Stations

All sewage lift stations referenced in RFTP N62470-75-B-5437 except for S-BB-1 will be interfaced to the communication system by radio. CSC will furnish all labor and materials to perform the following tasks:

- Install transmitters
- Install sensors and wire to transmitters
- Install antenna system.

4.5.6 Communication System

Based on information in RFTP N62470-75-B-5437 and collected on site, communications for the proposed system is depicted in Figures 4-1, 4-2, 4-3, and 4-4. These figures show utilization of existing circuits, new outside cable requirements, and RF links. During the design phase, CSC shall work closely with base communications personnel to achieve the optimum transmission media.

Direct burial cable furnished by CSC will be filled type WT as manufactured by Superior Cable. Complete specifications are included in Appendix C.

Table 4-1. Boiler Plant Monitoring Requirements

	M625	PP-2615	G-650	RR-15	BB-9
Fuel Oil Temp 1 per plt.	3	2	3	2	3
Boiler Drum Level	3	2	3	2	3
Boiler Drum Pressure	3	2	3	2	3
Steam Pressure Atomization	3	2	3	–	1
Feed Water Pressure	1	1	1	1	1
Fuel Oil Storage Low Level Alarm	2	2	2	2	3
Fuel Oil Low Temp Alarm	3	2	3	3	3
Fuel Oil Low Pressure Alarm	1	1	1	1	1
Condensate Tank Low Level Alarm 1/plt	3	1	2	1	2
Condensate Tank Low Temp Alarm 1/plt	3	1	2	1	2
Flame/Boiler Malfunction Alarm	3	2	3	3	3
Deaerator Tank Low Level Alarm	–	–	–	–	–
Deaerator Tank Low Temp Alarm	–	–	–	–	–
Condensate Pumps On/Off	4	2	3	2	6
Power Failure Alarm	1	1	1	1	1
Fire/Smoke Alarm	1	1	1	1	1
Intrusion Alarm	1	1	1	1	1

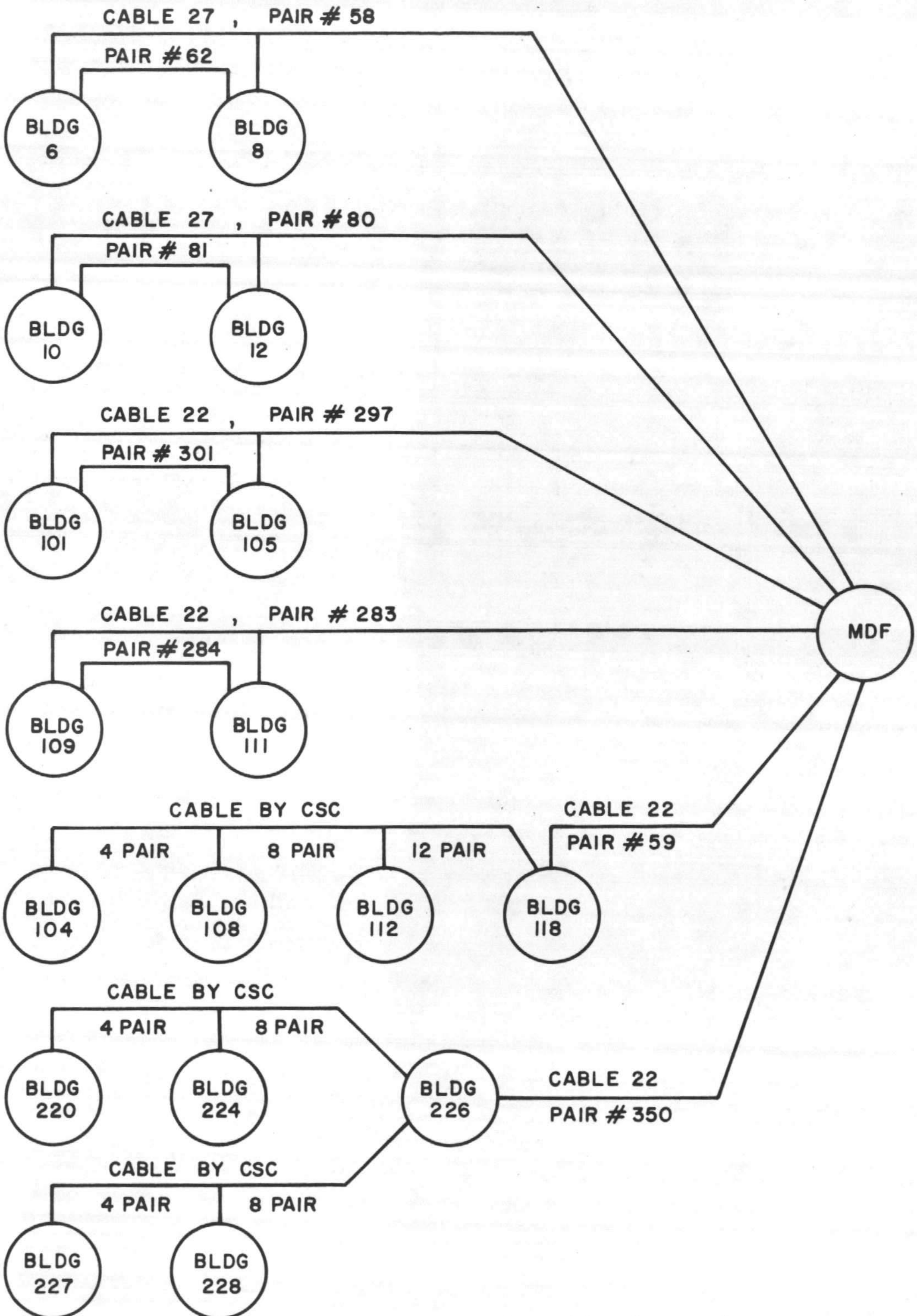

Figure 4-1. Communications Systems Requirements, Hadnot Point Area (1 of 4)

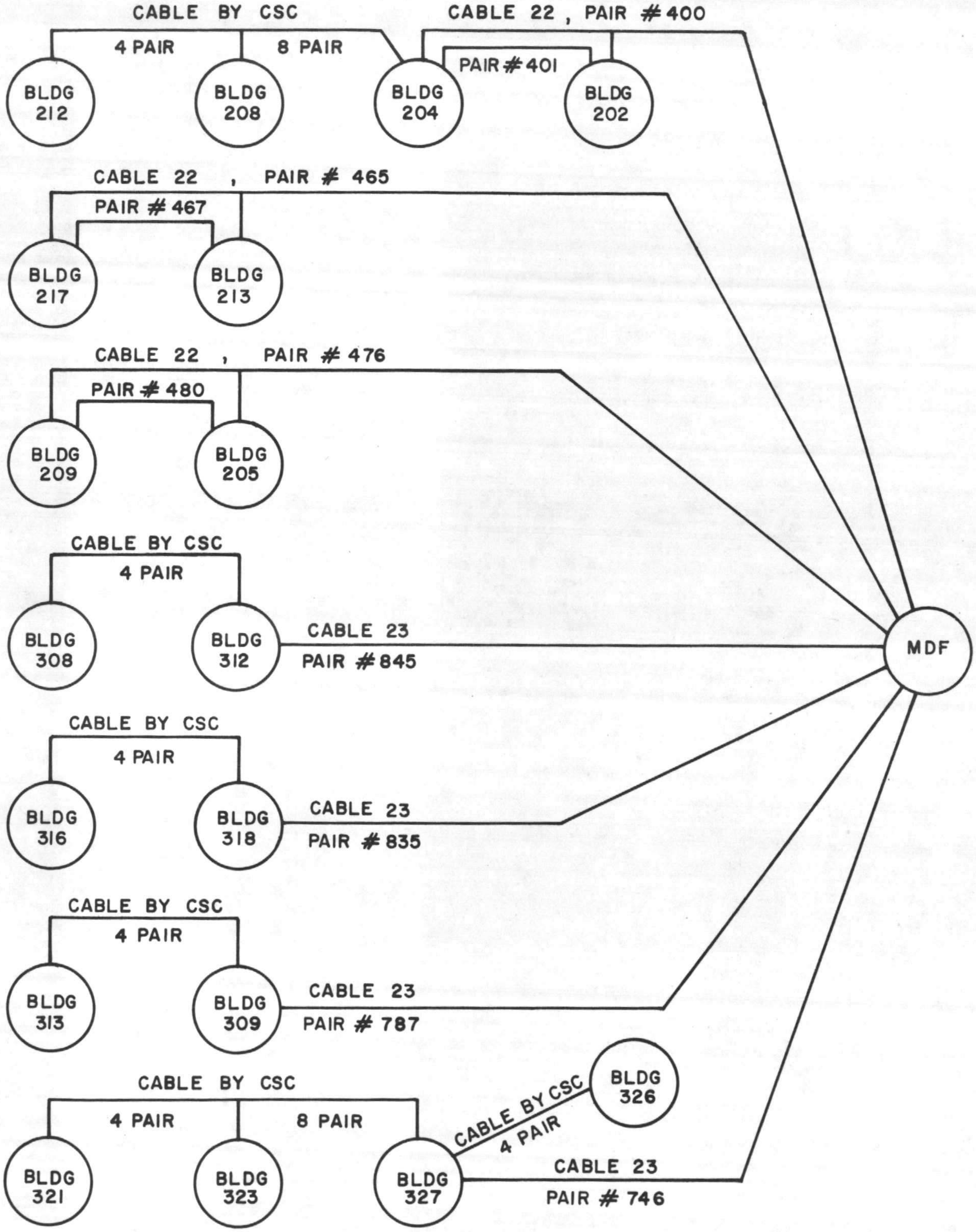

Figure 4-1. Communications Systems Requirements, Hadnot Point Area (2 of 4)

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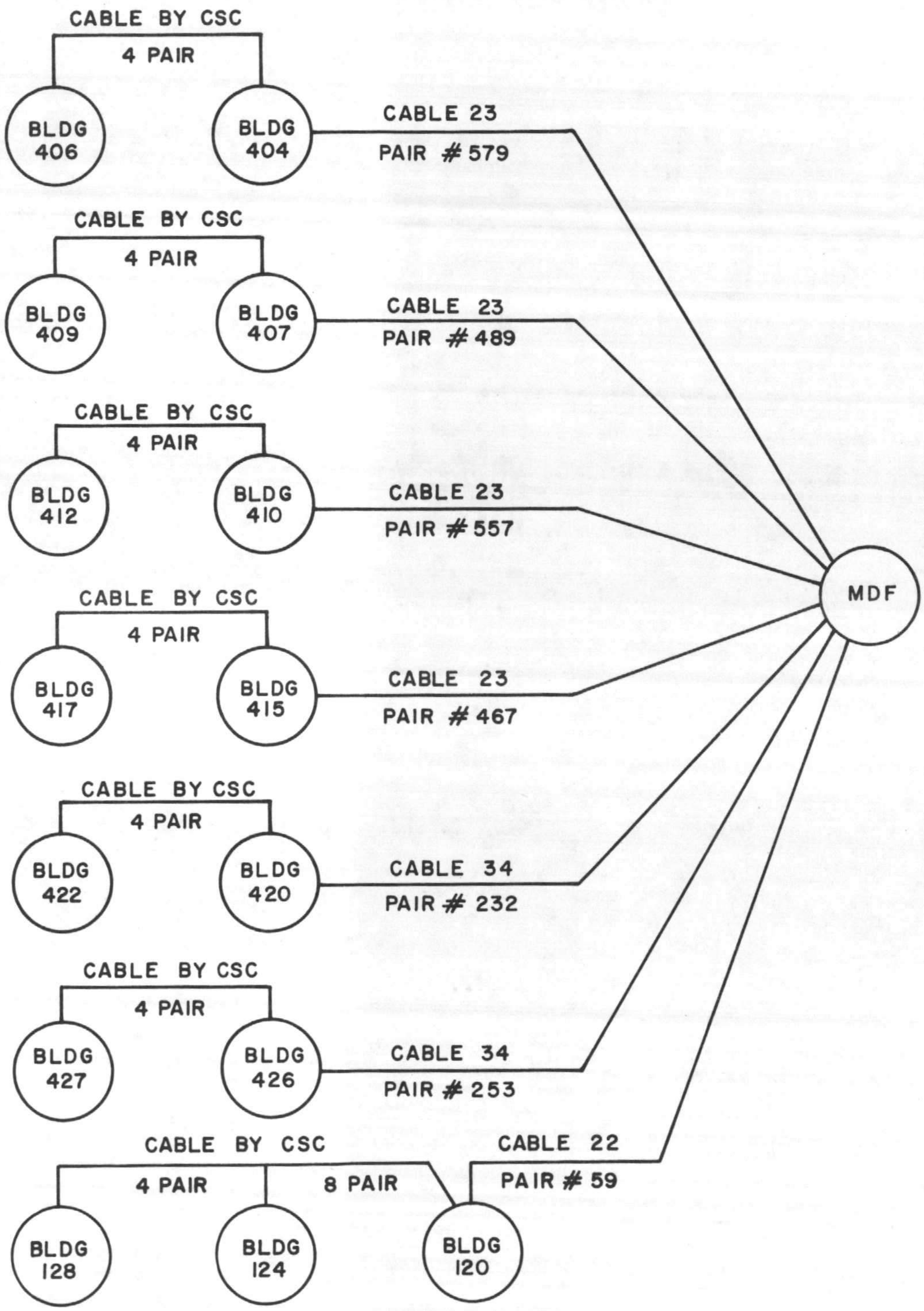


Figure 4-1. Communications Systems Requirements, Hadnot Point Area (3 of 4)

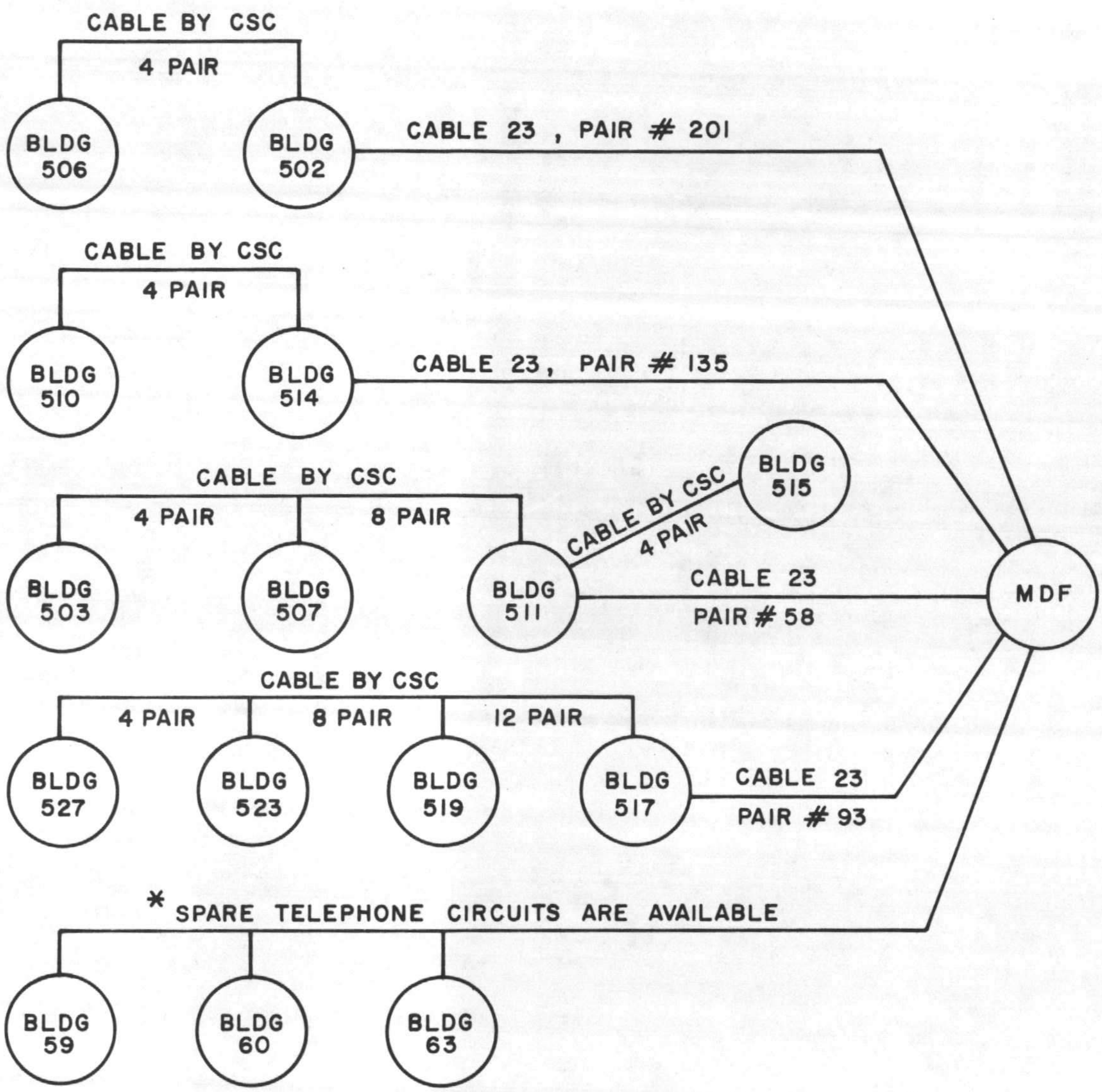
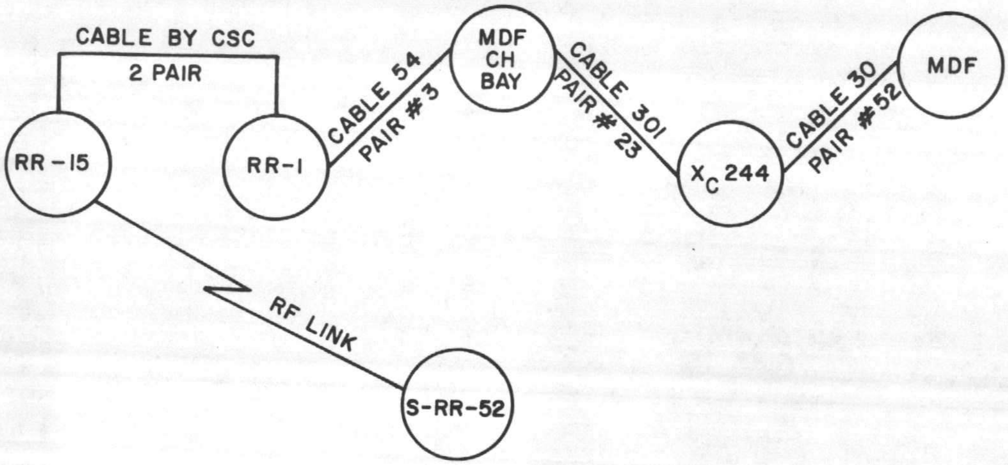


Figure 4-1. Communications Systems Requirements, Hadnot Point Area (4 of 4)



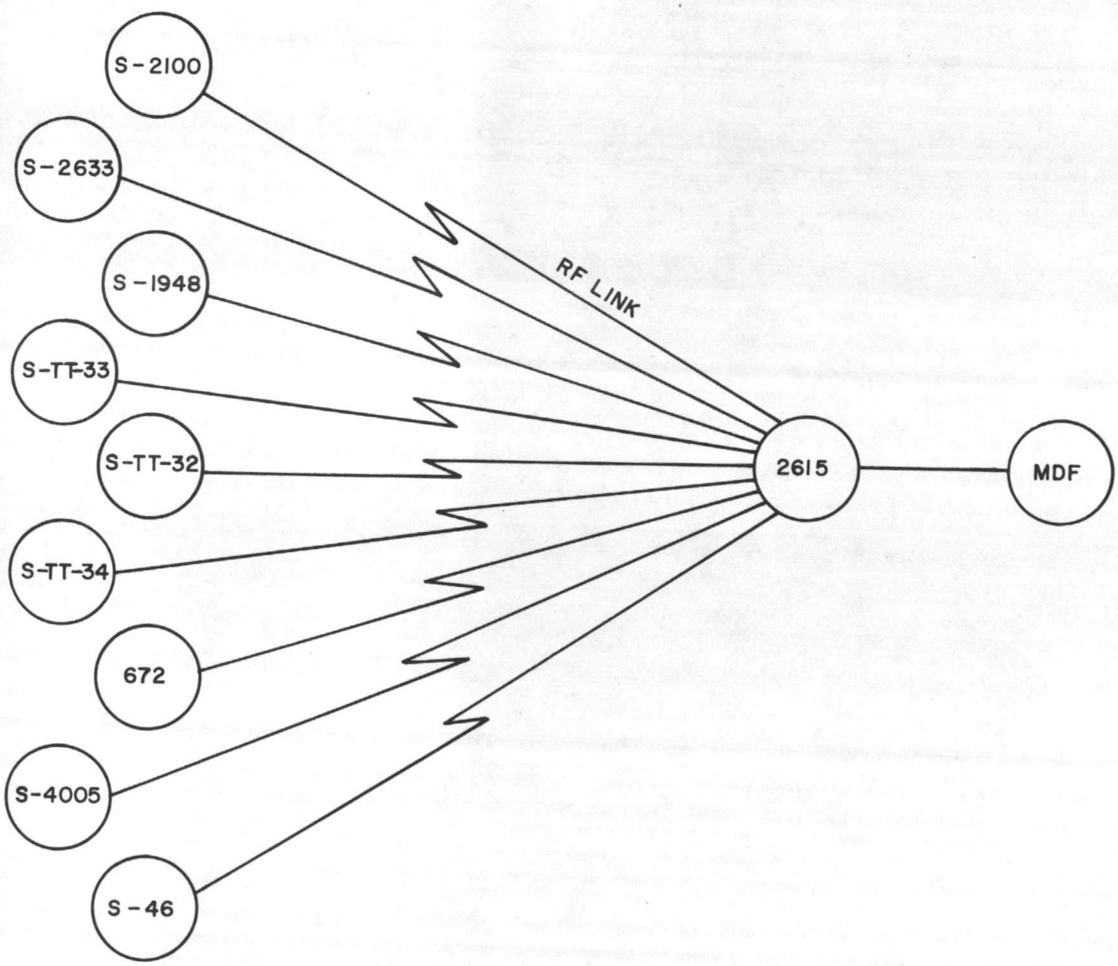


Figure 4-2. Communications Systems Requirements, Miscellaneous (1 of 2)

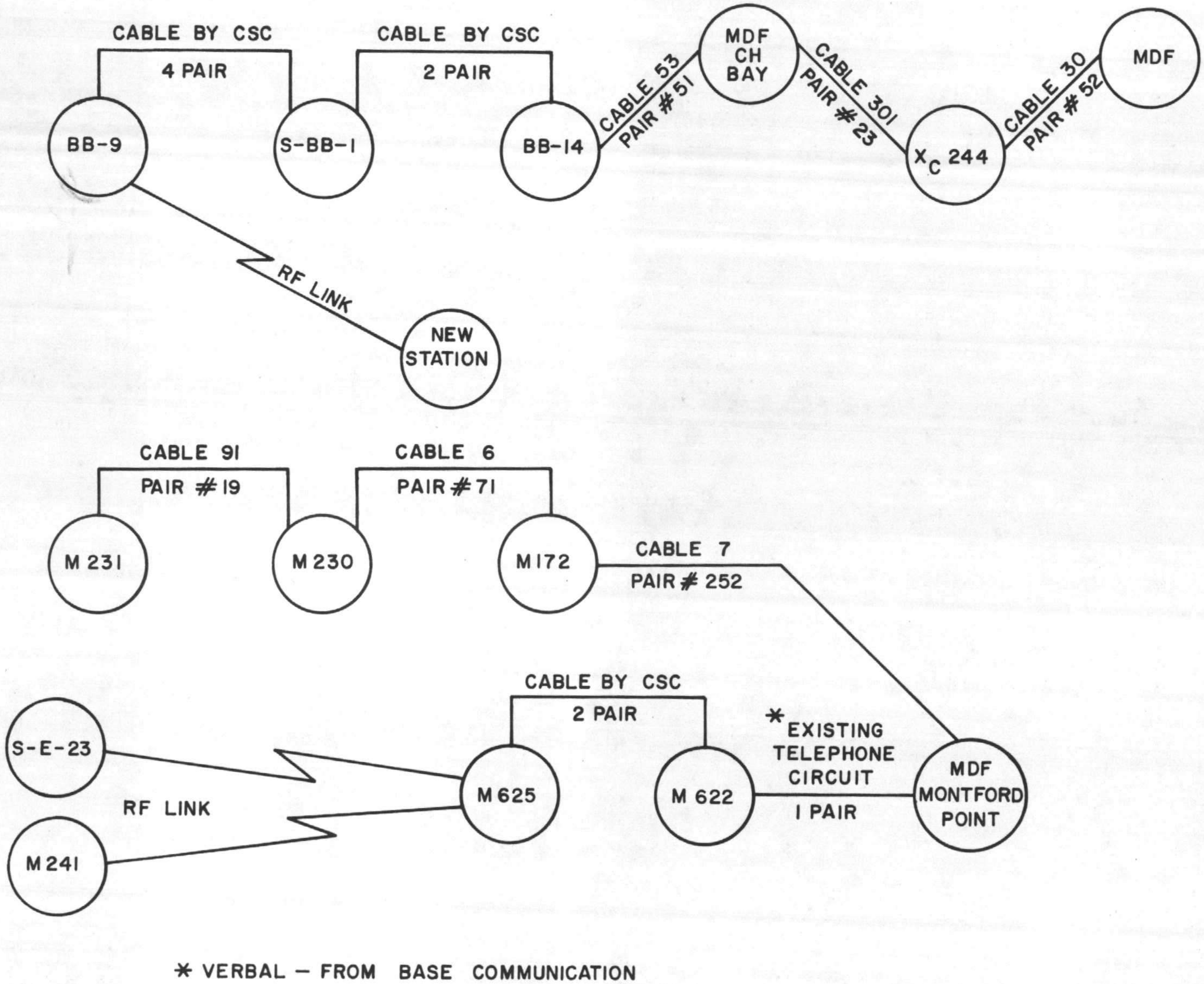
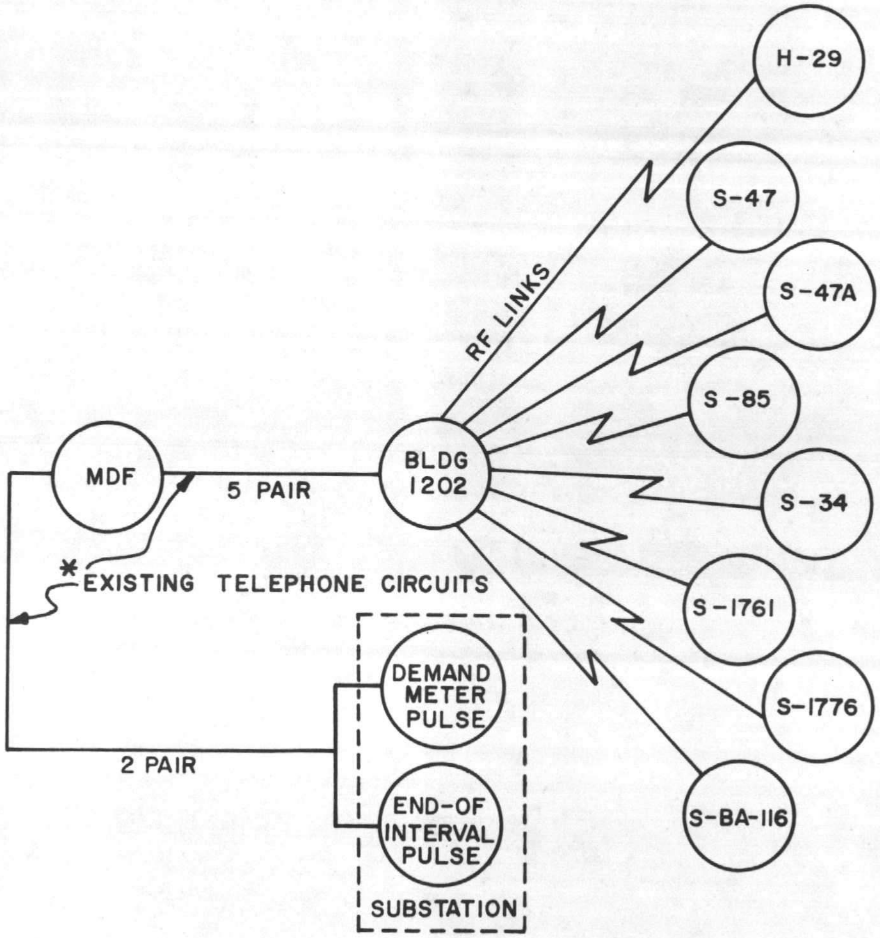


Figure 4-2. Communications Systems Requirements, Miscellaneous (2 of 2)



* VERBAL – FROM BASE COMMUNICATIONS

Figure 4-3. Communications Systems Requirements, MDF and Building 1202

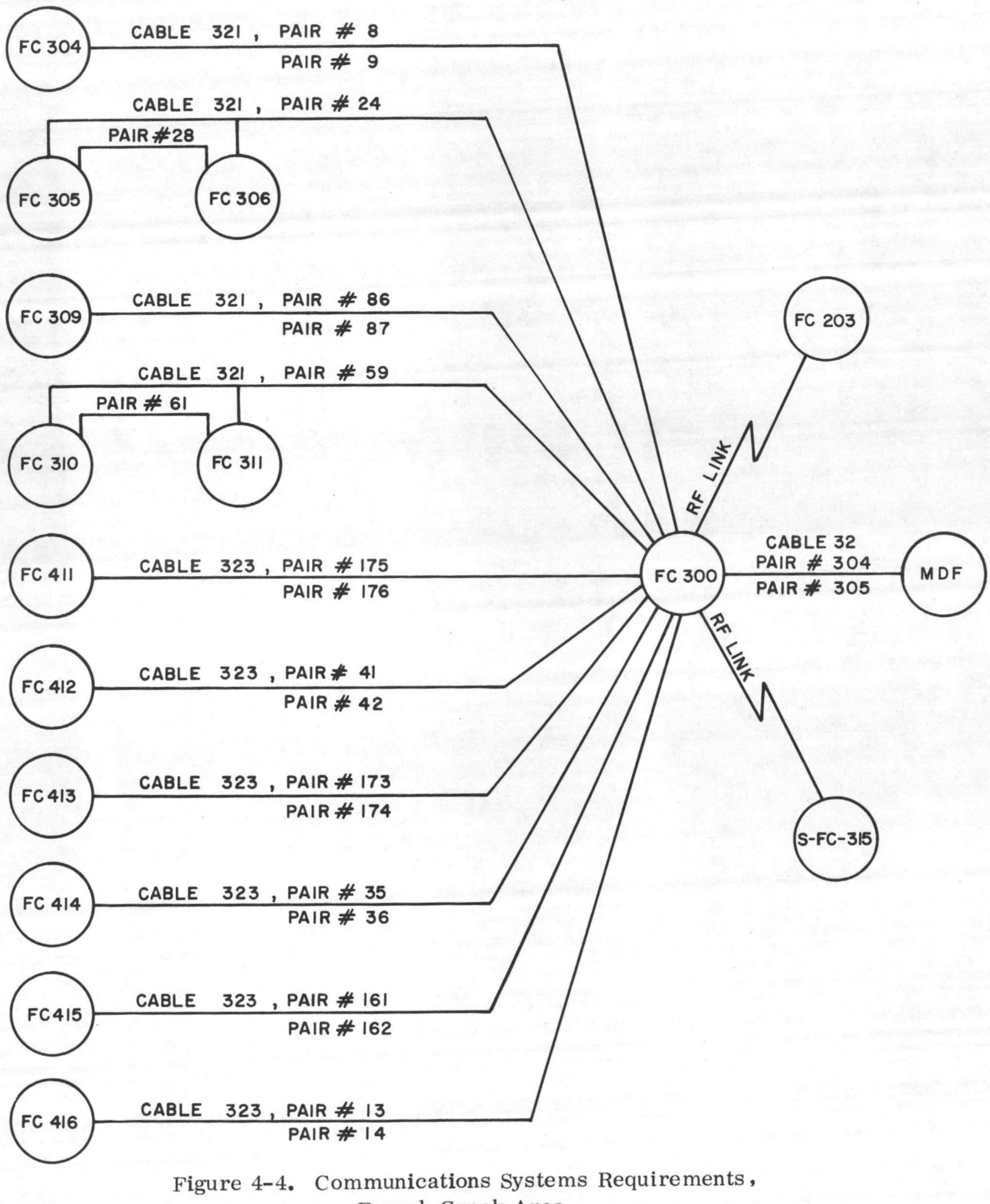


Figure 4-4. Communications Systems Requirements, French Creek Area

SECTION 5 - SYSTEM DOCUMENTATION

This section describes the documentation to be provided to the Government over the life of the project. Four copies of all items of documentation will be provided, except as noted in Paragraph 5.4.

5.1 FABRICATION DRAWINGS

Fabrication drawings will include both electrical and mechanical documentation. Drawings of this type will generally include, but not be limited to, the following items.

- Special Enclosures
- RTU Cabinetry
- Elevations Drawings
- Equipment Layout.

These drawings will be forwarded to the Government for comments and review in advance of any fabrication effort. Upon return of these documents, CSC shall procure the necessary materials and complete the fabrication of the item. "As-built" fabrication drawing will then be furnished at the completion of the project.

5.2 OPERATING AND MAINTENANCE MANUALS

This category of documentation encompasses the following.

- Terminal - Operator's Manual
- System Operator's Manual
- Equipment Calibration Manual
- Communication System Maintenance Manual.

These manuals will be provided in three-ring binders suitably reinforced to withstand handling. Loose leaf binding will facilitate organizing the Terminal Operator's Manuals on a terminal-specific basis. The System Operator's Manual will contain the entire terminal operator's data sheets as well as complete procedural description for systems startup, restart, and shutdown. The Communications Systems Maintenance Manual will contain

trouble shooting guides for the communication hardware. The Equipment Calibration Manual will contain detailed procedures to be employed by the maintenance group to insure proper field device calibration. Draft copies of all operator's manuals will be delivered prior to beginning final acceptance tests. The final copies will be delivered at project completion and will incorporate changes required by testing exercises. Equipment Calibration Manuals (four copies) will be delivered at the conclusion of the project.

5.3 INSTALLATION DOCUMENTATION

Installation documentation will consist of "as built" drawings, description, and lists initially submitted as the "Detailed Installation Plan" described in Paragraph 4.3.

5.4 SOFTWARE DOCUMENTATION

The following software documentation will be provided to Camp Lejeune. Four sets of the following documentation will be provided, except as noted.

5.4.1 Operating System Software

Standard operating system software will be provided as executable modules on disk together with reference manuals, including FORTRAN, Assembler, utilities and System Generation. Only one copy of the executable modules on disk will be provided.

5.4.2 Application Software

Application software documentation will include the following:

- Detailed description of CSC generated application program and design criteria
- Detailed flowcharts of CSC generated application program
- Complete set of compiled and assembled listings of CSC generated application program
- Complete executable code on disk - 1 copy.

SECTION 6 - PROJECT MANAGEMENT

6.1 ORGANIZATION

This section provides a description of CSC corporate history and organizational structure. Additionally, the Proposed Project Organization, Associated Management Procedures, and Project Support Facilities are discussed in detail.

6.1.1 CSC Corporate History and Organizational Structure

Computer Sciences Corporation was founded in 1959 as one of the first independent companies devoted exclusively to the study, design, development, and implementation of software programs for computer systems. Since then, the company has consistently maintained a position of leadership in this continually expanding industry and is now a principal source for computer-based control and information systems for industrial, commercial, governmental, scientific, and military applications throughout the world. Figure 6-1 shows the CSC corporate organization. Mr. W. R. Hoover leades the corporation with headquarters in Los Angeles, California. The nine divisions shown on the chart include the Information Network Division (INFONET), providing major time-share services both domestically and on an international basis; Commercial Division and the CSC Leasing Division, serving a wide range of commercial data processing activities; several joint venture companies in Europe (Common Market); and the Systems Group, comprised of five major divisions headed by Dr. A. E. Nashman.

The Systems Division, as a part of the Systems Group, covers requirements involving real-time systems (Defense Systems, Information Sciences, Communications-Electronics, and Industrial and Utility Systems) as shown in Figure 6-2 and is headquartered in Falls Church, Virginia. Within the Systems Division, the Industrial and Utility Systems Center brings together an experienced team of engineering personnel with outstanding backgrounds in all aspects of process control, electric power systems, and telecommunications, with the ability to draw from the entire corporate staff to bring to bear the wide range of technical and management expertise resident within CSC. Figure 6-3 shows the organization of the Industrial and Utility Systems Center, headed by Mr. W. L. Moore.

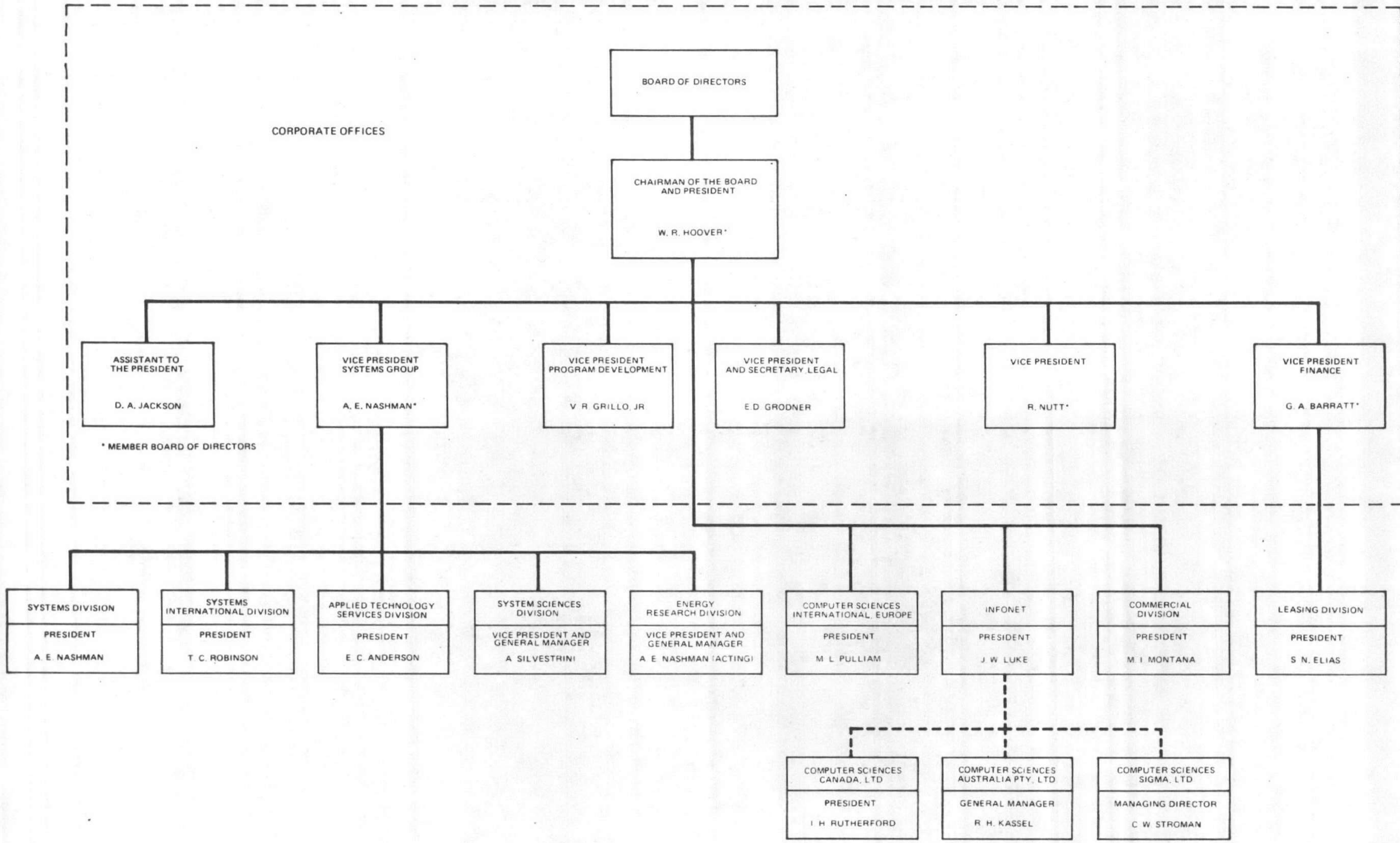


Figure 6-1. Corporate Organization

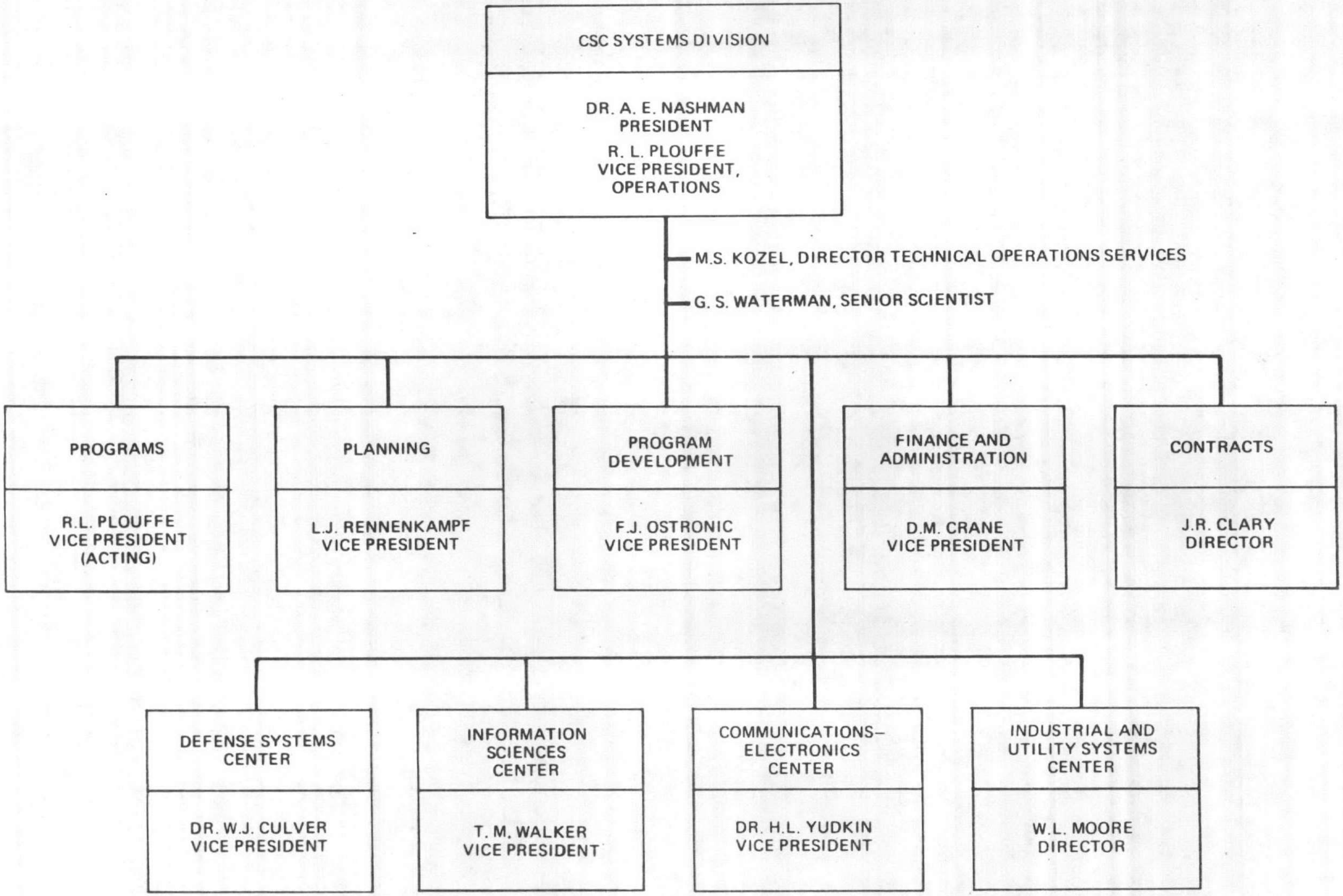


Figure 6-2. Systems Division Organization

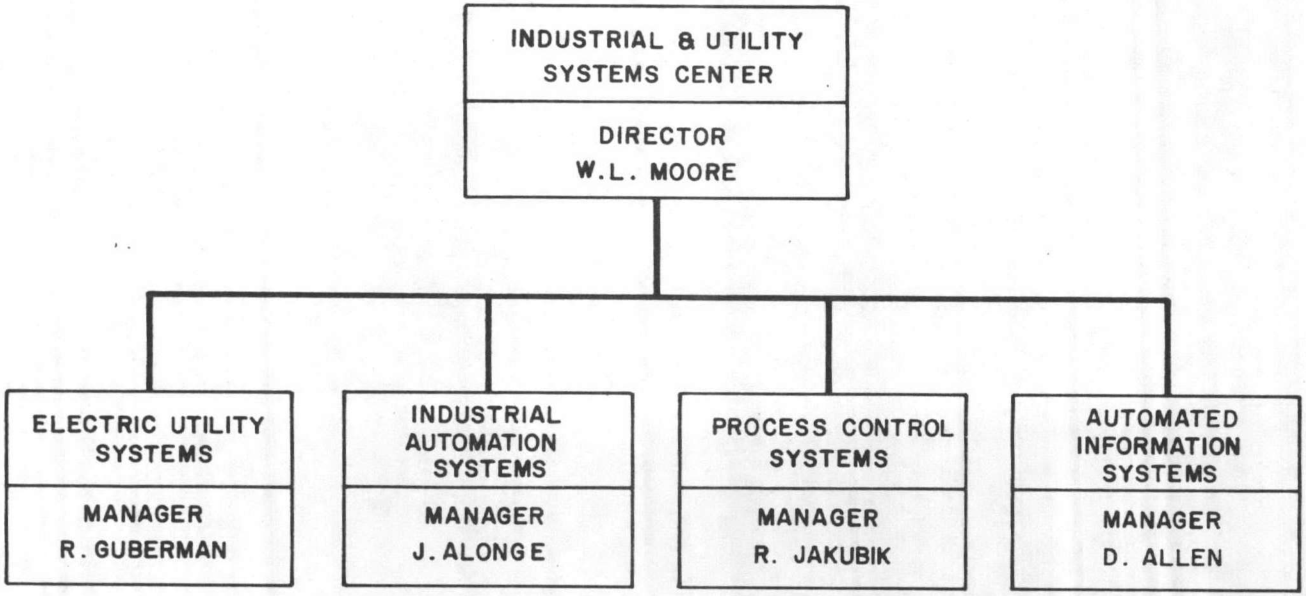


Figure 6-3. Industrial and Utility Systems Center Organization

Skills resident within the Industrial and Utility Systems Center include the complete range of capabilities necessary to complete the specified work on the Utility Control System as illustrated in Table 6-1. Table 6-2 summarizes the corporate staff profile which illustrates the significant technical depth resident within CSC. The large number of professionals (over 5000), with an average experience factor of over 12 years per man, provides a potential staffing base which assures competent project execution.

6.1.2 Project Organization

CSC will establish a project organization as shown in Figure 6-4 to execute the Utility Control System Project. This organizational structure is consistent with the overall CSC organization and provides for effective project control and inter-organization communication. Important features of this organizational structure and of CSC project management procedures are:

- The Project Manager acts as the focal point for all project communications, both technical and contractual.
- Division level support, including contract/subcontract administration, cost control, and documentation services, are provided by a pool of resources expert in their respective fields.
- Ongoing review at the center level and periodic reviewing at the division level covering technical, cost and schedule performance assure quick, positive reaction to potential project problems. The Project Manager has total visibility and support at division management level.

As shown in Figure 6-4, direct project responsibilities are established in three major areas:

1. Installation and Maintenance Services - This responsibility includes the on-site installation of all instrumentation, cabling and equipment including contracted installation services. This area of responsibility also includes the coordination of maintenance services, both CSC and subcontractor provided.

Table 6-1. Professional Skills Inventory

Industrial and Utility Systems Center
Professional Staff Skills Inventory
• Process Engineering
Process Control
Electric Power Systems
• Software Engineering
System Software
Data Acquisition and Control
Man/Machine Interface
• Hardware Engineering
Computer Systems
Man/Machine Interface
Digital Communications
Instrumentation
• Project Management

Table 6-2. Staff Profile

COMPUTER SCIENCES CORPORATION
STAFF PROFILE

• CSC	
TOTAL PERSONNEL	8119
PROFESSIONAL STAFF	5367
PhD	130
MS/MA	710
BS/BA	3181
NO DEGREE	1191
• PRIMARY EDUCATION FIELDS*	
ENGINEERING	1316
PHYSICAL SCIENCES	507
COMPUTER SCIENCES	1090
MATHEMATICS	1350
MANAGEMENT AND SOCIAL SCIENCES	1104
• SYSTEMS DIVISION	
TOTAL PERSONNEL	1896
PROFESSIONAL STAFF	1486
• AVERAGE EXPERIENCE – 12 YEARS	

*NOTE: Because U.S. Colleges did not award degrees in Computer Sciences until recently, almost 1700 of CSC's software personnel hold degrees in engineering mathematics, physics, or other fields.

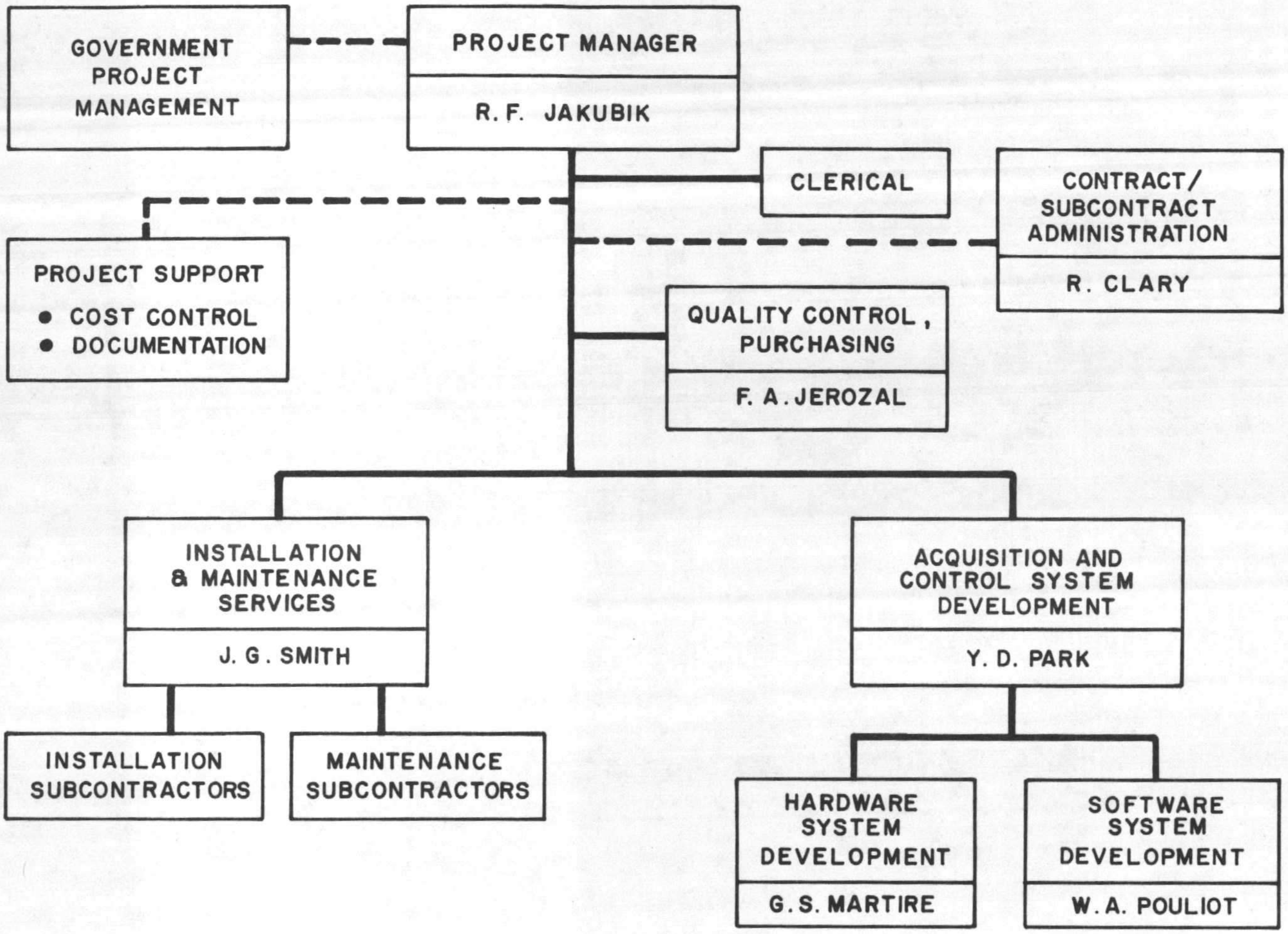


Figure 6-4. Project Organization

2. Acquisition and Control System Development - This responsibility includes the coordinated development of all hardware, software and support services necessary to the complete Acquisition and Control System.

3. Project Management - This responsibility includes coordination of all project activities including communication (and activity coordination), project administration and control, system quality control, purchasing (equipment) supplies, subcontracts administration, contract administartion, documentation production and documentation control, and internal (CSC) project reporting.

Personnel to be assigned in each area of responsibility are well experienced in the area of their assigned tasks with proven performance at CSC. Resumes of each responsible individual are provided in Section 10.

6.2 PROJECT MANAGEMENT PROCEDURES

The following are procedures recommended by CSC to be used in project technical, schedule and cost control.

6.2.1 Progress Reporting Procedures

Progress reports from CSC shall be of two types. First, by the tenth working day of each month CSC will transmit a progress report to the Government Project Manager. This progress report will include a chart showing, by subsystem, progress milestones for the complete effort and will identify the milestones completed as of the last day of the prior month. The report will also include a narrative covering milestones completed during the past month, planned effort for the current month, and outstanding problem areas and proposed remedial action.

Second, Trouble Reports, covering problem areas requiring immediate action by the Government Project Manager, may be transmitted at any time by CSC. These reports may initially be given in a verbal form, i.e., by telephone, but will always be confirmed in writing. The report will state the nature of the problem, proposed remedial action, and the potential impact on the CSC schedule or overall ability to perform under the contract.

It will be a project goal that outstanding problems identified in the monthly reports will be resolved within the current month and that problems presented in Trouble Reports will, insofar as possible, be resolved within 5 working days.

6.2.2 CSC Documentation Reviews

Documentation reviews fall into the following categories:

1. New Equipment Design - Design documentation including construction drawings, installation drawings, and manuals must be reviewed by the Government Project Manager prior to start of associated construction.

2. New Software Design - Program requirements and functional design documents must be reviewed by the Government Project Manager prior to the start of detailed program design.

3. Existing Equipment Documentation - Documentation on existing product software must be reviewed by the Government Project Manager prior to initiation of equipment construction and/or testing.

4. Existing Software Documentation - Documentation on existing product software must be reviewed by the Government Project Manager prior to start of implementation and/or modification.

5. System Field Acceptance Test Procedures - These test procedures will be submitted to the Government Project Manager for review at least 30 days prior to the scheduled test. The procedures presented will be updates of those agreed to before contract award.

6. Training manuals for all CSC-provided training courses will be submitted to the Government Project Manager for review at least 10 days prior to the start of the scheduled course.

7. Delivery of all "As-Built" subsystem documentation shall be made within 30 days after completion of the System Field Acceptance Test.

6.2.3 CSC Test Schedules

Field system tests will be shown as major milestones in the monthly reports. This, however, does not eliminate the requirement for official notification of intent to perform the test. Ten days prior to the intended (scheduled) test date, CSC will transmit notification of Intent to Test to the Government Project Manager. This notification will include the firm test date, status of necessary documentation, including test procedures, and required coordination by the Government Project Manager, if any.

6.2.4 CSC Shipment Schedules

As with test schedules, an official Intent to Ship notice will be transmitted to the Government Project Manager. The notice will be transmitted no less than 15 days prior to the indicated shipment date. In addition to identifying test and documentation status, CSC will indicate estimated date of arrival of shipment at its destination. The procedure will be followed for all shipments of finished goods to Camp Lejeune.

6.3 PROJECT SCHEDULE

Table 6-3 is a bar chart showing the principal work elements and associated implementation schedule through completion of the Utility Control System project. As shown, the overall project schedule is 12 months to completion of system field acceptance test. As the bar chart in Table 6-3 shows only major milestones, it is CSC's intent to submit a more detailed schedule within 105 days ARO.

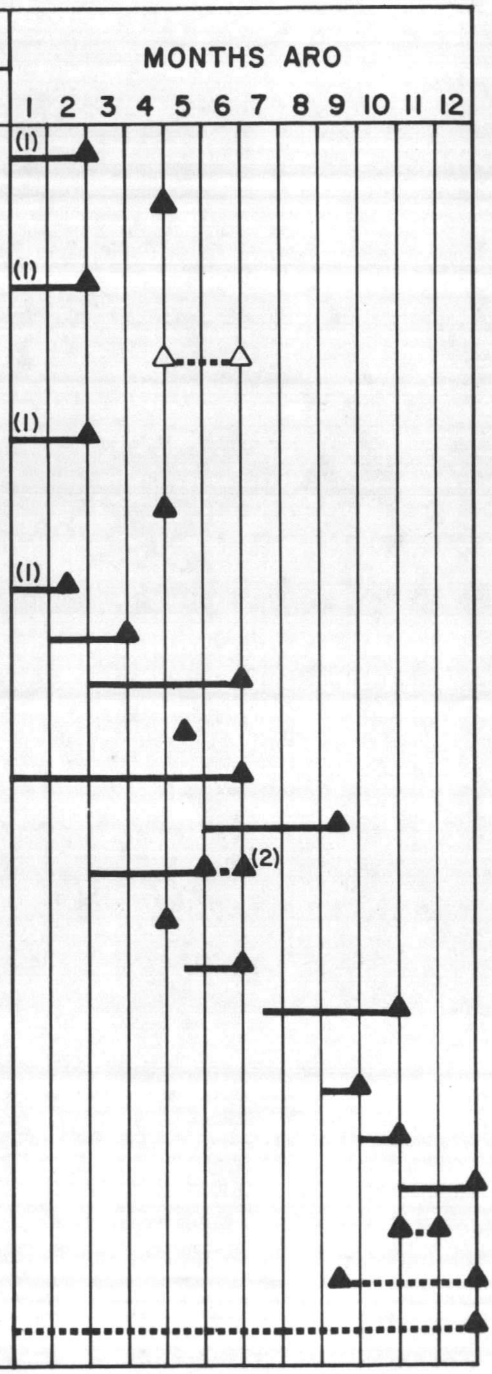
6.4 SUBCONTRACTORS

Only one subcontractor will be utilized by CSC on the Utility Control System. An electrical contractor will be selected and will perform the following tasks:

- RTU mounting
- HVAC interface unit mounting
- Conduit installation
- Cable installation
- Sensor installation

Table 6-3. Project Schedule

ACTIVITY	
NO.	DESCRIPTION
1	PREPARE & ISSUE PO FOR COMPUTER HARDWARE
2	RECEIVE COMPUTER AT CSC STAGING AREA
3	PREPARE & ISSUE PO FOR COMMUNICATION HARDWARE
4	RECEIVE COMMUNICATION HARDWARE AT CSC STAGING AREA
5	PREPARE & ISSUE PO FOR SENSORS AND ALARM DEVICES
6	RECEIVE SENSORS & ALARM DEVICES AT CSC STAGING AREA
7	PREPARE AND ISSUE SUBCONTRACT TO ELECTRICAL CONTRACTOR
8	DEVELOP FINAL FABRICATION DRAWINGS & SPECS
9	FABRICATE HVAC INTERFACE UNIT
10	CONFIGURE OPERATING SYSTEM
11	DESIGN APPLICATION SOFTWARE
12	CODE AND CHECKOUT APPLICATION SOFTWARE
13	DEVELOP FINAL INSTALLATION PLAN
14	FINALIZE COMMUNICATION NETWORK
15	PREPARE SYSTEM TEST PLAN
16	SITE INSTALLATION
17	TEAR DOWN AND SHIP SYSTEM TO CAMP LEJEUNE
18	SYSTEM INTEGRATION & PRELIMINARY TESTING
19	ACCEPTANCE TESTING
20	OPERATORS TRAINING
21	MAINTENANCE TRAINING
22	FINAL DOCUMENTATION



NOTE: Before issue of purchase order, normal 30 day review cycle will be followed.

(1) Includes design effort of 30 days.
(2) Government approval.

- Underground cabling installation
- Power and ground wiring at Building 1202.

The selected contractor will be under the direct supervision of CSC field personnel during on-site installation. The subcontractor's work effort will constitute approximately 15 percent of the total projected costs.

CSC and its installation subcontractor will comply with the Department of Labor wage rate classifications.

SECTION 7 - EXPANSION CAPABILITY

The proposed system is capable of future expansion in all hardware areas to support additional monitoring and control and in communications software in case multiple computer systems are to be utilized.

7.1 COMPUTER SYSTEM

Figure 7-1 depicts the conceptual design encompassing future system expansions. The proposed system for First Increment with 1 MCI and 53 RTUs can be expanded to 4 MCIs and 504 RTUs. Beyond that, a second Modcomp II/201 system would be utilized. Upon future expansion, the overall system supervision would be made via a Host computer. Communication software, MAXNET, is described in Paragraph 7.3. The second Modcomp II would have the same capacity as the first Modcomp II.

7.2 DATA ACQUISITION AND CONTROL HARDWARE

All field devices are standard products, which can be purchased from the listed manufacturers. Additional RTUs and their associated sensors and devices can be added at any time assuring available communication lines or RF link approval. All proposed RTUs are capable of at least double their listed capacity in Table 2-1.

7.3 COMMUNICATIONS SOFTWARE - MAXNET

MAXNET software allows multiple Modcomp computer systems to be linked together in a distributed network configuration. The resulting network operates as an integrated system.

MAXNET is designed to isolate the programmer and system operator from the communication protocols and other system idiosyncracies normally associated with multiprocessor configurations. All network functions are interfaced through executive services, FORTRAN callable subroutines or operator commands.

A large number of computer applications involve the capture of data at the source and rapid response to external events, coupled with large-scale data reduction and mass file storage on a demand basis. An appropriate solution to many of these applications is one

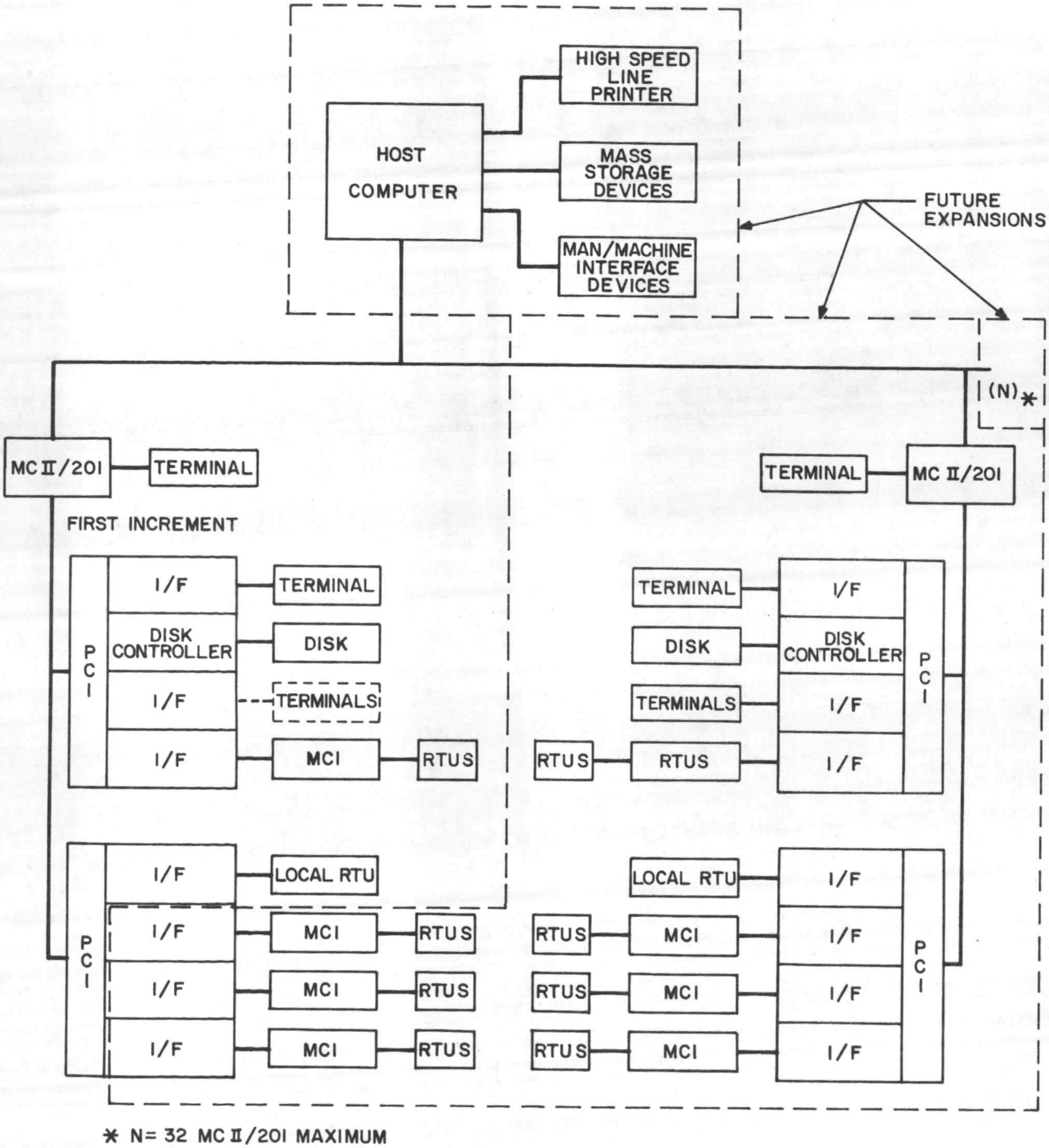


Figure 7-1. Conceptual Design for Future System

or more satellite computers, interfaced to the physical data sensors, connected by communications links to a Host computer which provides the large-scale data reduction and mass file storage on a demand basis.

7.3.1 Hardware Requirements

7.3.1.1 Host System

1. MODCOMP II computer or MODCOMP IV operating in the MODCOMP II mode with at least 24K words of memory.

2. A disk and a console device (teletype, CRT, etc.) which are required by the extended disk version of MAX III.

3. A communications link to each of the defined satellite MODCOMP computers. The links may be any of the following MODCOMP models:

   - 4810 - Asynchronous communications interface, 75-9600 baud, 20 ma current loop with two full duplex channels

   - 4811 - Asynchronous communications interface, 75-9600 baud, RS232C compatible with two full duplex channels

   - 5813 - Asynchronous communications interface, 75-9600 baud, one full duplex channel and remote fill hardware (RS232C or current loop)

   - 1911 - Asynchronous communications channels, 110 baud, 60/20 ma current loop with two full duplex lines

   - 1912 - Asynchronous communications channels, 75-9600 baud, RS232C compatible with two full duplex lines

   - 4815 - Synchronous communications interface, 110-20K baud, RS232C compatible with two full duplex channels. This device is supported with asynchronous line protocol

   - 4820 - Modcomp 16 bit parallel computer link, 100K words per second

- 1115 - Asynchronous communications interface, 110-9600 baud, 20 ma current loop with one half duplex channel
- 1116 - Asynchronous communications interface, 110-9600 baud, RS232C compatible with one half duplex channel
- 4821 - High Speed Serial Computer Link. 15K to 125K words per second, with two half duplex channels and remote fill hardware.

7.3.1.2 Satellite System

1. MODCOMP II computer or MODCOMP IV operating in the MODCOMP II mode with at least 24K words of memory.
2. A communications link to the Host system. Any link from the above list is supported.

7.3.2 MAXNET Services

7.3.2.1 Operator Directives - Satellites and Hosts

- FIL - Initial program load a remote system
- RAS - Create or change a logical file assignment in a remote system
- RRS - Remote task resume
- RDF - Create or change a logical file default assignment in a remote system
- RTK - Remote task kill
- RTA - Remote task activate
- RTE - Remote task establish (make core resident)
- RTD - Remote task deestablish
- BGV - Background give (Host only to allow satellite computers to use a batch processing task)
- BTK - Background take (Host only to regain use of the batch processing task)

- RBP - Remote batch processing (Satellite only to use background and peripherals of the Host for program development)
- RFO - Remote task information
- RHD - Remote task hold
- RFI - Remote logical file interrogation.

7.3.2.2 REX Services and FORTRAN Calls

Available to Assembly language and FORTRAN users.

1. Remote task establish
2. Remote default assign
3. Remote task resume
4. Remote task deestablish
5. Remote task information
6. Remote file assign
7. Remote task activate
8. Remote task kill
9. Remote task hold.

7.3.2.3 System Tasks

Provided by MAXNET III which can be included at system generation time.

1. A link task (LKT) which interfaces to the logical I/O system and allows device independent I/O transfers over multiple computer links.
2. A loader task (LDR) which enables loading of tasks from a Host system disk to a satellite computer.
3. A simultaneous output task (SYC) that takes data written to one device and outputs that same data to two devices. Normally this is used to output system messages to consoles at satellite and Host systems simultaneously.

4. MAXNET III Linking Loader which looks at the computer link for binary data during remote fill operations. This loader will perform a checksum calculation on a record by record basis and request a fixed number of retries if an error is detected.

5. A software core device interface which allows a user to transfer data to and from core buffers defined at system generation time either locally or remotely. Normally these core buffers will be subdivisions of global common areas.

7.3.3 Link Task Operation

The Link Task Program (LKT) is a symbiont interface to the MAX III logical I/O system. From a general programming standpoint, a symbiont interface has all the characteristics of a software I/O device controller. In the particular case of the LKT symbiont, this "controller" accepts a variable number of physical devices where the devices are asynchronous channel pairs or core devices. The number of devices and the associated device names are established at system generation time.

All standard I/O calls execute executive services which perform I/O functions through the logical I/O system. The logical file associated with the I/O call is examined in the logical I/O system and the proper device is selected. If the logical device is assigned to a CPU link, the LKT symbiont is entered. The LKT symbiont allocates a dynamic buffer and stores all the information pertaining to the original I/O call in the buffer along with any data that needs to be transferred. Then an I/O call is made by the LKT symbiont to the appropriate CPU link.

The remote system, after some handshaking protocol, has the associated CPU link channel in the read mode. Upon receipt of an interrupt, the data is transferred and stored in a dynamic buffer of this system's LKT symbiont. The original I/O call information is extracted from the buffer and a new I/O call is built that looks exactly like the original except that it is in the remote system and the buffer address is changed. When the I/O call is executed, the device that is assigned to the logical file in this system is the device selected for the I/O transfer.

7.4 OTHER SOFTWARE PACKAGES AVAILABLE FOR FUTURE INCREMENTS

The following is the list of software packages that are currently available at CSC for use at Camp Lejeune for future increments.

1. Energy Control System

   a. Data Acquisition and Control System

      - Data Conversion and Limit Checking
      - Failure Detection and Switching

   b. Man/Machine Interface Services

      - CRT Display Format Characteristics
      - Display Request and Control
      - Data Entry
      - Supervisory Control
      - Operator's Functional Panel
      - Logging
      - Alarm Messages and Processing
      - Free-Format Displays
      - Programmer/Engineer Function Panel

   c. Calculations

      - Flow Calculations
        - Pressure Drop Across an Orifice
        - Energy Balance
        - Pump Pressure and Motor Load
      - Mass and Energy Balance Calculations
        - Boiler Efficiency
        - Heat Transfer Coefficients
        - Energy Loads and Losses
        - Power Factors

- Mixed-Stream Temperatures
- Tank Levels

- Optimum Loading Strategies
  - Optimization Calculation
  - "Pseudo" Status Points
- Historical Data Accumulation
  - System Data Base History
  - Alarm Messages, Operator Actions, First-Out Sensor Condition, and Alarm Condition Bookkeeping Information
- Data Trending
  - Automatic Trending
  - Historical Data Trends
- Reports and Logs

2. Ethylene Plant Computer Control System

   a. Introduction
   b. Optimizing and Control Functions
   c. Background Programs
   d. Present-State Program
   e. Optimizer
   f. Updating Program
   g. Foreground Programs
   h. Data Acquisition from Process
   i. Control Setpoints to Process

3. Kerr-McGee Coal Loading System

   a. Overview
   b. Scale House Interrupt Service

c. Wait Logic

Detailed descriptions and flowcharts are contained in Appendix B.

SECTION 8 - MAINTENANCE

8.1 GENERAL

CSC will perform overall system maintenance under separate contract should the Government so choose. A comprehensive maintenance plan utilizing field proven techniques will be initiated for all field devices. The computer and peripheral maintenance will be performed by MODCOMP field service under subcontract to CSC. MODCOMP field service for Camp Lejeune is located at Greenville, North Carolina, 80 miles from Jacksonville, North Carolina.

8.2 PRELIMINARY MAINTENANCE PLAN

The preliminary plan is broken into two portions -- MODCOMP hardware maintenance and non-MODCOMP hardware maintenance.

8.2.1 MODCOMP Hardware Maintenance

The MODCOMP hardware (CPU, disk, etc.) will be maintained by MODCOMP operating as a subcontractor to CSC. The proposed maintenance will include:

- Preventive maintenance, coordinated with base operations, to reduce operating costs and increase productivity. It is a carefully planned maintenance program performed at regular intervals of not more than 90 days. Diagnostics are run and weak components or modules are identified and systematically replaced, reducing the probability of future failure
- All parts and labor needed to keep the computer in peak operating condition. All labor necessary to support the hardware during the contract coverage is included. All parts, both maintenance and replacement, are included
- Engineers trained on the equipment. Every Field Service Engineer goes through extensive classroom and hands-on hardware training before entering the field organization. Then, because no two systems are exactly alike, the engineer who services the system learns its unique features and becomes an expert on it

- Spare parts stocked by MODCOMP. A worldwide spare parts network maintained by MODCOMP relieves the Government of the logistic, administrative, and investment requirements associated with spares.

8.2.2 Non-MODCOMP Hardware Maintenance

The non-MODCOMP hardware is comprised of equipment from several vendors. The major contributors are:

- F&M Systems Company - RTUs and MCI
- Motorola - RF equipment
- Rosemount - Sensors
- CSC - HVAC interface
- Omega - Thermistor.

Periodic maintenance and calibration of this equipment will be performed every 90 days by CSC personnel, should the Government so choose. In addition, call out service is available should procedures included in the training as outlined in Section 3 not correct the failure. Table 8-1 depicts calibration and preventative maintenance frequencies by major equipment type.

8.3 TEST EQUIPMENT

The following is a preliminary list of test equipment required to trouble shoot and calibrate the proposed equipment.

- Oscilloscope - Textronic 221
- Decade Box - General Radio 1434
- Loop Calibrator - Transmation 1020
- VOM - Simpson 261-2
- Pressure Calibrator - Taylor 153S18
- Digital VOM (high accuracy) - Simpson 460.

Table 8-1. Calibration and Preventative Maintenance Frequency

Type	Frequency
CPU and Peripherals	Quarterly
RTUs	Bi-Yearly
MCI	Quarterly
Sensors and Alarm Devices	Yearly
HVAC Interface	Yearly
RF Equipment	Quarterly

SECTION 9 - ENHANCEMENTS

The following enhancements can be made to the Utility Control System. However, these functions are beyond the requirements outlined in the NAVFAC Specification No. 05-75-5437 and not included in the proposed system.

9.1 MULTIPLE SCAN FREQUENCIES

Most programs which perform process functions operate on a timed basis. These include analog signal scan, digital scan, alarm scan, control and calculation. Frequency of service is determined at update time.

A frequency, expressed in seconds, is assigned to each time class via update. All programs are assigned priorities. In the event two or more service functions are scheduled to run at a certain time, the higher priority program will run first. If two time classes belonging to a service program are scheduled, the time class having the shortest interval (most frequent) will be processed first.

9.2 DAILY SUMMARY REPORTS

The following daily summary reports can be provided on a CRT and/or the terminals.

- Boiler summary
- Fuel usage summary
- Load shedding.

The sample formats of these reports are described in the following pages as Reports No. 1 through No. 3.

9.3 TEMPERATURE CONTROL

Control of the heating and cooling equipment will be done based on one average temperature of a building in addition to load shed control proposed in the base system. Under this scheme the system will have the ability to override the local thermostat based on an operator entered setpoint.

REPORT NO. 1

DAILY BOILER SUMMARY

DATE ____________________

	EFFICIENCY, %			STEAM		FUEL		STEAM
	ACTUAL	BOGEY	TEMP °F	PRESS PSIG	FLOW LBS/HR	STARTING TYPE	TIME OF CHANGE	PRODUCTION LBS
BOILER/SHIFT								
BOILER NO. 1								
1	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-
BOILER NO. 2								
1	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-
BOILER NO. 3								
1	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-

REPORT NO. 2

DAILY FUEL USAGE

DATE ______________

	OIL (LBS)	GAS (MSCF)
USAGE FROM FLOWMETERS	–	–
FROM TANKS/P.S. METER	–	–
DIFFERENCE	–	–
% DIFFERENCE	–	–
	AT MIDNIGHT	AT 8:00 AM ON / /
OIL STORAGE, LBS		
TANK NO. 1	–	–
TANK NO. 2	–	–
TANK NO. 3	–	–
	TIME	AMOUNT (LBS)
OIL DELIVERIES	–	–
(up to 5 deliveries/day)		
TOTAL		–

REPORT NO. 3

DAILY LOAD SHEDDING
(ISSUED ON LOAD-SHED DAYS ONLY)

DATE ____________________

LOAD SHEDDING

EQUIP NAME	EQUIP DESCRIPTION	NO. OF SHUTOFFS DURING REPORT PERIOD	NO. OF SHUTOFFS IN BILLING PERIOD	TIME* OFF AT	TIME* ON AT	MINUTES* OFF
-	-	-	-	-	-	-
				-	-	-
				-	-	-

*Variable number of entries for each sheddable load.

9.4 LOAD SHEDDING AND RESTORING

The following can be provided:

- Indication of whether load can be shed or restored at present time (because of minimum on/off time constraints)
- Economic analysis on power utilization
- Message to the operator when there is a skewed end-of-interval signal and capability to select either a digital clock or end-of-interval as Reference Time.

9.5 ADDITIONAL STATUS POINTS

9.5.1 Position

Status (position) of the local-off-computer switch in each HVAC interface unit will be transmitted back to the computer. This will give the operator greater visibility of the system status.

9.5.2 Compressor Run Status

Run status (on/off) of all air conditioning unit compressors will be transmitted back to the computer, allowing greater system visibility.

9.6 LOADS

In barracks incorporating 10 separate condensing units, sheddable loads as described in Paragraph 2.9 can be further broken down to allow smaller increments of power to be shed. Breakdown selection is as follows:

- Load - 1/2 building
- Load - 1/5 building
- Load - 1/10 building.

9.7 ADDITIONAL ANALOG DATA

9.7.1 Fuel Oil Tank Level

Fuel oil tank level will be transmitted to the computer for readout in gallons or pounds. A local readout in percentage will also be incorporated.

9.7.2 Barometric Pressure

Barometric pressure to be saved for historical data.

9.7.3 Relative Humidity

Relative humidity to be saved for historical data.

9.8 ANALOG SENSOR VALIDITY CHECK

This program will print a message identifying the analog sensor and its location should the readings not be within specified limits.

9.9 SYSTEM SHUTDOWN

CSC can provide a system "logical shutdown" routine to be used whenever system shutdown is required. This routine will ensure communications have completed, and that all required reports have been produced. A message indicating the system's status as "Down" will also be output to command terminal.

9.10 CRT

CRT can be used to visually display all logs and status of buildings and process points. It may be used as a Command Terminal to reduce load on a DECwriter and to allow a faster response.

SECTION 10 - CSC QUALIFICATIONS

10.1 EXPERIENCE AND CAPABILITIES

Computer Sciences Corporation (CSC) was founded in 1959 as one of the first independent companies devoted exclusively to the study, design, development, and implementation of software programs for computer systems. Since then, the company has consistently maintained a position of leadership in this continually expanding industry, and is now a principal source of computer-based control and information systems for industrial, commercial, governmental, scientific and military applications throughout the world. Services rendered during this time have included every aspect of computer technology, such as the design and implementation of high-order, real-time data acquisition and control systems; studies, analyses, design and implementation of all types of dynamic communications systems involving voice, data and video transmission; conceptual design through the integration of highly sophisticated applications-oriented programming systems involving state-of-the-art optimization and linear programming techniques; and the design and implementation of multimachine software sets to the development of complete, integrated software programs for a number of real-time computers.

While preeminent in the development of innovative computer programs, CSC, during its formative years, was quick to recognize that mastery of the computer as a tool was only one of several steps required in providing the optimum solution to a client's problem -- that a system must be more than just process-oriented. It must also be sensitive to the special needs and environment of each client. Consequently, as the range of services expanded into new areas, CSC accordingly augmented its staff with specialists who understood the source of the client's problem and who could adequately define the technical and nontechnical aspects of the problem in providing an effective computer solution. In conjunction with CSC's staff of systems software experts, these application-oriented specialists represent virtually every major area of industrial, commercial, government, social sciences, and scientific endeavor and provide CSC with a capability to address the entire area of information sciences -- the gathering, organizing, processing, communication

and interpretation of data. With this unique corporate capability, demonstrated by numerous successfully completed projects, CSC has evolved from its position as the number one independent software development company to become number one in problem solving through the application of computers.

CSC has grown rapidly by assembling specialists with proven backgrounds, adhering to rigid quality control and performance standards, and exercising sound management principles. At its inception, the company had five employees; the total now exceeds 8000, almost 5500 of whom are members of the professional staff. Financially, the company's revenue base has risen in a dramatic and fiscally sound manner -- from $230,000 in 1959 to $217 million in the fiscal year ending March 31, 1976. Through its operating divisions and subsidiaries, CSC now operates from more than 100 locations throughout the world.

During its corporate history, CSC has designed and implemented systems for over 2500 clients. These clients include a substantial number of "Fortune 500" companies, a significant sector of the utility industry, essentially all Federal Government agencies, numbers of educational institutions, over 150 banks and insurance companies, and every major manufacturer of computer hardware.

Because CSC neither manufactures hardware nor is affiliated with any equipment manufacturer, a comprehensive knowledge of various computing, communications, and display equipment produced by all major computer hardware manufacturers has been developed and maintained.

The company's technical personnel are familiar with the operational characteristics and unique capabilities of virtually any given equipment configuration. This broad technical awareness enables CSC to evaluate and respond to the specific strengths of a hardware subsystem to achieve the best balance for optimal system performance. With no conflict-of-interest problems, the company's analysts are free to exercise a true system objectivity and total freedom to design the most effective system solely on an analysis of the system requirements and existing time and cost constraints.

CSC's major resource is the combined experience, capability, and diversity of its staff. The company has been able to achieve its remarkable growth by assembling specialists

with a level of experience and education rated as the highest of any comparable organization in the information sciences. The 5500 members of the professional staff average more than 12 years' professional experience. Approximately 20 percent of the staff members are computer specialists, physicists, mathematicians, scientists, and financial analysts at the MS and PhD levels.

An industry-wide reputation for professional-level technical capabilities has also enabled CSC to attract top management personnel who are recognized leaders in their specialities. Corporate and Division management includes former presidents of leading corporations in the information sciences, as well as managers from a broad range of industrial organizations.

10.2 CSC STAFF

10.2.1 Project Personnel

The following pages contain descriptions of the professional background of key personnel currently planned to be assigned to the Utility Control System project as shown in the Project Organization Chart, Figure 6-4.

R. F. JAKUBIK

HIGHLIGHTS OF MAJOR COMPUTER CONTROL ACTIVITIES

TRW, INC.
1956-1962

Applications engineer for ethylene plant computer control project for Petroleum Chemicals, Inc. (now Cities Service). Defined control functions for TRW-330 Control Computer. The controlled variables were feed rate, steam rate, steam rate, coil outlet temperature and suction pressure on feed gas compressor.

Project manager for computer control of soap manufacturing plant for Procter & Gamble Company. Managed the technical and business aspects of the project and organized the training of Procter & Gambple personnel in the operation and use of the computer system.

Process analyst responsible for conducting technical and economic feasibility studies for computer control of ammonia, methanol, acetic anhydride, catalytic cracking, distillation, petroleum refining, and butadiene plants.

GENERAL ELECTRIC CO.
1963-1965

Project manager for computer control of batch process for plastics manufacture for Monsanto Company. The computer was used to store batch formulations for a number of products, schedule and control the use of the raw material weigh systems, charge materials from the weigh tanks to reactors, control the batch temperature in each reactor according to a predetermined temperature-time curve, and control the operation of a distillation column.

Project manager for computer project utilizing dual process computers, remote scanners and telecommunications equipment for Bonneville Power Authority.

Project manager for project to develop mathematical models and control strategy for computer control of ethylene plant for Mobil Chemical Company. Mathematical models were derived for the cracking furnaces, feed gas compressor, and distillation train including the demethanizer, ethylene splitter and propylene splitter. The control strategy utilized a non-linear optimizer to determine the setpoints for over 70 controlled variables.

REAL-TIME SYSTEMS, INC.
1966-1968

Manager of process control goup responsible for several turnkey computer control projects.

Installed process computer in styrene-butadiene plant (SBR) for Uniroyal Chemicals Company. The computer performed direct digital control (DDC) of 32 control loops and sequential control (startup/shutdown) of 65 pumps and solenoid valves.

Installed process computer in a batch polyvinyl chloride (PVC) plant for Uniroyal Chemicals Company. The computer was programmed to "scan" several plant analog signals, and compute each reactor's conversion level from a material balance around each reactor. Based on the computed conversion level, the rate of ingredient addition was modified. The system also computed the reaction "endpoint".

Installed a process computer for Ciba-Geigy in herbicide manufacturing facility. System performed supervisory setpoint control, advanced cascade control and operator communications functions.

CHEM SYSTEMS, INC.
1969-1971

Provided process computer consulting services to Texaco, Inc. and Humble Oil & Refining Co. relative to monitoring and control of gas plants. The control strategy to be implemented by the computer system was defined in detail. In addition, the economic benefits to be achieved from the control system were evaluated as well as the cost of installation and startup.

Provided process computer consulting services to Picatinny Arsenal relative to computer control of trinitrotoluene (TNT) manufacturing plants. The optimum configuration and implementation plan for remote control of the TNT process was developed. The rationale for the choice of the preferred control system was based on cost, reliability and safety.

CSC
1972-1973

Prepared a design-criteria package for control system and control room for automated multi-base (explosive) facility for Hercules, Inc. The control system design criteria package included the control room requirements (size, floor loads, type of construction, power, heat and cooling, etc.) and equipment costs for the process computer, field sensors, transducers and transmitters, software, engineering design, and field installation.

Designed a computer-based pollution monitoring and control system for Hercules, Inc. Various alternative systems were evaluated. The optimum system was selected based on performance and cost.

1973-1974

Designed a laboratory data acquisition system for analytical instruments in consolidated laboratory for the Commonwealth of Virginia. The data acquisition, computation, control, reporting and display requirements were defined. Analytical instruments interfaced to the data acquisition system were mass spectrometer, chromatograph, autoanalyzer, atomic absorption unit, infrared analyzer, and others.

1974-1975

Program manager for a multi-million dollar control system for a munitions plant at Radford Army Ammunitions Plant (RAAP). CSC's responsibility included specification of field sensors, control room instrumentation, computer hardware, design of the startup/shutdown and continuous control strategy, and training of RAAP personnel to use the control system.

1975-

Project manager for design and costing of a computer system to control a batch reaction system for Union Carbide Corporation and to interface with an analog backup system.

EDUCATION

BS in Chemical Engineering, West Virginia University; MS in Physical Chemistry, John Carroll University.

PROFESSIONAL EXPERIENCE

20 years

G. S. MARTIRE

HIGHLIGHTS OF MAJOR COMPUTER CONTROL ACTIVITIES

WESTINGHOUSE ELECTRIC CORPORATION
1956-1957

Operated an AC Network Analyzer to solve Load Flow, Short Circuit, Loss Formula, Transient Stability, and Network Equivalent problems.

1957-1961

Performed digital production studies, program maintenance, and modifications of Load Flow, Loss Formula, Transient Stability, and Network Equivalent programs.

UNITED STATES ARMY
1961-1963

Designed and implemented various data processing applications.

WESTINGHOUSE ELECTRIC CORPORATION
1963-1966

Participated in programming and debugging standard programs for solving Loss Formula and Transient Stability problems.

Wrote cross-correlation and spectral density programs which included plotter output.

1966-1969

System specifications, programming, and debugging for the Middle South System, Public Service of Oklahoma, and Pacific Gas and Electric PRODAC 50 systems.

Assisted in the field installation of the Public Service of Oklahoma system.

Responsible for program specifications, programming and debugging of operator's console packages, and other support programs for General Motors automated warehouse and William Brothers Pipeline Company bulk product distribution stations.

Wrote data accumulation programs for New Boston II thermal power plant.

1969-1971

Project Director for New England Power Exchange pool dispatch computer. Responsibilities included: man/machine interface design (panel and CRT displays); requirements definition; application program design and testing of high speed serial data links; on-site installation. Overall system functions included: load frequency control, pool economic dispatch, interchange scheduling and evaluation, unit commitment (including hydro, nuclear, thermal, gas turbine, diesel, and pumped storage units), off-line load flow, on-line hybrid load flow (including operator load flow) with contingency evaluation, periodic logging, data acquisition and alarming, etc.

1971-1974

Project Director for Iowa Illinois Gas and Electric dispatching and SCADA system. Responsibilities included: overall project definition, hardware configuration analysis, conceptual software design, cost estimating, scheduling, manpower profiles, customer liaison. Overall system functions included: Dual Sigma 5 computers, on-line load flow, automatic contingency analysis, off-line load flow, load frequency control, economic dispatch, supervisory control and data acquisition from 26 remote stations, and graphic and alphanumeric CRT operator interface.

Hardware configuration analysis, conceptual software design, costing in a technical consulting role for marketing of electric power dispatch and SCADA systems.

CSC
1974-

Senior Computer Systems Engineer responsible for central station equipment, system software, and application software for the Central Area Power Coordination Office including computer equipment, man/machine interface equipment and software, communication equipment and software, and dispatch applications. Also currently participating in the development of specifications for the Tampa Electric Company Energy Dispatch System, and Los Angeles Department of Water and Power.

EDUCATION

BS in Electrical Engineering, University of Pittsburgh.

PROFESSIONAL EXPERIENCE

20 years

Y. D. PARK

HIGHLIGHTS OF MAJOR COMPUTER CONTROL ACTIVITIES

POLYTECHNIC INSTITUTE OF BROOKLYN 1964-1966	Research work on optimization of distillation column based on on-off control.
REALTIME SYSTEMS 1967	Consultation for Chem Systems in absorption, extraction, and distillation processes.
1967-1968	Contributing team member in methanol computer control for Borden Chemical. Included signal processing, set point control, data logging and reactor control.
1968	Contributing team member in ethylene computer control for Jefferson Chemical. Included signal processing, set point control, and data logging.
1968	Contributing team member in gas chromatography system on Honeywell 516 for Honeywell.
1968-1969	Designed, programmed, and installed computer control system for Chase, Brass and Copper metallurgical laboratory with emf and atomic absorption furnaces. Included foreground, background and conversational routines.
SCIENTIFIC RESOURCES CORPORATION 1969	Developed and programmed N-P-K fertilizer granulation formulation LP model to include inventory constraints.
1969-1970	Consultation for Hoffmann-LaRoche and CORCO in distillation processes.
DAVIS COMPUTER SYSTEMS	Developed off-line ethylene plant simulation/ optimization model based on LP technique for El Paso Gas Products. Included naphtha, ethane, and propane cracking furnaces, compressor, flash pot, demethanizer, deethanizer, depropanizer, C_2 and C_3 splitters.

METROMATION 1971	Performed work on gas chromatography system.
1972	Contributing team member in patent application for Ethylene Furnace Control Package.
1972-1973	Developed and programmed process interface programs, which enable the user to interface Basic Control System with most process instruments. Included analog signal processing, alarm checking, set point control, and PID control.
1972-1973	Performed work on furnace control for ethylene plant for B. F. Goodrich Chemical.
1972-1973	Studies for AMOCO and several European ethylene plants.
CSC 1973-1974	Contributing team member in Commonwealth of Virginia State Laboratory Automation Project.
1975-	Participant in the design of process control systems for a major petrochemical client.
EDUCATION	BS CHE, University of Virginia; graduate studies in Chemical Engineering at Polytechnic Institute of Brooklyn.
PROFESSIONAL EXPERIENCE	12 years

W. A. POULIOT

HIGHLIGHTS OF MAJOR COMPUTER CONTROL ACTIVITIES

UNIVERSITY OF MASSACHUSETTS 1965-1968 (Part-Time)	Developed a set of FORTRAN matrix operation programs for computer analysis of statistical data.
	Assisted in teaching a basic FORTRAN course for engineering students.
	Participated in the development of the UMASS timesharing system for the CDC 3600. The majority of this work involved design and implementation of the drum input/output software for the system.
	Modified the FORTRAN library routines for the UMASS system to make them relocatable.
CSC 1968-1969	Assisted in design of specialized data management system.
	Participated in the development of a specialized disk sort package in IBM 360 ALC using a virtual memory technique.
	Designed a program package to determine possible intersection points of geometric figures on the surface of a sphere. All calculations were performed using spherical geometry rather than planer approximation.
	Made modifications to a major transportation model to simulate worldwide troop and supply deployments.
1969-1971	Responsible for design and implementation of a large portion of a real-time operating system for the XDS Sigma 5 computer system. This included development of the priority interrupt software, computer-to-computer communications, dynamic storage allocation and modifications to CalComp

software. Assisted in development of functional and interface specifications for special purpose analog and digital data acquisition hardware.

1971-1972	Worked in the Configuration Management group for a large multicomputer installation. Developed documentation and testing standards. Developed operational procedures to provide optimal software integrity and data backup.
1972	Task leader of six-man task to implement a real-time test package for the experiments aboard NASA's Atmospheric Explorer statellite.
1972-1973	Participated in the preliminary design of a large scale computer-based advance instructional system for the Air Force Human Resources Laboratory. Responsible for initial design of time-sharing operating system extensions for the training system.
1973	Performed a design study for a major utility company to increase the capabilities of their real-time monitor and control system.
1973-1974	Developed operating system extensions and modifications for a dual-computer real-time process control system. The system supported batch as well as direct digital control.
1974-1975	Lead Software Engineer for the design of a real-time laboratory automation/information system for a large synthetic fiber manufacturer.
1975-	Lead Software Engineer on the development of an Ocean Wavemaker Simulation System.

EDUCATION — BS in Electrical Engineering, University of Massachusetts.

PROFESSIONAL EXPERIENCE — 9 years

J. G. SMITH

HIGHLIGHTS OF MAJOR COMPUTER CONTROL ACTIVITIES

HONEYWELL, INC. 1958-1960	Contributing team member in design, installation and start-up criteria of Analog Control Systems for DX Sun Ray, Monsanto Chemical, El Paso Natural Gas, Rexall Chemical, and Continental Oil Co.
1961-1962	Project Engineer for modernization and centralization of all Analog Control Systems for Continental Oil Co. in Artesia, New Mexico. Work included: (1) specifying, procuring, and installing instrumentation for new process requirements; (2) utilization study of exsiting instrumentation (modernize or replace); (3) relocation of local controllers to central control room; (4) installation design, including wiring, piping, control room panels, etc.; and (5) installation implementation and plant start-up. Participated with Continental's Process Engineers during plant balance study and implementation procedures.
1962-1964	Technical Representative to U. S. Army, White Sands Missile Range, New Mexico. Performed feasibility study on (1) modernization of instrumentation on environmental chambers; (2) interfacing existing or new instrumentation of environmental chambers with data acquisition system on a small scale computer; (3) interfacing existing control systems on waste disposal facility and water distribution system with a small scale computer; and (4) modernization of control systems on steam generating facilities.
1964-1966	Installation responsibility in the West Texas and New Mexico area for pipeline automation project for Transwestern Pipeline Co., Houston, Texas. Installation and start-up responsibility of Analog Control Systems for new refining facilities, Warren Petroleum (3 plants). Design, installation, and start-up of small scale Analog Control Systems for Standard Oil, Texaco, El Paso Natural Gas, and Phillips Dodge Refining Corporation.

Designed and installed interface between existing instrumentation on environmental chambers located at White Sands Missile Range, New Mexico, and Government Furnished Telemetry System.

1966-1969

Project Manager for Marston Lake Filtration Plant Control System Project, Denver, Colorado. Turnkey responsibilities included system design, instrumentation selection and procurement, panel fabrication, field installation, and start-up.

Project Manager for Shell Chemical Revamp Project, Denver, Colorado. Turnkey responsibilities included design, installation, and start-up of control system for a new process, utilizing existing instrumentation furnished by Shell Chemical.

Project Manager for the Ft. Bliss Water Distribution Data Acquisition and Control System Project, Ft. Bliss, Texas. Turnkey responsibilities included design, instrumentation selection and procurement, installation, and start-up of data acquisition and control system for widely scattered sources encompassing some 600 square miles.

<u>F&M SYSTEMS CO.</u>
1969-1972

Responsibilities included: (1) engineering design for interfacing field instrumentation to remote terminal units for data transmission to and from central computer, (2) installation engineering for field devices, RTUs, computers, display units, analog back-up devices and other peripheral equipment, (3) supervisor of field labor, including the various crafts, during installation, checkout and start-up. Major projects included: (1) Monitoring and Control of Airport Facilities, SEATAC Airport, Seattle, Washington, (2) Control and Surveillance of a Water Distribution System, Houston, Texas, and (3) Security and Control of an Exhibition Facility, Chicago, Illinois.

<u>CSC</u>
1972-1974

Responsibilities include computer system installation planning and implementation, startup procedures and detail design. Major applications: detailed installation design for an automated single-base propellent line, utilizing explosive and intrinsically safe criteria;

1974-1975	Detailed design of the analog subsystem, programmable controller logic, and field instrumentation for an automated Black Powder plant; conceptual design of analog subsystem, field instrumentation, and computer interface hardware for an automated multi-base propellent line.
1975-	Responsible for the system and logic design of a programmable controller subsystem for the movement and control of an automatic materials handling system involving track type cars for a major munitions manufacturer.
EDUCATION	Studies in Business Administration, San Angelo Junior College; and in Electrical Engineering, University of Texas. Completed military and industrial courses in Fundamentals of Radar and Fundamentals of Instrumentation.
PROFESSIONAL EXPERIENCE	18 years

10.2.2 Technical Support Personnel

The following pages show the professional background of typical personnel within the Industrial and Utility Systems Center with capabilities consistent with the Utility Control System project. These individuals may be called upon to support the project in specific technical areas and, in the event any of the key personnel planned for assignment are unavailable at the time of project award, may be assigned on a long term basis.

D. G. ALLEN

HIGHLIGHTS OF MAJOR COMPUTER CONTROL ACTIVITIES

PPG INDUSTRIES, INC. 1964-1965	Conversion of LP model for 2-dimensional cutting problem from IBM 7090 to IBM 1620.
1966-1967	Plant-level supervisor for corporate order entry system design/development. Conducted order input glass size mix studies on IBM 1620.
1967	Contributing team member in design programming of in-plant glass cutting/warehousing area production information system on IBM 1800.
1968-1969	Supervisor of systems engineering responsible for 10 man group in area of automated order processing, optimal 2-dimensional layout, computer controlled cutting, and conveyor control. Wrote numerous plant product flow economic models.
1969	Conducted feasibility studies for automated cutting/warehousing at company's other plants.
1969	Developed models of product flow through conveyor system complexes.
UNIVERSITY OF W. VA. 1968-1969	Taught computer systems courses in Assembly language and FORTRAN programming, systems design.
CSC 1969-1970	Programmed data management system for U.S. Air Force using IBM 360/30.
1970-1971	Project Manager for design, programming, implementation of data acquisition/control system for classified U.S. Air Force project involved with digital analog data acquisition, supervisory set point control, graphics displays support and data base management on large scale IBM 1800.

1971	Designed/programmed control of microscopes (IBM 1800/NOVA computer combination) used in analysis of high energy particle tracks in film emulsions at NASA, Goddard Space Flight Center.
1972	Project Manager for classified U.S. Air Force project involved with software support of special purpose operators' consoles.
1973-1974	Preliminary analysis and configuration for explosives plants, hospital clinical labs, letter and bulk mail processing centers, power distribution systems, chlorine production facilities, photo processing facilities.
1974-1975	Program Manager for design, programming, hardware procurement, and implementation of a Laboratory Information System for a major polyester manufacturer. System based upon DEC PDP 11/40 minicomputer acquires data directly from numerous process laboratory instruments as well as a dozen remote CRT terminals. System supports real-time data base inquiries, provides automatic test scheduling and quality summary reporting and maintains total plant product quality data over the most recent 31 day period.
1974-	Manager, Automated Information Systems Department, responsible for the Industrial Laboratory and Automated Materials Handling Systems.
<u>EDUCATION</u>	BS in Electrical Engineering, Grove City College (Pennsylvania); graduate studies in Industrial Management, Center for Management Development, Frostburg State College (Maryland).
<u>PROFESSIONAL EXPERIENCE</u>	12 years

J. C. ALONGE

HIGHLIGHTS OF MAJOR COMPUTER CONTROL ACTIVITIES

U. S. AIR FORCE
1964-1969

Captain, U. S. Air Force, responsible for design approval of range safety airborne command and control system for all missile programs at Cape Kennedy.

SERVICE TECHNOLOGY CORP.
1969

Principal investigator of a research study to develop a computer controlled municipal communications and control system for use in crime prevention, detection and public safety. The study explored such concepts as computer controlled vehicle dispatching of police, fire ambulance services, automatic vehicle location and direct CPU to vehicle communication via teleprinter. Report published December 1969.

1969-1972

Project Engineer for the analog front-end of the Langley Research Center Data Acquisition, Display and Control System. Responsible for the integration and testing of five computer controlled low level analog data acquisition systems. Designed digital interface subsystems to accomplish manual and computer control of analog subsystems and programmable calibration sources. Designed overall instrumentation system grounding and shielding circuitry for reduction of noise and common mode potentials. Prepared detailed test procedures for checkout and final acceptance of analog subsystems and conducted system inplant acceptance tests.

1971

Proposal to NASA Lewis Research Center. Engineering responsibility for analog front-end and digital interface for a Jet Engine Test Center Low Level Analog Data Acquisition System.

1971

Proposal to Naval Ordnance Laboratory. Engineering responsibility for analog front-end and digital interface for Hypersonic Hypervelocity Wind Tunnel Data Acquisition System.

KENTRON HAWAII, LTD.
1972-1973

Technical proposal manager for the design of computer controlled U.S. Postal Service Bulk Mail Center Process Control System. Responsible for technical approach and technical compliance with all RFP requirements. Prepared technical proposal and designed special purpose digital control logic interface to the mechanized mail processing machinery.

CSC
1973-1975

Program Director for the Black Powder Manufacturing Plant process instrumentation and control system. Responsible for total system configuration and performance.

1973

Proposal to NASA Marshall Space Flight Center for large multiprocessor low level data acquisition system. Engineering responsibility for the analog front-end and digital interface hardware. Also participated in digital processor system configuration.

1975-

Program Director for Wavemaker System for Hydromechanics Laboratory Facilities at U.S. Naval Academy. Responsible for total system configuration and performance.

1975-

Program Director for Materials Handling Control System for Lone Star Army Ammunition Plant. Responsible for total system configuration and performance.

EDUCATION

BS in Electrical Engineering, Manhattan College, ME in Electrical Engineering, University of Florida.

PROFESSIONAL EXPERIENCE

12 years

D. K. DAUDET

HIGHLIGHTS OF MAJOR COMPUTER CONTROL ACTIVITIES

FARRINGTON ELECTRONICS INC. 1967	Programmed document transport control and mark reading recording data for Vernons Pool of England. Varian 620-I computer.
1968-1969	Programmed document transport control and data acquisition conducting diagnostic tests on character recognition hardware for Farrington 3030 Page Reader System. Varian 620-I computer.
1969-1970	Designed/programmed data acquisition and recording of digitized type written and machine printed characters used for design of character image templates. Also programmed algorithms for design of sets of character image templates used for machine reading of type written characters. Varian 620-I used for image recording. CDC 6400 used for template design.
LUNDY ELECTRONICS INC.	Designed/programmed system application software for Lundy/Farrington 4040 Journal Tape Reader. Varian 620-I computer.
1972-1973	Programmed field service maintenance reporting schedules used for maintenance and quality control of installed systems. Varian 620-I computer.
1973-1974	Programmed transport control and data acquisition of Lundy/Farrington high speed document reader/sorter for testing by foreign based companies (SIEMENS and BDB of Germany). Digital PDP 11-05 and Varian 620-I computers.
CSC 1974-1975	Member of team designing/programming laboratory automation and data management systems for a major polyester manufacturer. Digital PDP 11-40.
1975-	Member of a team designing and implementing an Ocean Wavemaker Simulator system.

EDUCATION	Studies in Industrial Electronics, Pennsylvania Technical Institute; studies in Computer Programming and Applications, Northern Virginia Community College.
PROFESSIONAL EXPERIENCE	9 years

G. E. GRAHAM

HIGHLIGHTS OF MAJOR COMPUTER CONTROL ACTIVITIES

NASA GODDARD
1961-1963

Developed control strategies and defined control system performance for controlling the attitude of a large orbiting astronomical observatory. Used an analog computer to simulate single-axis, two-axis and three-axis control assuming an inertial reference from gimballed star trackers or high resolution error sensors in the experiment optical system.

CONTROL RESEARCH ASSOCIATES
1965-

Developed a digital computer simulation to demonstrate the cause of instability in the speed control of a brushless DC motor. Used the same simulation to demonstrate a hardware stabilizing technique.

CSC
1969-1972

Project Manager for an engineering design optimization program to minimize the cost of installed pipes and compressors in gas pipeline networks. Supervised a group of five professionals developing the FORTRAN programs.

1973

Marketing Analyses of planned computer control projects in the gas industry.

Managed the design of a proposed manufacturing plant machine and maintenance monitoring system. The design included time clock monitoring, CRT data display, approximately 80 data input boxes (with pushbuttons) on the plant floor and a telephone communication system.

1973-1974

Analyzed, programmed and checked out software to control the sequential actions for starting, monitoring and stopping major sections of a large Army propellant manufacturing plant. Developed major portions of the software design for a system manager program which coordinates the sequential activities of each of the major portions of the plant. The design included coordination activities for all plant units whenever a specific

unit experienced either a normal or an emergency shutdown or was placed in a Hold condition.

Created detailed specifications of DDC and sequential control software for each of the major components of the propellant plant.

Developed analyses of a conveyor speed control loop using sampled-data, Z transform root locus techniques.

1975- Taught customer training course in applications programming.

Managed the preparation of a detailed layaway plan for the process control computer and all instrumentation associated with an automated TNT production facility.

Currently participating in the design of a process control system for a major petrochemical process client.

EDUCATION — BS in Engineering Science, Pennsylvania State University; MS in Engineering Mechanics, Stanford University; MS in Engineering Administration, George Washington University.

PROFESSIONAL EXPERIENCE — 15 years

R. P. GUBERMAN

HIGHLIGHTS OF MAJOR COMPUTER CONTROL ACTIVITIES

WESTINGHOUSE ELECTRIC CORPORATION 1967	Participated in programming and debugging a standard electric utility power dispatch and control package.
1968-1971	Lead Programmer for Pacific Gas and Electric Company PRODAC 250 Dispatch System. Responsibilities included system organization, program specification, design, writing, debugging, in-house and field testing, software coordination, scheduling, and review.
	Designed and implemented large scale Hydro-Thermal Optimization software package for the daily scheduling of the Pacific Gas and Electric interties and generating plants.
	Assumed project directorship role for the Pacific Gas and Electric Company PRODAC 250 Dispatch System startup and Hydro-Thermal Optimization software package installation and testing.
1971	Project Director of City of Tallahassee PRODAC 2000 SCADA and AGC computer system. In charge of system definition and project scheduling.
1972	Consultant and troubleshooter for both Public Service Company of New Hampshire and the New England Power Exchange PRODAC 250 system startups. Areas worked on included enhancements to operating system, message writer, and man/machine interface.
1972-1974	Project Director of Iowa-Illinois Gas and Electric Company man/machine interface part of their SCADA and AGC system. Responsible for project definition, hardware configuration analysis, software design and review, costing, scheduling, manpower, customer liaison, subcontracting. Overall system functions included: dual Sigma 5 computers, on-line and off-line

	load flows, automatic contingency analysis, LFC, EDC, SCADA, batch processors for data base generation and revision, CalComp plotter, and minicomputers front ending graphic and alphanumeric displays, printers and pushbutton panels.
	Technical consultant for marketing of Electric Power Dispatch and SCADA systems. Functions included: facilities layouts, personnel organization and staffing requirements, conceptual software design, costing, proposal preparation and presentation.
CSC 1974-1975	Senior Power Systems Engineer responsible for the design and development of power system applications including interchange and generation management, man/machine interface, and SCADA functions.
1975-	Manager, Electric Utility Systems, responsible for electric utility and industrial energy management systems development.
EDUCATION	BS in Electrical Engineering, Rensselear Polytechnic Institute.
PROFESSIONAL EXPERIENCE	9 years

P. McCURDY

HIGHLIGHTS OF MAJOR COMPUTER CONTROL ACTIVITIES

SHELL OIL CO. 1956-1960	LP studies (IBM 650) on alkylation, platforming, and gasoline blending.
	Wrote and wired many programs (IBM 604 and 650) on refinery daily material balances and laboratory calculations.
	In-house lecturer on regression techniques and FORTRAN.
TRW/BUNKER-RAMO 1960-1963	Process analysis task manager for turnkey ammonia control project for Allied Chemical Co. (RW-300). Work included development and use of detailed calculation models for reforming and synthesis areas. Participated in development of dynamic control version for DDC or supervisory use.
1961-1964	Process analysis task manager for turnkey ethylene control project for Nippon Petrochemical Company in Kawasaki, Japan. Wrote control models for compression, refrigeration, and all distillation columns.
1964-1965	Contributing team member in model development for study of a hypothetical ethylene plant (Union Carbide). Several kinds of feed (gas and liquid; multiple recycles.)
1965	Paper: "The Application of Space Technology to Chemical Process Control," Regional AIChE Meeting.
GENERAL ELECTRIC CO. 1965-1966	Contributing team member in model development for study of Mobil Chemical ethylene plant. Included in-house computer analysis of complex 2-column demethanizer column. Wrote most of down-stream present-state material and energy balance programs and updating and control.

1967	Performed feasibility study for control of Hercules methanol plant.
1967-1968	Consultation for GE Japanese licensee, Toshiba, in ethylene project for Tonen in Kawasaki, Japan. Worked on modified-profit-function non-linear optimizer.
1967	Wrote/compiled 4 volumes of 12-volume Process Analysis Notebook prepared for Toshiba (ammonia and ethylene). Gave lectures at 3-week course for them.
1968	Performed feasibility study for computer control of ammonia plant for American Oil; also another for a Mississippi farmer co-op.
1968	Paper: "The Role of the Process Analyst," LSU Computer Workshop.
1968	Feasibility study on control of titanium dioxide plant for Glidden Co.
1969	Designed and programmed a control model for a hypothetical distillation column for use in a touring demonstration of BICEPS.* Incorporated lead/lag dynamic control.
1969	Developed and documented a variety of programs related to fluid cat cracking and chemical and physical properties.
1969	Paper: "Computer Control of a Modern Methanol Plant," National AIChE Meeting.
1970	Paper: "Sizing Large Computer Control Systems," LSU Computer Workshop.
1970	Wrote all user manuals for BICEPS.*

*BICEPS is GE's fill-in-the-forms supervisory control system.

1971	Performed in-house analyses on GE-PAC 4020 of application of OPO and BICEPS* to ethylene plant control. OPO is an augmented LP; it can use non-linear models.
1971	Paper: "Applications of BICEPS in Process Control," National Meeting of ISA.
1971	Feasibility study for control of Sohio ethylene plant; also a study for Shell Oil plant.
1971	Wrote test programs for BICEPS and FORTRAN functions in three dual-computer (GE-PAC 4020) oil refinery - control systems for ESSO.
1972	Wrote some of data-link application software for 1-over-2 (three GE-PAC 4010s) oil refinery control system for ESSO.
1972	Feasibility study for control of molybdenum ore grinding and purification for Climax Molybdenum Co.
1972	Prepared and presented a short course on the practical applications of BICEPS to a customer team at Tenneco Chemical.
CSC 1973-1974	Preliminary analysis and configuration for explosives plants, analytical lab automation, and discrete control.
1974-1975	Developed and implemented process control strategy for a Black Powder manufacturing system.
1975-	Currently participating in an industrial survey of the long-term automation needs of Algeria.
EDUCATION	BA and Engineers Degree in Chemistry, Stanford University.
PROFESSIONAL EXPERIENCE	20 years

W. L. MOORE

HIGHLIGHTS OF MAJOR COMPUTER CONTROL ACTIVITES

RAYTHEON COMPANY 1958-1963	Designed, built, and tested digital control of airborne reconnaissance receivers.
	Designed, built, and tested alphanumeric CRT display systems stroke-write and Charactron character generation techniques.
	Designed and implemented a mobile computer-based EMI data acquisition system.
PHILCO-FORD 1963-1964	Project Manager for Control/Display Interface subsystem interfacing operational consoles to the Manned Spacecraft Control Center (MSCC) Real-Time Computer Complex in Houston, Texas. Managed the development and implementation of the Master Time subsystem for the Command/Control System at the MSCC.
1964-1969	Led the system design of process control and data acquisition systems for pumping plants, canals, and generating plants in the California Aqueduct System.
1965-1969	Project Manager for the design and implementation of the operational software/man/machine interface hardware for a dual Sigma 5 based Energy Control System (Houston Lighting and Power).
	Technical Director for the design of a dual computer data acquisition and control system involving monitoring and controlling electric power transmission and natural gas distribution (City Public Service Board of San Antonio).
	Technical Director for the man/machine interface system for the Pennsylvania-Jersey-Maryland Power Pool. The interface equipment included limited-graphic color digital television hardware.
	Product Manager in charge of the development of digital television products for commercial and process control applications.

Technical Director for the design of a dual computer (Sigma 5) based Energy Control System for Cleveland Electric and Illuminating Company.

HOUSTON ENGINEERING RESEARCH CORPORATION
1969-1972

Technical Director in charge of requirements definition, system design, supplier selection, and project control for the development of a dual computer-based Energy Control System for Iowa-Illinois Gas and Electric Company. System functions included supervisory control and data acquisition of electric transmission and distribution systems, gas distribution systems, steady state security assessment of electric transmission systems, economic dispatch of electric power, electric system load forecast, unit commitment and interchange management. Gas dispatch functions included load forecasts, hourly dispatch of interruptible service, and operational logs.

Technical Director for the system design and supplier selection for a dual computer Energy Control System for Carolina Power and Light Company. Dispatch functions included economic dispatch of electric power, security assessment of the electric transmission system, and interchange management.

Technical Director for the design of a graphic CRT oriented man/machine interface system for the control and data acquisition computer at a conventional electric power plant for Philadelphia Electric Company.

CSC
1972-1975

Technical Director for the Design of Energy Control Systems for the electric power industry. Assignments include system design tasks for Arizona Public Service Company, Sierra Pacific Power Company, Tampa Electric Company, and Taiwan Power Company.

1975-

Director, Industrial and Utility Systems Center for CSC. Responsible for all real-time industrial system activity.

EDUCATION

BS in Electrical Engineering, California State Polytechnic College. AA in Business Administration, Yuba College.

PROFESSIONAL EXPERIENCE 18 years

W. P. MULOKEY

HIGHLIGHTS OF MAJOR COMPUTER CONTROL ACTIVITIES

CSC 1968-1969	Designed and constructed an analog to digital data acquisition system for direct cycle steal injection of data into an IBM 1130 computer system.
1969-1970	Responsible for the design and evaluation of state-of-the-art hardware for two signal processing and data acquisition systems on four computer controlled wind tunnel systems. Performed a detailed analysis of several extremely low noise, low level multiplexing systems and signal conditioning techniques.
1970-1972	Responsible for the analysis and redesign of the Tiros Attitude Determination System for NASA-Goddard. This system used an IBM 360/95 to make critical position and attitude measurements from telemetered sensor data on weather satellites. Developed new technique for data recovery from noisy signals. Served as Attitude Determination Team Coordinator for ITOS-A (NOAA-1) Launch Support.
1972-1975	Responsible for control strategy design, hardware, specification and data base generation for CASBL I; the first automated gunpowder production facility. Also responsible for several applications programs for sequential control of equipment in the CASBL facility.
1975-	Project Manager responsible for the development of a computer based materials handling system utilizing unitized track cars for a major munitions manufacturer.
EDUCATION	BS in Electrical Engineering, Rensselear Polytechnic Institute; MS and doctoral studies in controls and systems, George Washington University.
PROFESSIONAL EXPERIENCE	8 years

S. WILLIAMS III

HIGHLIGHTS OF MAJOR COMPUTER CONTROL ACTIVITIES

LEEDS & NORTHRUP 1966	Designed, coded, and implemented major man/machine program modules for Virginia Electric and Power Company Digital Computer System. Implemented economic dispatch program for Virginia Electric and Power Company Digital Computer System.
1967-1968	Designed, coded, and implemented common study subsystem, and implemented various studies including: economy "A" pricing; post-interchange cost evaluation; load forecasting; economic dispatch evaluation.
1968	Responsible for on-site installation and debugging of Virginia Electric and Power Company Digital Computer System. Responsible for development and installation of second phase of Virginia Electric and Power Company Digital Computer System which included various long term studies: thermal unit commitment; long term interchange evaluation; hydro water usage monitor; hydro water usage scheduling; NODAL iterative load flow.
1968-1969	Project Programmer (program design and implementation coordination) in a liaison role for prime contractor on Houston Lighting and Power Company Digital Computer System. In addition to liaison role, had direct responsibility for design of Interchange Transaction Subsystem. Responsible for implementation and installation of: SCADA programs; thermal unit commitment; NODAL iterative load flow.
1970-1973	Project Programmer for Commonwealth Edison Digital Dispatch System. Responsible for scheduling and manpower for design, implementation, system integration, system field installation, and system field acceptance phases of the project. Overall system functions include: load frequency control; economic dispatch control; interchange scheduling and evaluation; reserve and overload

	monitoring; remote data acquisition; periodic logs, comprehensive dual computer failover program; unit commitment; maintenance scheduling study; fuel restriction study; load forecasting; load flow studies (operator load flow and automatic contingency evaluation); man/machine interface, etc.
1973-1974	Manager of Standard Application Programming Group. Group had responsibility to design, in conjunction with application engineering, standard application programs for use in digital computer systems used to control and monitor electric power generation and distribution. Once designed, the Group had the responsibility to implement the program for eventual use as part of a standard electric power control and monitoring system.
CSC 1974-1975	Project Manager, Electric Utility Systems Projects. Responsible for energy control systems design and software implementation. Responsible for software system design for the Tampa Electric Company Energy Dispatch System.
1975-	Software Manager and Deputy Project Manager for the Ocean Wavemaker Simulation System project.
EDUCATION	BS in Electrical Engineering, Worcester Institute of Technology.
PROFESSIONAL EXPERIENCE	10 years

10.3 COMPANY RELATED EXPERIENCE

In evidence of CSC's implementation capabilities in the area of Industrial Data Acquisition and Control Systems, and Telecommunications Systems Design, the following paragraphs give brief descriptions of jobs for which CSC has had total project responsibility. Also evident is CSC's diverse hardware experience and flexibility in the implementation of process control systems.

10.3.1 Continuous Automated Single-Base Line (CASBL) Hercules Incorporated

CSC designed and developed a dedicated Continuous Automated Single-Base Line (CASBL) real-time process control system to serve a new $60 million propellant production plant. CSC had total systems responsibility for engineering, programming, integration, installation, checkout, and training to produce the most cost-effective and efficient system possible. The new plant replaces manual batch processing with a fully automated system that will permit constant quality control throughout the entire manufacturing process, increasing safety and efficiency and reducing product costs, and operating on a 24-hour basis.

The CASBL system will operate in a multiprogrammed environment, with both FORTRAN and Macro Assembler languages available; will provide constant quality control throughout the entire manufacturing process; and will be capable of sequential -- as well as continuous -- process control to support startup, shutdown, and emergency procedures.

Process control applications include the capability to ensure normal operation should there be a central processing unit (CPU) failure or failure of certain critical analog controllers. The man/machine interfaces have been demonstrated to be sufficiently flexible to permit simple yet secure changes in process control parameters, control algorithms, and software. The complete CASBL system, including off-the-shelf hardware and custom software, was tested in CSC's facility for over a year in a simulated process control environment that was identical to the requirements of the CASBL real-time process control system.

The heart of the control system is a PCP-88 computer which consists of two DEC-8 computers plus peripheral equipment. The dual computer provides an extremely reliable

system since the second DEC-8 acts as a backup for the first one. Internal software checks are performed once a second to monitor hardware performance. When a fault is detected, the software automatically switches to the second CPU and operates from a duplicate copy of the process variables which are stored on the backup data storage device every second.

The system provides direct digital control for 99 loops and monitors 328 analog inputs and 671 digital status points. It provides digital status and control for 711 points, including 601 motors. Figure 10-1 and 10-2 illustrate the overall process design.

Contact: Hercules Incorporated
U.S. Army Ammunition Plant
Radford Arsenal
Radford, Virginia
Attn: Mr. Horace Smith, Jr.

Date of Commissioning: November 1974

10.3.2 Foundry Process Control System
American Cast Iron Pipe Company

This customer-proprietary process control and monitoring software system includes a GE/PAC-4020 computer and associated hardware for process control of six pipe casting machines and monitor of the spectrometer and cupola operations. There are several remote operator stations of various configurations, with features such as digital switches for input parameters, visual displays and typewriters for selective monitoring of real-time functions and alarm conditions, and both audible and light alarm indicators located near concerned areas.

Since the system was both a production and an R&D effort, a major software design objective was to provide ease of expansion and modification, as well as to generate a working system on the initial hardware. Other design objectives were to use the computer vendor's furnished executive system to its fullest capability without modification, use a minimum of core memory, and fulfill all of the timing requirements of the process control hardware.

With the exception of the periodic polling of several analog/digital inputs (for alarm monitoring and real-time data printouts), the real-time functions of the software are completely

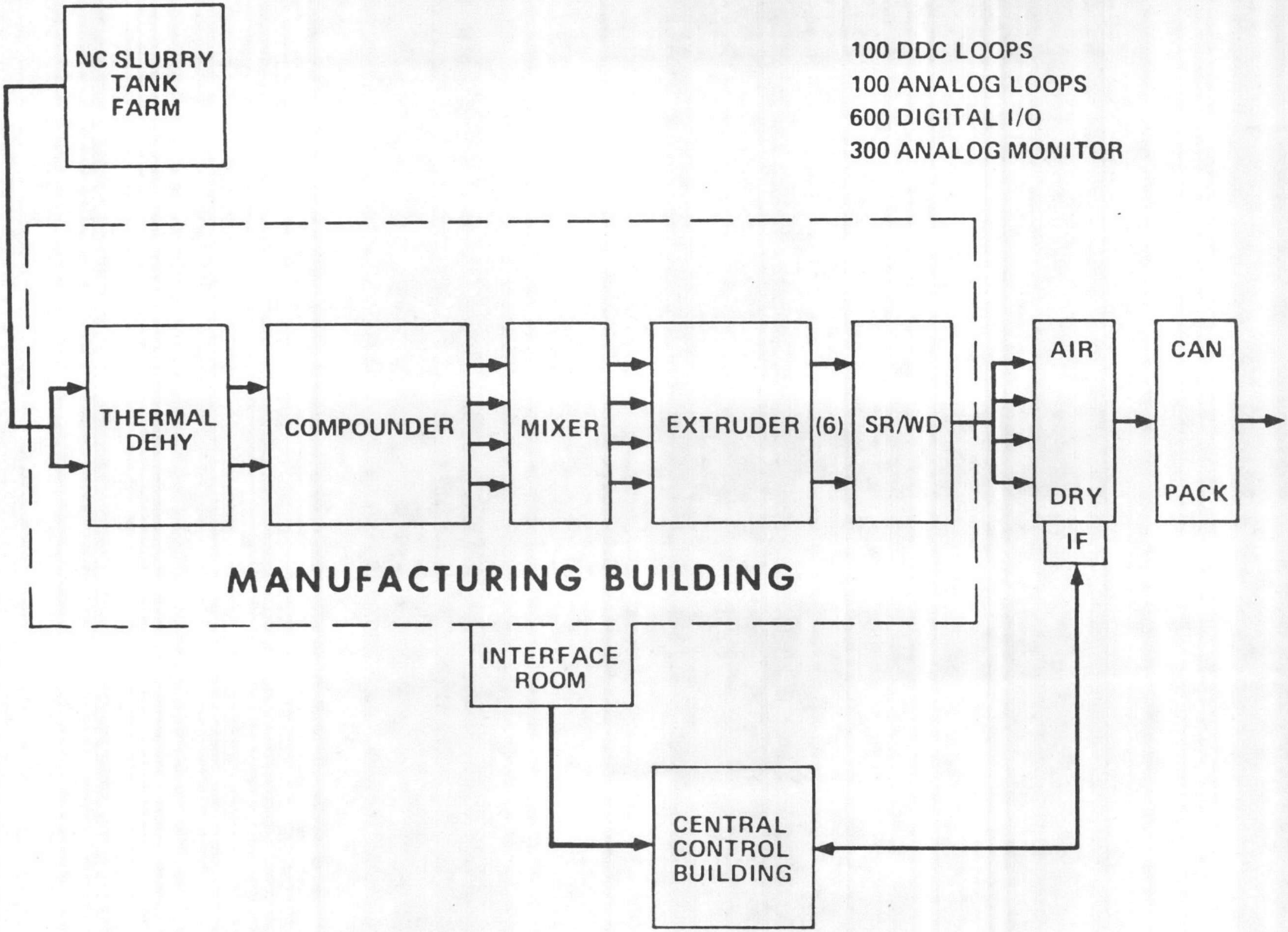


Figure 10-1. CASBL Process Block Diagram

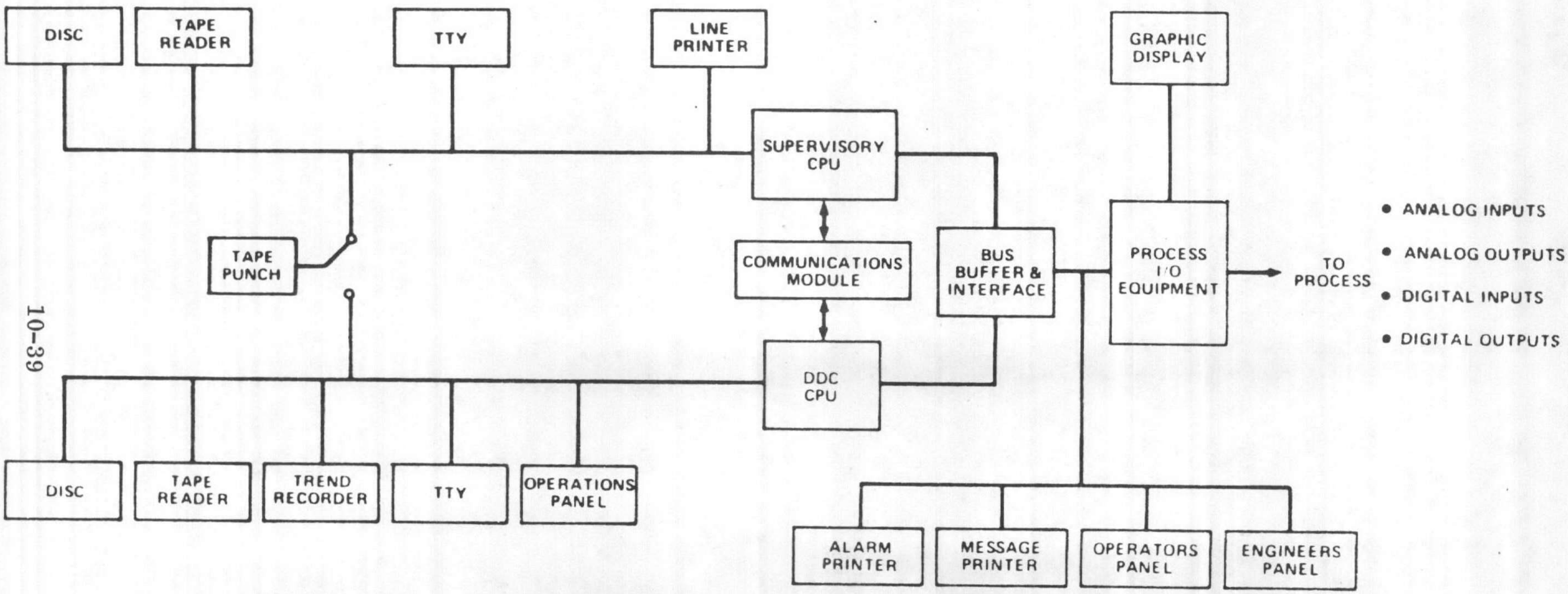


Figure 10-2. CASBL Digital System

asynchronous. Therefore, the external inputs from the process hardware dictated most of the internal timing of the system hardware.

The functional operation of all six machines is identical. This allows significant cost savings in software development efforts, since a single set of routines is associated with the functions shared by all of the machines. A technique of queuing the requests is used to handle the situation of two or more machines that require simultaneous access to the same routine. When a machine routine is entered, it searches its queue table to determine which machine is to be serviced. After executing the functions of the routine, the queue table is again searched to service any other requests. The routines do not exit until all requests have been serviced and their queue tables are empty.

Throughout the project, CSC personnel maintained a close working relationship with the customer's process control staff to ensure their complete understanding of the entire system. Since completion and acceptance of the CSC-furnished subsystems, the client's staff has been able to maintain and modify (as necessary) the system performance without outside assistance.

Contact: American Cast Iron Pipe Company
2930 North 16th Street
Birmingham, Alabama
Attn: Mr. Don Bowerman

Date of Commissioning: January 1970

10.3.3 Order Processing and Production Monitoring System DuPont - Canada

CSC has furnished and installed a computer-based system to DuPont - Canada to provide order processing and production monitoring for a cellophane manufacturing plant. The system utilizes a DEC PDP-8 minicomputer and disk drive and several remotely located CRT consoles, card readers and output typers.

Customer orders are prepared in the data center in punched card form and then entered into the CSC-furnished system and stored on disk by required delivery data. The production supervisor selects production runs via a CRT console displaying orders to be processed

and the system generates a punched card containing product type and quantity. This punched card accompanies the cellophane rolls through a quality control station and is re-entered into the system prior to a computer-monitored weight station. The computer determines an order has been filled -- by monitoring total order weight -- and via three remote printers produces roll labels, packing lists and packing labels.

Figure 10-3 depicts the basic components of the system.

Contact: DuPont of Canada, Ltd.
Shawinigan Works
Shawinigan, Quebec
Attn: Mr. John Russell

Date of Commissioning: December 1974

10.3.4 Black Powder Control and Instrumentation System ICI - United States

CSC designed and implemented a computer-based control system for a new black powder manufacturing facility. This is the first plant to be constructed that utilizes automatic control and is designed to produce 500,000 pounds of black powder explosive per month.

CSC was responsible for design, engineering and programming and furnished all control room equipment including central processor, analog instrumentation panels, motor control interface facilities and analog and digital process display devices. The actual equipment included a Fox 2/30, Interspec/Spec 200 and two MODICON programmable controllers.

The basic steps in the process are: raw material preparation, milling densification, granulation, screening by particle size, polishing, drying, glazing, final product screening, and packaging. Each of these steps is interconnected by a system of belt conveyors.

The process control system monitors the complete process, controls all batching and sequencing operations, maintains a continuous throughput, prevents over- and underfilling of equipment and secures the system in a safe and orderly manner when an emergency occurs. In addition, the process control system maintains a running inventory of the process, calculates yields, and prints out operating instructions, logs, demand logs and status of equipment in emergencies.

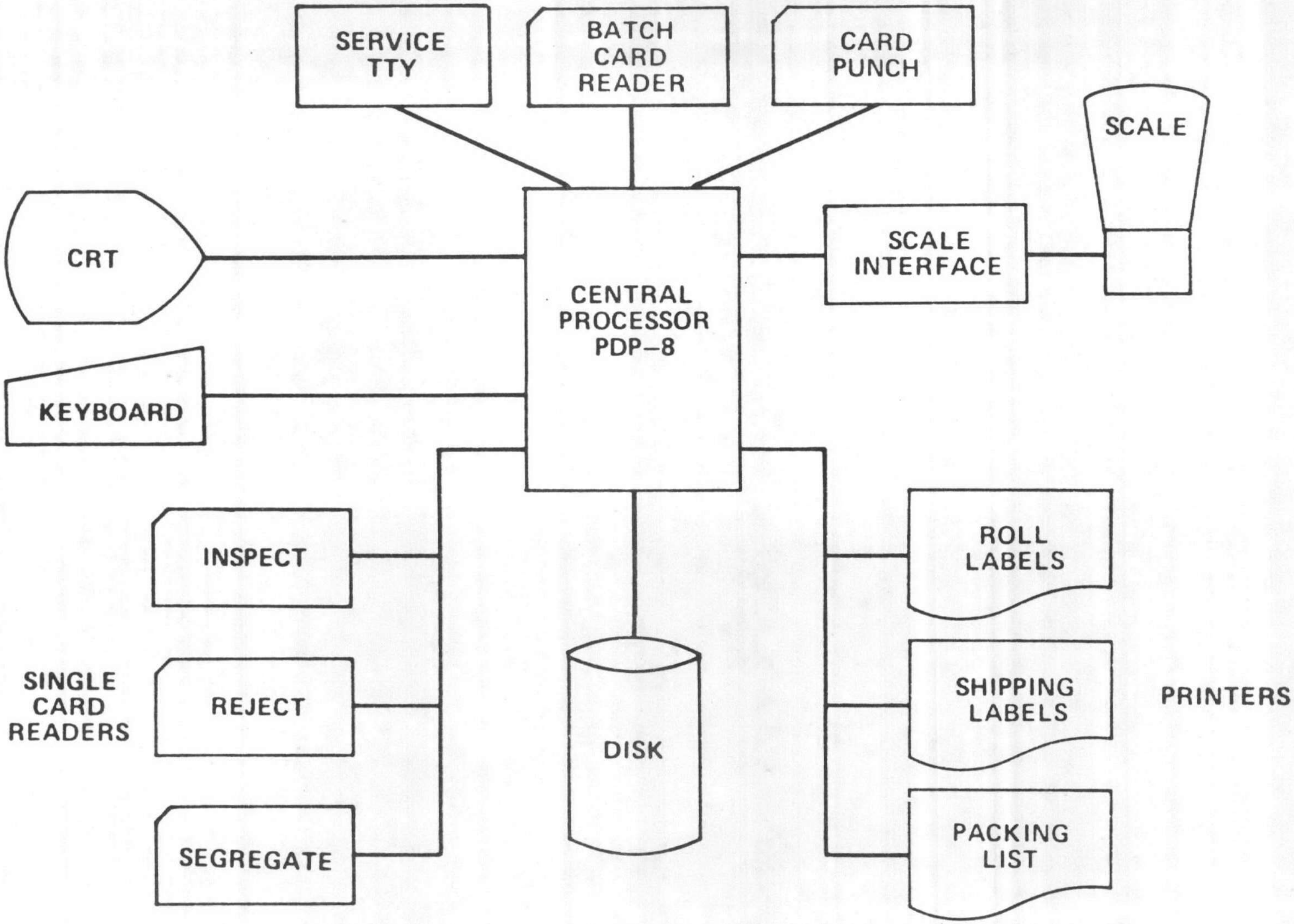


Figure 10-3. Basic Components of Order Processing and Production Monitoring System

Figure 10-4 shows a block diagram of the system hardware.

Contact: ICI United States, Inc.
Indiana Army Ammunition Plant
Charlestown, Indiana 47111
Attn: Mr. John D. Lorenz

Date of Commissioning: January 1976

10.3.5 Acoustic Intelligence Data System (AIDS) U.S. Navy Scientific and Technical Intelligence Center

Under contract to the U.S. Navy, CSC developed a computer-based hardware/software complex dedicated to off-line processing of acoustic information that has previously been recorded on instrumentation-quality magnetic tape. The system utilizes XDS Sigma 5 and 7 computers, with display devices, digital incremental plotters, remote-entry terminals, and standard peripheral devices. The system also employs a CSP-30 computer to perform Fast Fourier Transforms in real-time, and an analog processing system for front end entry of the acoustic data. In addition to the extensive software development required, CSC was responsible for hardware development and procurement.

After successful completion of factory acceptance tests, the system was shipped to the Navy's site in Suitland, Maryland. With CSC's support, the Navy conducted operationally oriented tests. CSC is currently providing one year of augmented maintenance support at the Navy site.

In carrying out its overall turnkey prime-contract responsibility, CSC exercises a wide range of system contractor capabilities. As the software developer, CSC's main areas of activity included the following:

1. Applications software to provide automated data analysis, remote device handlers, and various other software subsystems.
2. Systems software to provide a real-time monitor and other executive systems functions.

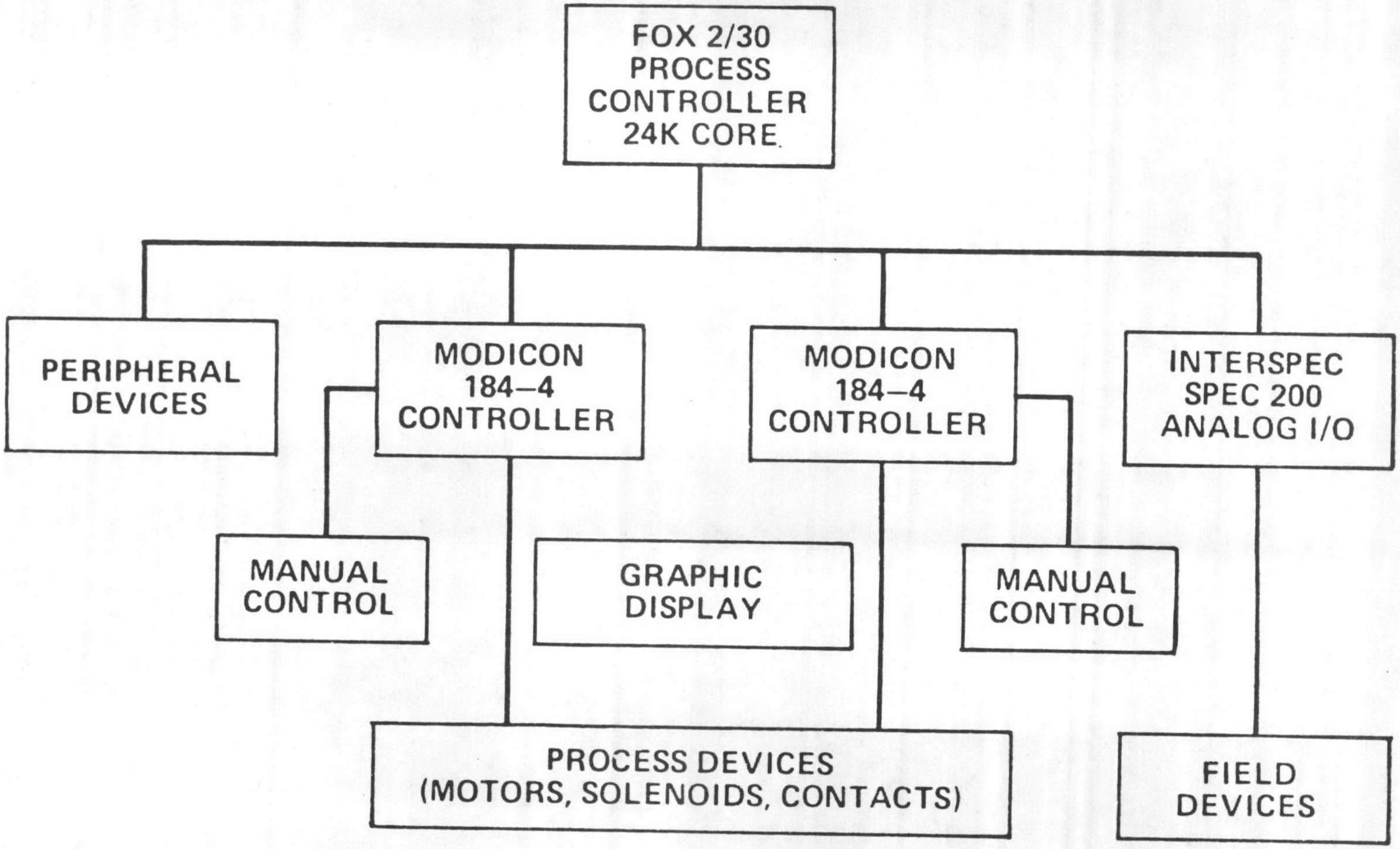


Figure 10-4. Black Powder System Hardware Block Diagram

3. Data management systems to provide a data management system and program language that will incorporate the present NAVSTIC data base and functional requirements.

4. Computer operations and program testing to supervise the subcontractors and hardware installation, and to provide program checkout for full system implementation.

As the hardware developer and system integrator, CSC executed its responsibilities in the following areas:

1. Procurement of commercially available hardware, including XDS computer systems, a CalComp incremental plotter, a teletypewriter, and ADAGE "ARDS" graphic display terminals.

2. Procurement of developmental special hardware, including CSPI's CSP-30 Fast Fourier Transform unit and HRC's acoustic processing system.

3. In-house development of the Data Acquisition System (DAS), a special interface subsystem to digitize and otherwise format the analog data for input to the computer processor.

4. Site preparation and installation at CSC's interim and the Navy's final computer sites, including all phases of hardware installation.

5. Documentation, such as software and hardware design disclosures, equipment maintenance and operations manuals, drawings, and parts lists.

6. Training, including a computer programmer's course, a computer operator's course, hardware maintenance courses, and a system user's course.

7. Total system maintenance of all hardware elements during the development phase and during the one year post-acceptance period, and software maintenance after system acceptance.

Figure 10-5 shows the system block diagram.

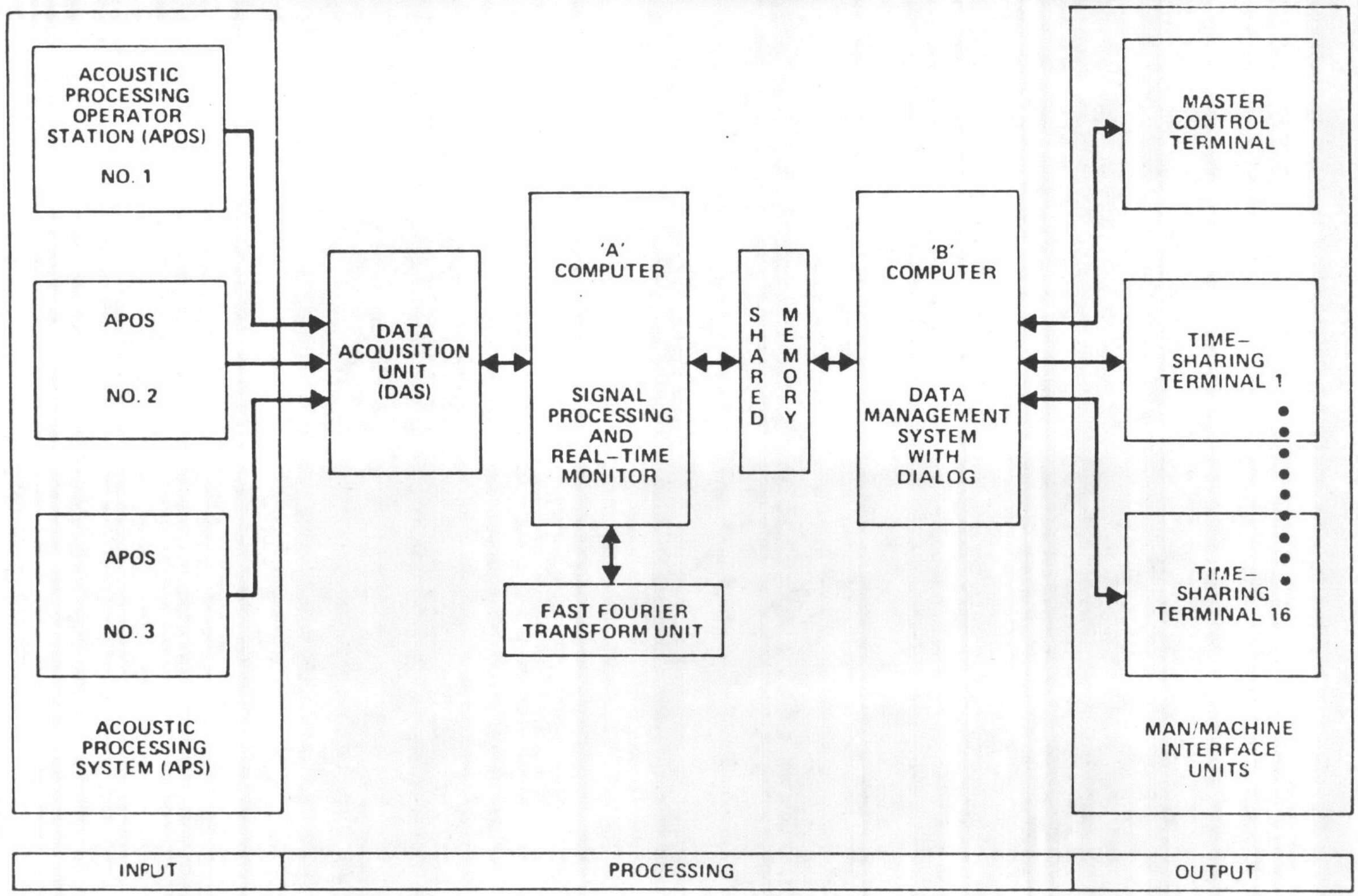


Figure 10-5. AIDS System Block Diagram

Contact: U.S. Navy
Naval Intelligence Support Center (NISC)
Washington, D.C. 20390
Attn: Mr. A. Weinrauch

Data of Commissioning: April 1972

10.3.6 London Airport Cargo EDP Scheme (LACES) U.K. Customs

Computer Sciences Corporation was engaged by International Computers, Ltd. (ICL) as principal contractor to provide the development of software, including all of the applications programs and real-time operating system, for the London Airport Cargo EDP Scheme (LACES). LACES is designed to increase the efficiency and speed of customs clearance of international shipments arriving at London Heathrow Airport and to develop trade statistics for the United Kingdom (U.K.).

The system is designed so that computer records are created and processing is initiated following notification, via CRT, of the receipt of the shipment at the airline cargo shed or the input of data from the air waybill via either a CRT in the airline's office or from anywhere in the world via SITA (the airlines international message handling network).

Customs entry processing is initiated by the input of selected data from the customs entry via CRT from the office of a customs agent or an airline acting as a customs agent. The system then checks data for consistency and correctness and converts foreign units of measurements and currency to U.K. standards. Duty is calculated according to one of several methods, making allowance for trade agreements and other discounts and exceptions. The computer then evaluates each shipment to establish the level of inspection that is required. Statutory provisions and customs guidelines, plus a random factor, relate the level of inspection to the need for inspection. In approximately 20 percent of the cases, goods and documents are selected for inspection; in 20 percent of the cases, only the documents are selected; and in 60 percent of the cases, the computer will release the goods after a brief time-out period to allow intervention of a Customs Officer. Editing, calculation of duty, and evaluation for inspection are done in six seconds.

The initial LACES configuration included two ICL System 4/72 central processors, each with 393,000 bytes of core storage. One of the processors handles the system's real-time transactions and the other is used for batch processing, program testing, and for stand-by purposes.

The LACES terminal network initially consisted of 221 DIDS 401 visual display units (CRTs) manufactured by Cossar. By 1978, the CRT network is expected to be expanded to a total of 370 terminals. The CRTs will be supplemented by 40 character-printers to be used whenever written records are required.

Figure 10-6 gives a diagram of the process operation.

Contact: International Computers, Ltd.
London, England

or

Garry P. White
Docos House
62 Commercial Road
London, England

Date of Commissioning: July 1971

10.3.7 Laboratory Data Acquisition System Commonwealth of Virginia

CSC installed a Laboratory Data Acquisition System for the Consolidated Laboratory in Richmond, Virginia. The system configuration, comprising two Hewlett-Packard HP-2100A computer systems, was selected after detailed evaluations were carried out on various system configurations and different computer vendor's equipment.

System No. 1 is interfaced to low-data-rate instruments that include:

- Gas chromatograph
- Infrared spectrometer
- Ultraviolet spectrometer.

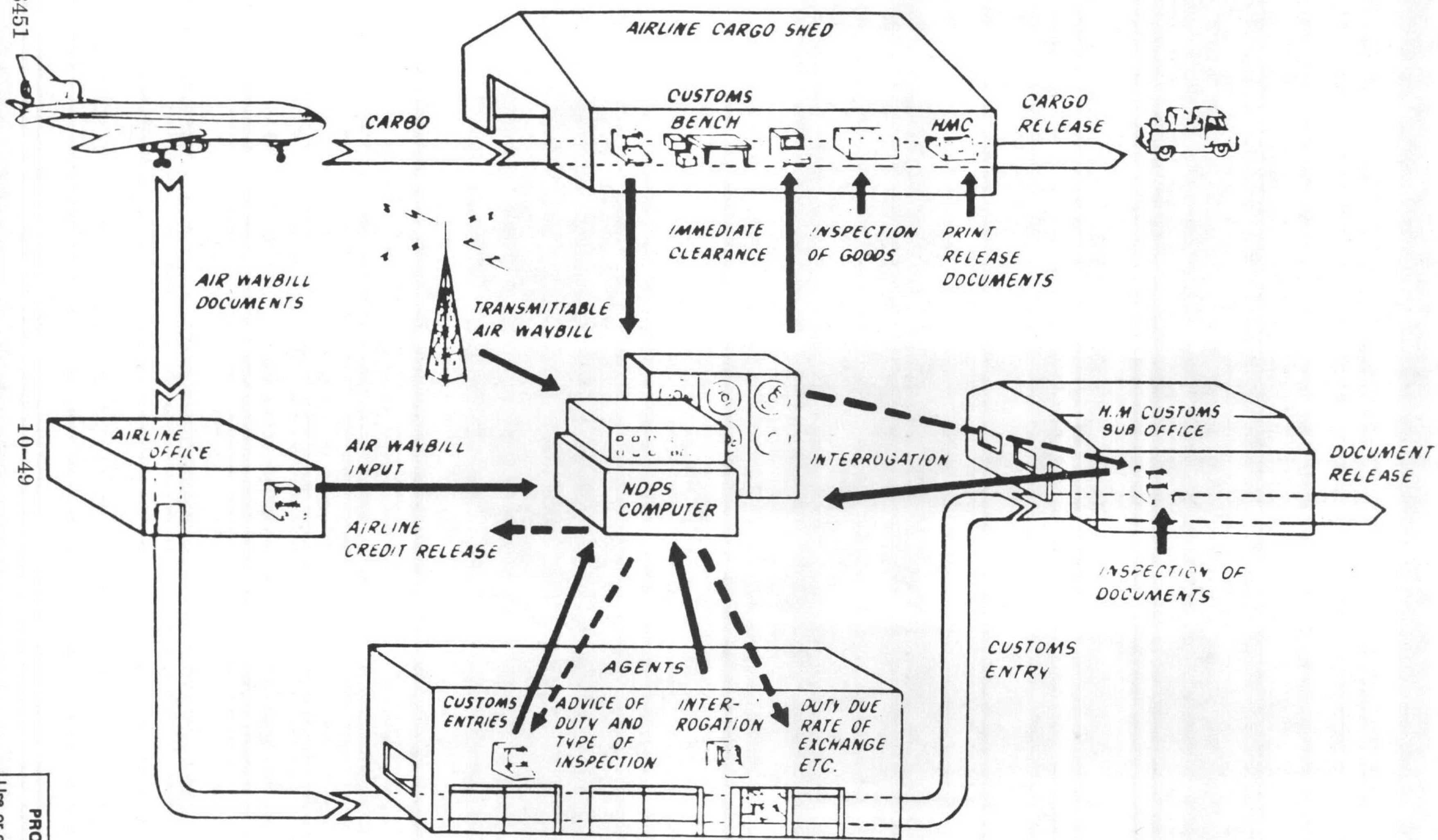


Figure 10-6. LACES Process Operation

CSC

System No. 1 acquires data from each instrument in real-time, stores and processes the data, generates analysis reports, provides "background" capability to enable online compilation and debugging of new programs and non-time critical analysis of reduced data, and permits communication with System No. 2 computer and telecommunications with a computer located at the State Data Processing Center.

System No. 2 automates high-data-rate instruments, including a mass spectrometer and nuclear magnetic resonance spectrometer. It acquires data from these instruments in real-time, generates analysis reports, plots analysis results on a digital plotter, and provides storage for a library of spectral data and the capability to search the library for qualitative identification of unknowns.

Contact: Commonwealth of Virginia
Division of Consolidated Laboratory Services
Richmond, Virginia
Attn: Dr. Charles O'Rear

Date of Commissioning: October 1974

10.3.8 Laboratory Information System
Fiber Industries, Inc.

CSC provided a turnkey sensor-based process Laboratory Data Acquisition, Control and Information System to Fiber Industries, Inc., a division of Celanese Corporation. The system monitors gas chromatographs, stress/strain testers and colorimeters and supports 31-day, on-line data base containing laboratory test results. The test results data base is updated in real-time from the monitored instruments and manually input test results are available to plant personnel via 12 terminals (CRT and typer units). The Laboratory Information System provides instrument automation and the centralization of laboratory record keeping in the client's polyester staple fiber plant. CSC developed this system on a DEC PDP 11/35 computer, which contained a full complement of data processing peripherals and analog and digital I/O.

Contact: Fiber Industries, Inc.
P.O. Box 2000
Florence, South Carolina
Attn: Mr. William Batts

Date of Commissioning: September 1975

10.3.9 Ocean Wavemaker Simulator Systems U.S. Naval Academy

This project, currently under development, will provide an Advanced Computer-Based Data Acquisition and Control System plus associated wavemaking equipment for three ocean-simulator tanks to the U.S. Naval Academy. When the three tanks are fully automated, the mechanical portion of the wavemaking systems can be adjusted through computer control until a desired combination, or spectrum, of waves is achieved.

The computer system, in addition to permitting control of tests and integrated data acquisition, will be equipped with a graphic display system which will enable midshipmen and their instructors to view test performance.

Computers to be used in the wavemaking complex include two Digital Equipment Corporation minicomputers: a PDP 11/50 and a PDP 11/05.

Contact: U.S. Naval Academy
Supply Office/Public Works Office
Annapolis, Maryland 21403
Attn: Prof. Bruce Johnson

Date of Commissioning: July 1977

10.3.10 Automated Passenger Reservation and Ticketing System Illinois Central Railroad

At the request of the Illinois Central Railroad, CSC prepared a detailed design of a communication network to support a proposal for an automated passenger reservation and ticketing system.

The system was designed to serve 58 terminals, 50 ticket printers, and 10 management report printers located in a wide geographic area between Illinois and Louisiana. Communication links were developed using microwave and wired circuits consisting of customer-owned facilities and facilities leased from common carriers. Twelve circuits were planned to meet the needs of both the ticketing system and the customer's other communication needs.

Recommendations were based on specific equipment capabilities and the costs of acquisition, operation, and maintenance.

10.3.11 Global Communications System
U.S. Air Force

Under this contract, CSC was responsible for the analysis and evaluation of the worldwide Air Force Communications System and for recommending modernization and extensions. Of prime importance were considerations of increased capacity, compatibility, connectivity, reliability, quality, and providing more rapid, reliable and secure transmission service, and high-speed data and graphic communications to serve current and future needs of the Air Force.

The systems that evolved as a result of CSC studies provided a worldwide communications network of modular design and promoted logical growth of individual facilities that were selected and applied as building blocks for other new operational requirements, weapon systems, and support systems.

CSC formulated communications standards and systems engineering designs to meet USAF and DCA standards; served as advisor to the USAF on MIL-STD-188 committee; and developed system parameters and specifications based on analysis of communications requirements, state-of-the-art, system interfaces, tradeoff studies, and cost-effectiveness criteria.

Area Network Engineering performed by CSC included the analysis, updating, augmentation, and functional integration of existing and future systems in the continental United States, Northern Area, Pacific, and Europe. CSC also developed criteria for space and range communications command and control, ground/air/ground systems, test planning, and other areas.

10.3.12 Market Research Studies Southern Pacific Company

CSC recently completed two extensive market research studies and supporting quantitative economic analyses for the Southern Pacific Company. The reports resulting from these studies covered: (1) an examination of the total market for leased communications lines; (2) the economic feasibility of Southern Pacific offering a commercial, common carrier microwave service to business organizations; (3) the interstate and intrastate engineering/economic justifications required for filing with the Federal Communications Commission; and (4) the development of a proposed rate structure and tariffs for the Southern Pacific Company's microwave services.

These studies were concerned with two potential microwave networks: one along the West Coast between San Diego, California and Seattle, Washington, and another through the Southwest between Los Angeles, California and East St. Louis, Illinois. CSC designed and conducted a data collection survey in which more than 200 firms and organizations were contacted and interviewed. The data collected during this survey were structured and analyzed by CSC so as to derive significant conclusions concerning the potential market size, engineering development, and economics of the proposed special service microwave systems.

The market research reports structured and examined the total communications market, including all classes of telecommunication services as well as modes of service, with particular emphasis on both the short- and long-term aspects of the microwave communications market. The study reports included the detailed results of investigating the potential impact of proposed rates on demand for service, citing the reactions of potential users to various classes of service, and a measured relationship between the level of economic activity and the demand for private leased communications lines. A separate report covered the development of a proposed rate structure and set of tariffs, utilizing the collected data in conjunction with numerous statistical and mathematical analytical techniques.

10.3.13 Intercomputer Network Design Systems Analysis Federal Reserve Board

A CSC team conducted a feasibility study and made recommendations for a system concept that would provide on-line data processing capabilities to the Federal Reserve Board in Washington, D.C., and the Federal Reserve Bank of Richmond, Virginia, by means of a centralized, timesharing computer system.

During Phase I of the study, CSC analyzed traffic and program loading factors at each site and developed responsive system configurations for feasibility and economic analyses, reflecting current and proposed operations. The system requirements under study included computer and communications hardware, interfacing hardware, and total systems software.

Phase II involved the synthesis and analysis of system concepts and feasibility models and resulted in recommendations for the future course of action to be taken by the Federal Reserve Board. Specific hardware configurations were proposed and procedures for handling existing and anticipated processing requirements were suggested. Tradeoffs in cost effectiveness were a major consideration.

CSC also provided recommendations to resolve the problems of program conversion, the lack of familiarization with remote operations, and the integration of the local computational operations in Washington and Richmond into a centralized system, while maintaining current operations.

10.3.14 TELPAK Configuration and Cost Studies Defense Communications Agency (DCA)

Under contract to the Defense Communications Agency, CSC conducted a cost and value analysis study to enable the government to reduce its commercial (common carrier) communications costs. The study was conducted in cooperation with the American Telephone and Telegraph Company, and required analysis and revision of the Department of Defense TELPAK communications network, which is comprised of well over a million channel miles of voice, teletype, and data communications throughout the United States.

Principal CSC efforts included:

- Studies of grouping to ensure maximum use of large TELPAK groups
- Investigations of billing and evaluations of the possible economic effects
- Studies of alternate routine and reliability.

10.3.15 Automatic Coal Loading System Design, Kerr-McGee Corporation

CSC recently completed a system design for Kerr-McGee Corporation. The system design study included developing the detailed flowcharts, and implementation cost and schedules.

CSC developed the functional requirements and the detailed logic diagrams for the following tasks:

- Acquire car information from Scale House processor
- Calculate train speed
- Determine nominal height of each car
- Supervise car-loading sequence
- Maintain current estimates of silo levels
- Prepare train-loading report
- Monitor critical sensors.

In addition, CSC specified computer hardware, process input/output, and software requirements for a proper interface with the sensors and controllers at the loading facility.

10.4 MANUFACTURING CAPABILITIES

The hardware system which CSC proposes to provide for the Utility Control System will be assembled from equipment and subsystem provided by qualified equipment vendors.

CSC has two system staging and integration facilities in the Falls Church area. One facility, at 6565 Arlington Boulevard (Falls Church), is an area of approximately 3,400 square feet and is part of the same facility as the Systems Division's major engineering offices. The second staging and integration site is approximately three miles away at 2821 Mary Street (Falls Church) and contains staging space of approximately 6,400 square feet. The facilities have sufficient power and air conditioning to support the staging of

systems for the Utility Control System project. Additionally, the facilities have raised computer flooring in equipment staging areas. Included are modest sheet metal and machine shops as necessary to support system staging and integration. The facilities are currently utilized to approximately 60 percent of capacity.

10.5 PROJECT SUPPORT PROVISIONS

10.5.1 Subcontract Administration

CSC has a staff of five contract administration specialists expert in the negotiation, execution, and administration of a wide range of commercial and industrial subcontracts. This staff will support the CSC Project Manager through all phases of subcontract negotiation and administration through completion of the overall project.

10.5.2 Quality Assurance Provisions

CSC maintains a corporate-wide quality assurance program with the primary objective of producing high quality systems, on schedule and within budgeted cost, in compliance with contracted requirements. This program covers all elements of systems including hardware, software, services, and documentation.

In areas of hardware development, quality assurance engineers assigned to the Industrial and Utility Systems Center review purchase requisitions to determine that materials procured conform to contractual requirements. When materials are received they are inspected to ensure compliance with purchase orders with respect to quantity, quality, performance, and documentation. Completed assemblies are inspected prior to performance testing and shipping to ensure workmanship to best commercial practice, mechanical and electrical compliance with contractual standards, and compliance with specified configuration. Quality control engineers review packing and shipping procedures and provide receiving inspection on all equipment and materials received on-site. Completed work on-site is inspected to ensure compliance with contractual standards and performance.

Software is inspected from both a performance and documentation standpoint to assure contractual compliance from a functional and performance standpoint as well as overall quality. Inspection is performed at preliminary design completion, final design completion, and at acceptance test time.

Quality inspection is performed on all deliverable documentation; hardware design, software design, training, and installation. Inspection determines contractual compliance with respect to content, format, completeness and copy requirements.

The Quality Assurance Program in all its phases assures both the client and CSC management that the delivered product is consistent with the high standards of performance which CSC strives to maintain in the industry.

Camp Lejeune PUBLIC WORKS
Mech Br.

STANDARD FORM 20
JANUARY 1961 EDITION
GENERAL SERVICES ADMINISTRATION
FED. PROC. REG. (41 CFR) 1-16.401

(Modified)

REQUEST FOR TECHNICAL PROPOSALS
(CONSTRUCTION CONTRACT)

REFERENCE
N62470-75-B-5437

DATE
26 May 1976

NAME AND LOCATION OF PROJECT

Two-Step Formal Advertising (Turnkey)
Utility Control System, First Increment
Marine Corps Base, Camp Lejeune,
North Carolina

DEPARTMENT OR AGENCY

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND

BY (Issuing office)

Atlantic Division, Naval Facilities Engineering Command
Naval Station, Norfolk, Virginia 23511

Proposals, ten copies, for the work described herein will be received until 3:00 p.m. (Local Time), ~~29 July~~ 12 Aug 1976 at the Atlantic Division, Naval Facilities Engineering Command, Building N-21, Room No. 105, Naval Station, Norfolk, Virginia.

CAUTION: - Late Proposals - See the special provisions in this request for information related to Late Proposals.

Description of Work: Design and construction of Utility Control System - First Increment for the Marine Corps Base, Camp Lejeune, North Carolina, as necessary to provide a complete and usable system in accordance with furnished criteria.

NOTE THE AFFIRMATIVE ACTION REQUIREMENT OF THE EQUAL OPPORTUNITY CLAUSE WHICH MAY APPLY TO THE CONTRACT RESULTING FROM THIS SOLICITATION.

NOTE THE CERTIFICATION OF NONSEGREGATED FACILITIES IN THIS SOLICITATION. Bidders, offerors, and applicants are cautioned to note the "Certification of Nonsegregated Facilities" in the solicitation. Failure of a bidder or offeror to agree to the certification will render his bid or offer non-responsive to the terms of solicitations involving awards of contracts exceeding $10,000.00 which are not exempt from the provisions of the Equal Opportunity Clause (1972 AUG).

A preproposal conference will be convened at the Atlantic Division, Naval Facilities Engineering Command, Building N-21, Room No. 105, Naval Station, Norfolk, Virginia commencing at 2:00 p.m., 14 June 1976. Attendees at this conference will be briefed concerning the turnkey concept and will be afforded an opportunity to present questions concerning this project. Please advise this Command if your firm desires to participate in the Preproposal Conference.

This request for Technical Proposals is comprised of the attached Specification No. 05-75-5437, and all forms and drawings thereto listed in the specifications.

FALSE STATEMENTS IN PROPOSALS. Proposals must set forth full, accurate, and complete information as required by this Request for Technical Proposals. The penalty for making false statements in proposals is prescribed in 18 U.S.C. 1001.

[illegible] Naval [illegible] Facility [illegible] North Carolina [illegible]

[illegible]

[illegible] permit [illegible]

CAUTION: [illegible] possession [illegible]

[illegible] pathogenic organisms [illegible] North Carolina [illegible]

NOTE: [illegible] THIS [illegible]

[illegible] Naval Station [illegible] Norfolk, Virginia [illegible] 1976 [illegible]

[illegible] cations.

[illegible]

NAVFAC SPECIFICATION
NO. 05-75-5437

TWO-STEP FORMAL ADVERTISING (TURNKEY)
UTILITY CONTROL SYSTEM
FIRST INCREMENT

for the

MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

Appropriation: OPN

A priority rating will apply to this contract upon reward. The Contractor shall follow the provisions of DMS Reg. 1 and all other applicable regulations and orders of Business and Defense Services Administration in obtaining controlled materials and other products and materials needed to perform this contract.

NOTICE

All general inquiries concerning this procurement shall be made to Mr. G. M. Gulbranson, Contract Division, Atlantic Division, Naval Facilities Engineering Command, Naval Station, Norfolk, Virginia 23511, telephone 444-7231, area code 804. (See section entitled "Proposals" concerning clarification of the provisions of the Request for Technical Proposals.)

The Government specifications and forms mentioned, non-Government publications and other information necessary may be examined at the office noted below.

Contractors unfamiliar with Naval Facilities Engineering Command contract forms should obtain the forms referenced in this specification from the Contract Division, Atlantic Division, Naval Facilities Engineering Command, Room 105, Building No. N-21, Naval Station, Norfolk, Virginia 23511, telephone 444-7231, area code 804.

[illegible]
NO. [illegible]

[illegible]

[illegible] NORFOLK, VIRGINIA

[illegible] ing [illegible] supply [illegible] this contract [illegible] materials [illegible] needed to [illegible] this contract.

[illegible]

All [illegible] Division [illegible] Naval Facilities [illegible] Naval Station, Norfolk, Virginia [illegible] (Preparation [illegible] Proposals" concerning [illegible] of the provisions [illegible] Technical Proposals.

[illegible] specifications [illegible] government publications [illegible] may be examined [illegible]

[illegible] Engineering Command [illegible] referenced in this specification [illegible] Division, Naval Facilities Engineering Command, Code 105, Building N-26, Naval Station, Norfolk, Virginia 23511, [illegible] Area code 804.

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DIVISION 1. GENERAL REQUIREMENTS

Section 1A. Method of Procurement
1B. General Paragraphs
1C. Proposals

SECTION 1A. METHOD OF PROCUREMENT

1A.1 Intent. The Government intends to procure this utility control system based upon design and cost competition in accordance with the provisions set forth in this Request for Technical Proposals (RFTP). If a contract is awarded, it will be a firm, fixed price contract. The specification and attachments outline the criteria and requirements to be used by proposers in submitting their proposal. Proposals must be submitted in accordance with this specification and include the "Required Data", as specified herein.

1A.2 This RFTP is comprised of:

(a) Step I

(1) Standard Form 20 (Modified)
(2) NAVFAC Specification No. 05-75-5437
(3) EFD Drawing Number 127144, NAVFAC Drawing Number 4027144, Utility Control System, First Increment, Camp Lejeune, North Carolina, General Facilities Locations.

(4) Drawings (Sheet 1 through 24) Camp Lejeune Annual Condition Maps. These drawings will be made available upon written request from bidders who have obtained the specification.

(b) Step II

(1) Standard Form 21
(2) Standard Form 19B (October 1969)
(3) Standard Form 23 (January 1961)
(4) General Provisions (November 1975)
(5) Guaranty Bond, U. S. Standard Form 24
(6) Labor Standards Provisions (November 1975)

1A.3 This Invitation for Bids is issued pursuant to two-step formal advertising in Part 5 of Section II of the Armed Services Procurement Regulation. Bids will be accepted and considered only from those firms who have submitted acceptable technical proposals pursuant to the first step of such procedures, as initiated by N62470-75-B-5437. Any bidder who has submitted multiple technical proposals in the first step of this two-step procurement may submit a separate bid covering each technical proposal which has been determined acceptable by the Government.

SECTION [illegible] OF PROCUREMENT

[illegible]

(2) Standard Form 21

[illegible]

SECTION 1B. GENERAL PARAGRAPHS

1B.1 General intention. It is the declared and acknowledged intention and meaning to provide and secure a utility control system for the Marine Corps Base, Camp Lejeune, North Carolina, complete and ready for use.

1B.2 General description. The work includes the design and construction of a complete utility control system for the Marine Corps Base, Camp Lejeune, North Carolina.

1B.3 Location. The work shall be located at the Marine Corps Base, Camp Lejeune, North Carolina. The central monitor and control units shall be located in Building 1202.

1B.4 Form of Contract. The contract will be executed on Standard Form 23 (January 1961), Construction Contract, and will include General Provisions (November 1975), and Labor Standards Provisions (November 1975). see 102 Affirmative Action etc

Make the following changes to the General Provisions:

Clause 45, at the end of paragraph (d), delete the following: "If the contract involves more than 6 months work or is described as hazardous character in the Invitation for Bids, Schedule, or Specifications, the following paragraph (e) will apply."

Clause 48, change "(1974 APR)" to "(1975 OCT)". Change "Bureau of Competitive Assessment and Business Policy" to "Bureau of Domestic Commerce".

Clause 51, change "(1974 APR)" to "(1975 JUN)". In paragraph (f), third line after "subcontracts", insert "exceeding $10,000".

Delete Clause 66 of the General Provisions

Clause 71, General Provisions, modify to read as follows:

PRECEDENCE (TURNKEY) DEC 1973

In the event of conflict or inconsistency between any of the provisions of the various portions of this contract (the reconciliation of which is not otherwise provided here,) precedence shall be given in the following order, the provisions of any particular portion prevailing over those of a subsequently listed portion.

(1) typewritten portions of the contract.

(2) the provisions of the "Request for Technical Proposals" issued in connection with this contract including all addenda, amendments, or other modifications issued thereunder.

(3) printed provisions of the contract form, including printed provisions of foreadded slip sheets.

(4) the contents of the Contractor's proposal, including but not limited to his forwarding letter, drawings, outline specifications, accepted alternates or additives and materials, tests or other data (including all supplements, amendments and modifications thereto).

(5) the Government reviewed contractor-prepared final plans and specifications, except to the extent that any variation therein has been specifically approved in writing pursuant to the provision 1B.17 entitled "Submission of Construction Drawings and Specifications."

Clause 77, delete paragraph (a) in its entirety.

Clause 100, change "(1974 JAN)" to "(1975 FEB)".

In paragraph (a), subparagraph (1), delete the last sentence and substitute the following therefor:

"If the Contractor has notified the Contracting Officer that the Disclosure Statement contains trade secrets and commercial or financial information, which is privileged and confidential, the Disclosure Statement will be protected and will not be released outside the Government."

Delete paragraph (4)(B) and substitute the following therefor:

"(4)(B) Negotiate with the Contracting Officer to determine the terms and conditions under which a change to either a disclosed cost accounting practice or an established cost accounting practice, other than a change under (4)(A) above, may be made. A change to a practice may be proposed by either the Government or the Contractor, provided, however, that no agreements may be made under this provision that will increase costs paid by the United States."

In paragraph (d), delete subparagraph (ii) and substitute the following therefor:

"(ii) prices set by law or regulation and except that the requirement to accept the Cost Accounting Standards clause by reason of Section 331.30(b) of Title 4 Code of Federal Regulations (4 CFR 331.30(b))."

To the General Provisions add the following new clauses:

104. EQUITABLE ADJUSTMENTS: WAIVER AND RELEASE OF CLAIMS

"(a) Whenever the Contractor, after receipt of notification of a change made pursuant to the clause of this contract entitled "Changes" or after affirmation of a constructive change thereunder, submits any claim for equitable adjustment under that clause, such claim shall include all types of adjustments in the total amounts to which that clause entitles the Contractor, including but not limited to the adjustments arising out of delays or disruptions or both caused by such change. Except as the parties may otherwise expressly agree, the Contractor shall be deemed to have waived (i) any adjustments to which otherwise might be entitled under the aforesaid clause where such claim fails to request such adjustments and (ii) any increase in the amount of equitable adjustments additional to those requested in its claim."

"(b) Further, the Contractor agrees that if required by the Contracting Officer, he will execute a release, in form and substance satisfactory to the Contracting Officer, as part of the supplemental agreement setting forth the aforesaid equitable adjustment, and that such release shall discharge the Government, its officers, agents and employees, from any further claims, including but not limited to further claims arising out of delays or disruptions or both, caused by the aforesaid change."

"105. ADMINISTRATION OF COST ACCOUNTING STANDARDS (1975 MAR)

For the purpose of administering Cost Accounting Standards requirements under this contract, the Contractor shall:

(a) Submit to the cognizant Contracting Officer a description of the accounting change and the general dollar magnitude of the change to reflect the sum of all increases and the sum of all decreases for all contracts containing the Cost Accounting Standards clause (7-104.83(a)).

(i) for any change in cost accounting practices required to comply with a New Cost Accounting Standard in accordance with paragraphs (a)(3) and (a)(4)(A) of the clause of this contract entitled "Cost Accounting Standards" within sixty (60) days (or such other date as may be mutually agreed to) after award of a contract requiring such change;

(ii) for any change to cost accounting practices proposed in accordance with paragraph (a)(4)(B) of the clause of this contract entitled "Cost Accounting Standards" not less than sixty (60) days (or such other date as may be mutually agreed to) prior to the effective date of the proposed change; or

(iii) for any failure to comply with an applicable Cost Accounting Standard or to follow a disclosed practice as contemplated by paragraph (a)(5) of the clause of this contract entitled "Cost Accounting Standards" within sixty (60) days (or such other date as may be mutally agreed to) after the date of agreement of such noncompliance by the Contractor.

1B.5 Commencement, prosecution, and completion of work: The Contractor will be required to commence work under the contract within 15 calendar days after the date of receipt by him of "Notice of Award", to prosecute said work diligently, and to complete the entire work ready for use within 365 calendar days. The time stated for completion shall include final cleanup of the premises. The contract completion date will be computed starting 15 calendar days after the date of the Notice of Award. This 15-day period is to allow for mailing of the Notice of Award and the Contractor's submission of required Bonds. Also, see paragraph 1B.17.

1B.6 Liquidated damages. In case of failure on the part of the Contractor to complete the construction of the project within the time fixed in the contract or any extensions thereof, the Contractor shall pay to the Government as liquidated damages pursuant to clause 5 of the General Provisions the sum of $85.00 for each day of delay.

1B.7 Labor relations and labor standards provisions. It is the Contractor's responsibility to maintain satisfactory labor relations with his employees. Representatives of the Contracting Officer will not participate in labor relations matters unless disputes develop that interfere with the proper performance of the contract, at which time the representative may endeavor to assist in settling the difficulty or may refer the matter to the Federal Mediation and Conciliation Service of the Naval Facilities Engineering Command for appropriate action.

1B.8 Late technical proposals, modifications of technical proposals and withdrawals of technical proposals (1973 SEP).

(a) Any proposal received at the office designated in the solicitation after the exact time specified for receipt will not be considered unless it is received before the invitation for bids in Step Two is issued, and

(i) it was sent by registered or certified mail not later than the fifth calendar day prior to the date specified for receipt of offers (e.g., an offer submitted in response to a solicitation requiring receipt of offers by the 20th of the month must have been mailed by the 15th or earlier);

(ii) it was sent by mail (or telegram if authorized) and it is determined by the Government that the late receipt was due solely to mishandling by the Government after receipt at the Government installation; or

(iii) it is the only proposal received.

(b) Any modification of the proposal is subject to the same conditions as in (a) (i) and (ii) above. Also, see Section 1C.9.

(c) The only acceptable evidence to establish:

(i) the date of mailing of a late proposal or modification sent either by registered or certified mail is the U. S. Postal Service postmark on the wrapper or on the original receipt from the U. S. Postal Service. If neither postmark shows a legible date, the proposal or modification of proposal shall be deemed to have been mailed late. The term "postmark" means a printed, stamped, or otherwise placed impression that is readily identifiable without further action as having been supplied and affixed on the date of mailing by employees of the U. S. Postal Service.

(ii) the time of receipt at the Government installation is the time/date stamp of such installation, on the proposal wrapper or other documentary evidence of receipt maintained by the installation.

(d) Proposals may be withdrawn by written or telegraphic notice received at any time prior to award. Proposals may be withdrawn in person by an offeror or his authorized representative, provided his identity is made known and he signs a receipt for the proposal prior to award.

1B.8.1 Telegraphic Modifications or Withdrawal of Proposal. Telegraphic modifications or withdrawal of proposal will be considered as specified herein. TELEPHONIC RECEIPT OF TELEGRAPHIC MODIFICATIONS OR WITHDRAWAL OF PROPOSAL WILL NOT QUALIFY THE TELEGRAM AS TIMELY. The telegram must be received at the place specified for receipt of proposals prior to the exact time set for receipt of proposals.

1B.9 Limitation of payment for design. If it should be necessary to terminate this contract, for any reason, prior to completion of design, the Government will pay the contractor a fair and reasonable price for the design services performed and delivered to the Government. However, such payment will not exceed 6 percent of the total construction cost (exclusive of architect-engineer work), regardless of the actual costs the contractor may be able to substantiate.

1B.10 Payments to Contractor. The Government will make progress payments for this work on a monthly basis, subject to suitable arrangements for the submission of payment requests being agreed upon between the Contractor and the Government. Payment will be made for material delivered on the site and for material delivered to the Contractor at locations other than the site, subject to the conditions set forth in Clauses 7(b) and 77 of the General Provisions. Progress payments may be made for work performed off-site provided inspection is made by the appropriate Defense Contract Administration Services Office and certification of materials and workmanship on your invoices is made by that office and that all other conditions of Clauses 7 and 77 are met. No payments shall be made until the Contractor's final plans and specifications have been submitted and approved.

1B.11 Guaranty Bond. Each proposer shall submit with his proposal a guaranty bond (U. S. Standard Form 24) executed by a surety company holding a certificate of authority from the Secretary of the Treasury as an acceptable surety for the penal sum required. Security shall be in the sum of 20 percent of the largest amount for which award can be made under the proposal submitted. FAILURE TO SUBMIT GUARANTY BOND ON TIME IS CAUSE FOR REJECTION OF THE PROPOSAL. The guaranty bond shall be accompanied by a verifax or other facsimile copy of the agent's authority to sign bonds for the surety company.

1B.12 Contract and performance and payment bonds. Within 10 days after the prescribed forms are presented to him for signature, the proposer to whom award is made shall enter into a written contract on the form prescribed by the Request for Proposals and shall furnish two bonds, each with satisfactory security; namely, a performance bond (Standard Form 25) and a payment bond (Standard Form 25A). The performance bond shall be in a penal sum equal to 100 percent of the contract price. The payment bond shall be equal to 50 percent of the contract price, except that it should be 40 percent of the contract price if that price is more than $1,000,000.00 and less than $5,000,000.00 and in the fixed sum of $2,500,000.00 if the contract price is $5,000,000.00 or more. The bond of any surety company holding a certification of authority from the Secretary of the Treasury as an acceptable surety on Federal bonds, for the required penal sums, will be accepted. Individual sureties will be accepted if each surety deposits with the Contracting Officer cash, bonds, or notes of the United States, or a certified check drawn to the order to the Treasurer of the United States, under the agreement that the collateral so deposited shall remain in the possession and control of the Treasurer of the United States for at least one year after completion of the contract.

1B.13 A physical inspection of the construction sites may be arranged by contacting the Assistant Resident Officer in Charge of Construction, Marine Corps Base, Camp Lejeune, North Carolina, telephone 451-2581, area code 919.

1B.14 Utilities. The Government will furnish available utilities as may be required for construction work, at prevailing Government rates, in accordance with clause, "Availability and use of Utility Services", General Provisions. Information concerning location of existing outlets and prevailing rates may be secured from the Contracting Officer.

1B.15 Interruption of Utility Services. Permission to interrupt any station utility service shall be requested in writing a minimum of ten working days prior to the desired date of interruption.

1B.16 Military Station Regulations. The Contractor and his employees and subcontractors shall become familiar with and obey all Station regulations. All personnel employed on the project shall keep within the limits of the work and avenues of ingress and egress, and shall not enter any other areas outside of the site of the work, unless required to do so in the performance of their duties. The Contractor's equipment shall be conspicuously marked for identification.

1B.17 Submission of construction drawings and specifications.

(a) Within 105 days after award of the contract and before start of construction and ordering of materials and equipment, the Contractor shall submit ~~10~~ 5 sets of 100 percent construction drawings, specifications and design calculations. Drawings and specifications shall be complete; partial submittals will not be accepted. Thirty days will be required for review by the Government. Such review does not constitute approval or acceptance of any variations from the Request for Proposals or from the proposal unless such variations have been specifically pointed out in writing by the Contractor and specifically approved in writing by the Government. After the necessary changes have been made to the drawings and specifications by the Contractor, he shall submit mylar reproducibles of the original tracings and 20 copies of the specifications to the Government. Work shall not be started until the drawings and specifications have been approved by the Government. The reproducibles and specifications will be retained by the Contractor for preparation of as-built drawings. Specifications shall be in the Construction Specification Institute format. All drawings shall bear the seal of a registered engineer.

(b) The Contractor shall utilize 28 by 40 inch tracing sheets with Atlantic Division, Naval Facilities Engineering Command printed title block for the project drawings. The Government will furnish one such sheet to the Contractor for guidance.

(c) Identification. For purposes of identification, the Contractor's drawings and specifications shall be identified by the following specification number: 05-75-5437 (Contractor).

1B.18 As-built drawings. Prior to final payment, the Contractor shall enter all changes and corrections on his 100 percent construction drawings. Changes and correction so entered shall be indicated by a lettered circle and noted as "as-built" in the revision space provided. In the case where no revisions or corrections on an individual drawing were necessary, the notation "As-built-No changes" shall be made directly below the revision block. The Contractor shall submit the "as-built" tracings to the Contracting Officer for acceptance and retention.

1B.19 Safety program. The Contractor shall implement a safety program conforming to the requirements of Federal, State and Local laws, rules and regulations. The program shall include, but is not limited to, the following.

a. "Occupational Safety and Health Standards", which can be ordered from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.

b. Department of the Army, Corps of Engineers, "General Safety Requirements", which may be examined in the office where bids are being received.

c. General Provisions, Clause 45.

1B.20 Equal Opportunity. In Clause 21, General Provisions, immediately following the preamble, delete the Equal Opportunity clause and substitute the following clause with the added footnote:

21 EQUAL OPPORTUNITY: (1972 AUG) (This clause applies only to employees recruited in the Continental United States)

(a) Certification of nonsegregated facilities. By the submission of this bid, the bidder, offeror, applicant, or subcontractor certifies that he does not maintain or provide for his employees any segregated facilities at any of his establishments, and that he does not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. He certifies further that he will not maintain or provide for his employees any segregated facilities at any of his establishments, and that he will not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. The bidder, offeror, applicant or subcontractor agrees that a breach of this certification is a violation of the Equal Opportunity Clause in this contract. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, creed, color, or national origin, because of habit, local custom or otherwise. He further agrees that (except where he has obtained identical certifications from proposed subcontractors for specific time periods) he will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding $10,000 which are not exempt from the provisions of Equal Opportunity clause; that he will retain such certifications in his files; and that he will forward the following notice to such proposed subcontractors (except where the proposed subcontractors have submitted identical certifications for specific time periods):

NOTICE TO PROSPECTIVE SUBCONTRACTORS OF REQUIREMENT FOR CERTIFICATIONS OF NONSEGREGATED FACILITIES.

A certification of Nonsegregated Facilities, as required by the May 9, 1967 order on Elimination of Segregated Facilities, by the Secretary of Labor (32 Fed. Reg. 7439, May 19, 1967) must be submitted prior to the award of a subcontract exceeding $10,000 which is not exempt from the provisions of the Equal Opportunity clause. The certification may be submitted either for each subcontract or for all subcontractors during a period (i.e., quarterly, semiannually, or annually). (Mar. 1968) (Note: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001).

(b) Certification of nonsegregated facilities by subcontractors and federally assisted construction contractors (Mar. 1968). Prior to the award of any subcontract, required to contain the Equal Opportunity clause contained in this contract, the Contractor shall obtain the certification set forth in 2-201 (a) (xli). This certification may be required by the Contractor, either for each subcontract or for all subcontracts during a period (i.e., quarterly, semiannually, or annually).

(c) During the performance of this contract, the Contractor agrees as follows:

(1) The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, or national origin. Such action shall include but not be limited to the following: Employment, upgrading, demotion, or transfer, recruitment or recruitment advertising, layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the Contracting Officer setting forth the provisions of this nondiscrimination clause.

(2) The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

(3) The Contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided by the agency Contracting Officer, advising the labor union or workers' representative of the contractor's commitments under this Equal Opportunity clause and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(4) The Contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, as amended by Executive Order 11375 of October 13, 1967, and of the rules, regulations, and relevant orders of the Secretary of Labor.

(5) The Contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, as amended by Executive Order 11375 of October 13, 1967, and by the rules, regulations, and orders of the Secretary of Labor or pursuant thereto, and will permit access to his books, records and accounts by the contracting agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(6) In the event of the Contractor's noncompliance with the Equal Opportunity clause of this contract or with any of such rules, regulations, or orders, this contract may be cancelled, terminated or suspended in whole or in part, and the Contractor may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, as amended by Executive Order 11375 of October 13, 1967, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, as amended by Executive 11375 of October 13, 1967, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(7) The Contractor will include the provisions of Paragraph (1) through (7) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order 11246 of September 24, 1965, as amended by Executive Order 11375 of October 13, 1967, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as the contracting agency may direct as a means of enforcing such provisions including sanctions for non-compliance: <u>Provided</u>,

however, that in the event the Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the contracting agency, the Contractor may request the United States to enter into such litigation to protect the interests of the United States.

1B.21 Parking and lighting of equipment. All construction equipment not in use shall be parked along the outside edge of the work or as directed. Light for equipment parked at night will be required. The use and type of lighting shall be in accordance with instructions issued by the Contracting Officer.

1B.22 Grounding and shielding of construction equipment. Any construction equipment or appliances used in conjuction with the work of this contract shall be adequately shielded, suppressed or grounded when required by the Contracting Officer.

1B.23 Preconstruction conference. Prior to commencement of the work, the Contractor will meet in conference with representatives of the Contracting Officer to discuss and develop mutual understandings relative to such Contractor operations on the facility as vehicle stickers, gate clearances, utility rates, interruption of utilities, scheduling, military station regulations, parking, lighting, and safety.

1B.24 Operation of equipment on pavements. The Contractor will not be permitted to operate any equipment on pavements at any time, except rubber tired equipment.

1B.25 Notice Regarding Buy American Act (September 1970). The Buy American Act (41 USC 10a-10d) generally requires that only domestic construction materials be used in the performance of this contract. Exception from the Buy American Act shall be permitted only in the case of nonavailability of domestic construction materials. A bid or proposal offering nondomestic construction material will not be accepted unless specifically approved by the Government. When a bidder or offeror proposes to furnish nondomestic construction material, his bid or proposal must set forth an itemization of the quantity, unit price, and intended use of each item of such nondomestic construction material. When offering nondomestic construction material pursuant to this paragraph, bids or proposals may also offer, at stated prices, any available comparable domestic construction material, so as to avoid the possibility that failure of a nondomestic construction material to be acceptable under this paragraph will cause rejection of the entire bid.

1B.26 Minimum wage rates and other labor standards. The Contractor shall pay mechanics and laborers employed or working directly upon the site of the work rates not less than those contained in the wage determination decisions of the Secretary of Labor No. NC76-1019.

1B.27 North Carolina Sales And Use Tax

(a) As used throughout this clause, the term "materials" means building materials, supplies, fixtures and equipment which become a part of or are annexed to any building or structure erected, altered, or repaired under this contract.

(b) If this is a fixed-price type contract as defined in the Armed Services Procurement Regulation, the contract price includes North Carolina sales and use taxes to be paid with respect to materials not withstanding any other provision of this contract. If this is a cost-reimbursement type contract as defined in such regulation, any North Carolina sales and use taxes paid by the Contractor with respect to materials shall constitute an allowable cost under this contract.

(c) At the time specified in paragraph (d) below:

(i) The Contractor shall furnish the Contracting Officer certified statements setting forth the cost of the materials purchased from each vendor and the amount of North Carolina sales and use taxes paid thereon. In the event the Contractor makes several purchases from the same vendor, such certified statement shall indicate the invoice numbers, the inclusive dates of the invoices, the total amount of the invoices and the North Carolina sales and use taxes paid thereon. Such statement shall also include the cost of any tangible personal property withdrawn from the Contractor's warehouse stock and the amount of North Carolina sales or use tax paid thereon by the Contractor. The Contractor shall furnish such additional information as the Commissioner of Revenue of the State of North Carolina may require to substantiate a refund claim for sales or use taxes.

(ii) The Contractor shall obtain and furnish to the Contracting Officer similar certified statements by its subcontractors.

(d) If this contract is completed before the next July 1, the certified statements to be furnished pursuant to paragraph (c) above shall be submitted with 60 days after completion. If this contract is not completed before the next July 1, such certified statements shall be submitted on or before the 31st day of August of each year and shall cover taxes paid during the twelve month period which ended the preceeding June 30.

(e) The certified statements to be furnished pursuant to paragraph (c) above shall be in the following form:

"I hereby certify that during the period ___to___, (Name of Contractor or subcontractor) paid North Carolina sales and use taxes aggregating $________ with respect to building materials, supplies, fixtures, and equipment which have become a part of or annexed to a building or structure erected, altered or repaired by (name of Contractor) for the United States of America, and that the vendors from whom the property was purchased, the dates and numbers of the invoices covering the purchases, the total amount of the invoices of each vendor, the North Carolina sales and use taxes paid thereon, and the cost of property withdrawn from warehouse stock and North Carolina sales or use taxes paid theron are as set forth in the attachments hereto.

1B.28 Written Guarantees And Guarantor's Local Representative.

Prior to completion of the contract, the Contractor shall obtain and furnish to the Contracting Officer's designated representative written guarantees for all the equipment and/or appliances furnished under the contract. The Contractor shall furnish with each guarantee: The name, address, and telephone number of the guarantor's representative nearest to the location where the equipment and/or appliances are installed, who, upon request of the Using Service's representative, will honor the guarantee during the guaranty period and will provide the services prescribed by the terms of the guarantee. At the time of installation, the Contractor shall tag each item of warranted equipment with a durable, oil and water resistant tag approved by the Contracting Officer. Leave the date of acceptance and inspector's signature blank until project is accepted for beneficial occupancy. Tag shall show the following information:

EQUIPMENT WARRANTY TAG

Type of Equipment..............................
Accepted Date..................................
Warranted Until................................
Under Contract N62470..........................
Inspector's Signature..........................

STATION PERSONNEL TO PERFORM ONLY OPERATIONAL MAINTENANCE

1B.29 Quarantines

1B.29.1 Quarantine for White Fringed Beetles. The entire Camp Lejeune reservation (including Camp Geiger) and the Marine Corps Air Facility, New River, have been quarantined by the United States and North Carolina Departments of Agriculture for the white fringed beetle. Compliance with the quarantine regulations established by these authorities as set forth in the U.S.D.A. Quarantine No. 72 and North Carolina State

Quarantine No. 7 is required for operations hereunder. Pertinent requirements of the quarantines include the following:

(a) Certification is required for the following articles and they shall not be moved from the reservation unless accompanied by a valid inspection certificate issued by an authorized white fringed beetle inspector.

(1) Soil, sand, or gravel moved independently or attached to other articles, such as heavy equipment including drag lines, road-grading machines, ditch diggers, bulldozers, and equipment with tracks or cleats.

(2) Nursery stock, plants and sod.

(3) Scrap metal.

Authorization for movement of equipment shall be obtained from the Contracting Officer, and requests for inspection shall be made sufficiently in advance of the date of movement to permit arrangements for the services of authorized inspectors. The equipment shall be prepared and assembled so that it may be readily inspected. Articles and materials requiring certification for movement shall be removed from the equipment by washing with water and such other means as necessary to accomplish complete removal. Resulting spoil shall be wasted as directed.

1B.29.2 Quarantine for imported fire ant. That area of Onslow County bounded by a line beginning at the intersection of U.S. Highway 17 and the White Oak River, thence southeast along said river to Bogue Inlet, thence south along said inlet to the Atlantic Ocean, thence southwest along said ocean to its junction with New River Inlet, thence northwest along said inlet to its junction with New River, thence northwest along said along said river to its junction with North Carolina Highway 172, thence southwest and west along said highway to its junction with U. S. Highway 17, thence north and northeast along said highway to the point of beginning, has been declared a suppression area by the United States Department of Agriculture for imported fire ant. All of Carteret County, and that part of Craven County where Marine Corps Air Station is located, likewise have been declared a suppression area by the same authority. Included in the Onslow County area is the entire Camp Lejeune reservation, including Camp Geiger and the Marine Corps Air Station (Helicopter), New River. Compliance with the quarantine regulations established by this authority as set forth in USDA Quarantine No. 81 dated 9 October 1970, is required for operations hereunder. Pertinent requirements of the quarantine for materials, originating on the Camp Lejeune reservation, the Marine Corps Air Station (Helicopter), New River, and the Marine Corps Air Station, Cherry Point which are to be transported outside the Onslow County or adjacent suppression areas, include the following.

(a) Certification is required for the following articles, and they shall not be moved from the reservation to any point outside the Onslow County and adjacent suppression areas unless accompanied by a valid inspection certificate issued by an authorized imported fire ant inspector.

(1) Bulk soil.

(2) Used mechanized soil-moving equipment.

(3) Any other products, articles, or means of conveyance of any character whatsoever, not covered by sub-divisions (1) and (2), when it is determined by an inspector that they present a hazard of spread of the imported fire ant and the person in possession thereof has been so notified.

(b) Authorization for movement of equipment shall be obtained from the Contracting Officer, and requests for inspection shall be made sufficiently in advance of the date of movement to permit arrangements for the services of authorized inspectors. The equipment shall be prepared and assembled so that it may be readily inspected. Articles and materials requiring certification for movement shall be removed from the equipment by washing with water and such other means as necessary to accomplish complete removal. Resulting spoil shall be wasted as directed.

~~1B.30 Separate Pricing. The Power Demand Control System as described in paragraph 2B.1.8 shall be separately priced and not included in the firm fixed price bid.~~

PAGE NOS. 18 AND 19
HAVE BEEN OMITTED.

SECTION 1C. PROPOSALS

1C.1 Proposal submission. Envelopes containing proposals must be sealed, marked, and addressed as follows:

Proposal for: Two-step formal advertising (TURNKEY)
Utility Control System - First Increment,
Marine Corps Base, Camp Lejeune, North Carolina

Specification No. 05-75-5437

To: Commander
Atlantic Division
Naval Facilities Engineering Command
Contract Divison, Code 02, Room No. 105, Building N-21
Naval Station
Norfolk, Virginia 23511

1C.2 Contents of proposals. Each proposer shall submit, as a minimum the following information:

(a) Step I

(1) The required technical data (See Paragraph 1C.11)

(b) Step II

(1) The lump sum price for all the work proposed to be performed in duplicate. Bids must be submitted on both items.
a. Price for all work, except Power Demand Control System.
b. " " Power Demand Control System as specified in par. 2B.1.8

(2) The required guaranty bond. (See paragraph 1B.11)

(3) Fully executed Standard Form 19B

(4) Acknowledgement of all amendments to this request for technical proposals that may be issued prior to the date specified for receipt of the proposals.

Forms that shall be used for submission of the information required under items (1), (2), and (3) above accompany the Request for Technical Proposals.

1C.3 Number of copies, time of receipt. Ten copies of the technical proposal shall be submitted under Step I. Instructions concerning the time and place of delivery are provided on the first page (S. F. 20 modified) of this Request for Technical Proposals. For Step II see ~~1C.2(b)~~. 1C.8.2

1C.4 Alternate or multiple proposals. In addition to their basic proposal conforming to the drawings and specifications proposers may, if they desire, submit multiple proposals or include alternates or variations of the work proposed. If multiple proposals or alternates are submitted, proposers should assure that the required bond is in a sum sufficient to cover the highest possible amount upon which award can be made. In addition, they should assure that full technical details, as may be appropriate, are furnished so as to assure that their proposals can properly be evaluated without the need for the request for additional information. (See paragraph 1C.6).

1C.5 Restrictions on Disclosure and Use of Data in Proposals and Quotations.

(a) A proposal, whether solicited or unsolicited, may include data, such as a technical design or concept or financial and management plan, which the offeror does not want disclosed to the public for any purpose or used by the Government for any purpose other than evaluation of the proposal. If an offeror wishes so to restrict his proposal, he shall mark the title page with the following legend:

> This data, furnished in connection with Request for Technical Proposals No. N62470-75-B-5437 shall not be disclosed outside the Government and shall not be duplicated, used, or disclosed in whole or in part for any purpose other than to evaluate the proposal; provided, that if a contract is awarded to this offeror as a result of or in connection with the submission of this data, the Government shall have the right to duplicate, use, or disclose the data to the extent provided in the contract. This restriction does not limit the Government's right to use information contained in the data if it is obtained from another source without restriction. The data subject to this restriction is contained in Sheets ________.

(b) The offeror shall mark each sheet of data which he wishes to restrict with the following legend:

Use or disclosure of proposal data is subject to the restriction on the Title page of this Proposal.

1C.6 Basis of award. Proposers are advised to submit proposals which are fully and clearly acceptable without additional explanation or information since the Government may make a final determination as to whether a proposal is acceptable or unacceptable solely on the basis of the proposal as submitted and proceed with the second step without requesting further information from any offeror; however, if the Government deems it necessary to obtain sufficient acceptable proposals to assure

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adequate price competition in the second step or deems it otherwise desirable in its best interest the Government may at its sole discretion, request additional information from offerors of proposals which the Government considers reasonably susceptible to being made acceptable by additional information clarifying or supplementing but not basically changing any proposal as submitted and, for this purpose, the Government may discuss any such proposal with the offeror. In the second step of the procurement only bids based upon technical proposals determined to be acceptable, either initially or as a result of discussions, will be considered for awards; and each bid in the second step must be based on the bidder's own technical proposals.

1C.7 Nonconforming proposals. Any proposal may be construed as a nonconforming proposal and ineligible for consideration if a proposer does not comply with the requirements of this Request for Technical Proposals. The failure to comply with the technical features, acknowledge receipt of amendments and submit the required bond are common causes for holding proposals nonconforming. Proposers submitting unacceptable technical proposals will be so notified upon completion of the technical evaluation of his proposal, and final determination of such unacceptability.

1C.8 Time for review and acceptance by the Government of Technical Proposals.

1C.8.1 Step I. The Government will review the proposals submitted and advise each proposer on or before ~~20 August~~ 3 Sept 1976 whether or not their technical proposals are acceptable.

1C.8.2 Step II. Proposers who are advised that their technical proposals are acceptable under Step I shall have until 2:00 P.M. (Local Time) ~~16~~ 23 September, 1976 to submit their lump sum price with guaranty bond and fully executed Standard Form 19B. All proposers submitting proposals in response to this request agree the Government shall have 30 calendar days after the date indicated for receipt of proposals to accept any proposal. In the event the Government cannot award a contract within this 30 calendar day period, any or all proposers may, at their option, extend the date for acceptance of their proposal.

1C.9 Modification of proposals. Modifications of proposals already submitted will be considered if received at the office designated in this Request by the time set for receipt of proposals. Telegraphic modifications will be considered but should not reveal the amount of the original or revised price. Modifications received after the designated time will not be considered (subject to the provisions of the "Late technical proposals, modifications of technical proposals and withdrawals of technical proposals"). Also see paragraph 1B.8.

1C.10 Clarification of the provisions of this request. Any explanation desired by a proposer regarding the meaning of interpretation of the Request for Technical Proposals must be requested in writing and with sufficient time allowed for a reply to reach proposers before the submission of their proposals. An interpretation made will be in the form of an amendment to the Request for Technical Proposals, and will be furnished to all prospective proposers. Receipt of all amendments must be acknowledged in the space provided on the Proposal Form, or by letter or telegram received by the time set for receipt of proposals.

1C.11 Required technical data. The following technical data (ten copies) shall be submitted as part of Step I of the formal proposal. Proposers are advised that the required data listed hereinafter will be utilized for technical review and evaluation and used to determine that each proposal provides the minimum performance characteristic of equipment and design.

(a) Technical Data. For the first-step of the two-step contract, the proposers shall submit the required technical data to the Government. One copy will be returned to the proposer along with applicable comments. The submittal shall include a written detailed description of the intended system design. Particular attention shall be paid to all points of equipment interface to include noting and pointing out signal and equipment compatibility at these points. Manufacturer's descriptive data and brochures shall be submitted for all major items of equipment proposed. Equipment data shall include, but not limited to basic control and communications systems, data modems, computers, all transducers, transmitters and operators. Where this data is not available or sufficiently detailed, a written description shall be given to insure coverage of all pertinent technical aspects. Wire and cable specifications and a description of the planned outside plant communications engineering approach shall also be submitted in sufficient detail to allow a clear understanding of the proposed layout.

(b) Drawings. Submit drawings that clearly depict the descriptions of the technical approach including but not limited to, functional block diagrams, communications layouts, interfaces, etc. Show all signal flows from terminals to transducers, all major equipment types, communication types and qualities, and control room layout.

(c) Equipment Schedule.

(1) Furnish equipment schedule to indicate items of equipment to be provided, size or capacities, manufacturer and model. This list shall reference the specification paragraph pertinent to each item.

(2) Furnish manufacturers catalog data on equipment and accessories. This data shall be in the order as listed on the equipment schedule.

(3) Furnish the name, address and qualifications of the firm slated to perform the overall system maintenance.

(d) Operational and Maintenance Data.

(1) Indicate special capabilities and training you feel will be required of base personnel who will be operating and maintaining the complete system and the number required.

(2) Provide preliminary periodic operation and maintenance requirements indicating both frequency and time required. Include preliminary calibration schedules required to maintain system accuracy.

(3) Provide a preliminary listing of equipment required to operate and maintain the complete system.

(4) Provide a preliminary recommended spare parts list.

(e) Other Requirements. Refer to Divison 3 of these specifications for other Technical Proposal Guidelines.

NOTE: FAILURE TO SUBMIT ALL OF THE DATA INDICATED IN THIS SECTION MAY BE CAUSE FOR DETERMINING A PROPOSAL NONRESPONSIVE AND, THEREFORE, NOT CONSIDERED FOR AWARD.

(2) Submit [illegible] data [illegible] on equipment and procedures. This data shall be in the order as listed on the equipment schedule.

(3) Furnish the name, address and qualifications [illegible] to perform the overall system maintenance.

(c) Operation and Maintenance Data.

(1) Indicate type of specialized equipment you feel [illegible] number of personnel [illegible] for operating and maintaining the complete system [illegible].

(2) Provide [illegible] periodic [illegible] and maintenance requirements [illegible] primary calibration [illegible] as required to maintain system accuracy.

[illegible] parts [illegible] maintain the complete system.

(4) Provide a recommended [illegible] spare parts list.

(e) Other Requirements. Refer to [illegible] of these specifications for other Technical Proposal [illegible] items.

NOTE: FAILURE TO SUBMIT ANY OF THE DATA INDICATED IN THIS SECTION MAY BE CAUSE FOR DETERMINING A PROPOSAL NONRESPONSIVE AND, THEREFORE, NOT BE CONSIDERED FOR AWARD.

DIVISION 2. DESIGN, INSTALLATION, TESTING AND DOCUMENTATION REQUIREMENTS

Section 2A. Design Criteria
2B. System Functional Requirements for Centralized and Transmission Systems
2C. System Functional Requirements for Field Mounted Sensors
2D. Installation Requirements
2E. Testing and Training Requirements
2F. Documentation Requirements
2G. Figures, Tables, and Forms

SECTION 2A DESIGN CRITERIA

2A.1 Scope. These design criteria are intended to serve as guideline specifications for use by the proposers in their design of the Utility Control System-First Increment for Camp Lejeune Marine Corps Base. Only factors considered pertinent to the overall systems performance are included in these specifications. The proposer shall draw upon his own resources and experience to develop a system around his existing equipment which complies with these guideline specifications. Since it is obvious that the communication scheme could consume more than one-half the total system cost, the proposer shall thoroughly analyze existing systems to determine their value in lieu of new added communications circuits. Existing field wiring and equipment shall be utilized insofar as they are practical and meet the requirements discussed herein. In addition, existing equipment and systems shall be provided with the necessary transducers, additional equipment and instrumentation to effect the system operating characteristics defined herein. The proposers shall review the envisioned overall future system to insure that the design for the initial system can be easily expanded in the future.

2A.2 Applicable Publications. During the design phase of the program, the successful proposer shall determine the explicit publications from the general publications list below required to install his design. He shall then identify these either in his design drawings or specifications or both such that all work performed under this specification will be in compliance with state and local codes, laws and ordinances, and all rules and regulations of the Administrative Authority having jurisdiction. The requirements and recommendations of the Occupational Safety and Health Act (1970) are by reference made a part of these specifications and all work shall comply with its requirements and recommendations wherever applicable.

A. Instrument Society of America - I.S.A.

B. National Electrical Code - N.E.C.

C. Underwriters' Laboratory - U.L.

D. American Society for Testing Materials - A.S.T.M.

E. American Standards Code - A.S.C.

F. American National Standards Institute - A.N.S.I.

G. American Society of Mechanical Engineers - A.S.M.E.

H. Insulated Power Cable Engineers Assocation - I.P.C.E.A.

I. National Electrical Manufacturer's Association - N.E.M.A.

J. National Fire Protection Association - N.F.P.A.

K. Radio-Television Manufacturers' Association - R.T.M.A.

L. National Bureau of Standards - N.B.S.

M. National Safety Code - N.S.C.

N. National Electrical Contractors Association - N.E.C.A.

O. Electronic Industries Association - E.I.A.

P. Federal Communications Commission - F.C.C.

Q. Rural Electrification Administration - R.E.A.

344-2	List of materials acceptable for use on telephone systems.
PC-2	Splicing plastic insulated cables.
PC-5	Station Installations.
511a	Specifications and drawings for construction of pole lines, aerial cables and wires, buried cables and wires, and station installations.
PE-39	Filled telephone cables for direct burial.

R. Department of the Navy

NAVMAT P-5100 Safety Precautions for Shore Activities

5nd LANTDIV 4-4330/1(11-74) Guide for Architect Engineer Firms performing Services for the Atlantic Division Naval Facilities Engineering Command Norfolk, Virginia 23511

S. Federal and Military Standards

MIL-C-17E Cable, Radio Frequency, Flexible and Semirigid, General Specification For

2A.3 Products. Furnish equipment and materials under this specification which are products of manufacturers regularly engaged in the production of such equipment and are the manufacturers' latest design. All items of the same type or ratings shall be identical. The entire system shall be the coordinated and integrated design of a single Contractor. The Contractor shall show satisfactory evidence that the equipment suppliers maintain a service department equipped to provide service and replacement parts for the equipment provided. Furthermore, evidence shall be shown that a firm, fully qualified and capable of performing maintenance on the entire system, is prepared to offer a service contract for the maintenance of the system after the warranty period.

2A.4 Installation shall be accomplished in accordance with NAVMAT P-5100, by a qualified, responsible and fully-experienced Contractor. This is a Turnkey contract, and it is the responsibility of the Contractor to insure that his design is provided in a manner which precludes system operating malfunctions at any time during the equipment life time as a result of improper or poor quality installation.

2A.5 General Requirements. The Contractor shall analyze the requirements, perform trade-off studies, design, furnish, install, and test a complete and operating Utility Control System First Increment as a Turnkey project. The initial system installation shall permit remote monitoring and control of certain building air conditioning and heating systems, monitor various sewage lift stations operations, monitor certain manned steam boiler operations, and monitor base electrical power usage and peak demand. This system shall be capable of expansion throughout the future to provide a more centralized monitoring and control system for all base utility services and other systems. Detailed functional requirements are listed in later sections of this document.

2A.5.1 Components and Appurtenances. It is not intended that these specifications limit procurement to any single manufacturer, but to define what is considered the minimum performance characteristics required in order to provide the necessary operational capabilites of the monitoring control system. All components, regardless of manufacturer, must be compatible for operating within the complete system. Standard commercial or government specification controlled components shall be used to the maximum extent possible to assure availability of spare and repair parts, and system expansion. The components provided must be capable of operating satisfactorily under the climatic and environmental extremes of temperature, humidity, rainfall, dust, dirt, etc., normally existing at the facilities where they are installed. Components provided must be constructed of materials and so designed that all necessary minor maintenance, repair, calibration and parts replacement may be made at the location of the component in the field. The Contractor shall design the entire system and provide the necessary protective equipment to minimize and localize damage from both man and natural disasters. Where detailed specifications are not contained herein concerning certain components, the proposer shall indicate in his proposal the type and quality of those items which he envisions to be put into use as well as their mounting and installation techniques.

SECTION 2B SYSTEM FUNCTIONAL REQUIREMENTS FOR CENTRALIZED AND TRANSMISSION SYSTEMS

2B.1 Conceptual System Configuration. System Block Diagram, Figure 2B.1 depicts one concept of operation as a means of defining the type of system that is expected. Certain features are of particular note in this diagram.

2B.1.1 Remote Station Unit (RSU). This is a field mounted interface unit connected to the Central Control Equipment (CCE) by a broad band data link (DL-A). These units are to be so designed and located to minimize the cost of transmission system. These units shall have the capability to communicate directly with monitoring field sensors and controls. In addition, the necessary interfaces shall be included for provisions to accept and generate transmissions through narrow band data links (DL-B) to even more remote sensors and controls. Inclusion of some form of message verification over the data link (DL-A) which shall allow for the retransmission of a missed message shall be provided in the unit's circuitry. These units shall be designed to be expandable by module, card, etc. for the future enlargement of the system. The system may also be expanded by the addition of new RSU at new locations. If units are installed outdoors, they shall be suitably weatherproofed. In all cases, the unit design shall be adequately tamperproof.

2B.1.2 Data Link Type A (DL-A). This link is a broad band communications link between the Central Control Equipment (CCE) and a Remote Station Unit (RSU). The minimum speed of 4800 baud will be required of this type link. Implementation of a DL-A may be by means of a coaxial cable, 4 wire cable, radio, dedicated phone circuit, or any other means which provides the required speed with an acceptable error rate. These links should be well chosen and installed to minimize the communications cost. It is not required that all DL-A be of the same type.

2B.1.3 Data Link Type B (DL-B). This link is a narrow band communications link between a RSU and very remote points. The minimum speed of DL-B shall be 1800 baud. Implementation of a DL-B may be by any acceptable means including coaxial cable, multi-wire cable, dedicated phone circuit or radio. These links should also be selected to minimize the communications cost. It is not required that all DL-B be of the same type.

2B.1.4 Central Control Equipment (CCE)

2B.1.4.1 Location. The central control equipment shall be installed in Building 1202 located in the Hadnot Point area.

2B.1.4.2 Control Terminal/Console. Provide a control console of the desk/console type to allow the operator full access to all system controls while seated in a swivel-type chair. All functions performed by the operator shall be from one of two control terminals. Provide terminals equipped with printing devices and typewriter keyboards with at least 118 print positions and a speed of at least 30 characters per second. One terminal shall be designated the Command Terminal and used to communicate the operator's commands to the system. The other terminal shall be designated the Alarm Terminal and used to present all alarm conditions and return-to-normal reports. Each terminal must be capable of performing both functions in the event one fails. In addition, provisions shall be made to the console to provide:

a) Convenient storage space for books, logs, and tables used by the operator.

b) Hierarchial access to the computer system through the operator console consisting of at least the following three levels:

   1) No changes.

   2) Normal operator privileges.

   3) Supervisory privileges to change system parameters.

c) Provide a digital clock of the oscillating quartz crystal type and having battery backup to allow continuity of the clock count in the event of short power outages. This display shall be light emitting diode or liquid crystal, approximately one-half inch high. Reset controls shall be accessible to allow reset from front panel. Reset shall be secured with a key operated lock to prevent tampering. It shall display month (01-12) day (01-31) hour (00-23) and minute (00-59) and shall automatically compensate for the number of days for the month displayed.

2B.1.4.3 Terminal Features

2B.1.4.3.1 Alarms are active while off-normal conditions exist and the alarm terminal must print an appropriate alarm message including date and time of occurence. The Command Terminal shall be used to acknowledge all alarms and to silence the audible device. The Alarm Terminal must record the time of acknowledgement and return-to-normal conditions. The operator shall be able to request a summary of all outstanding alarms.

2B.1.4.3.2 Status reports on the values of all analog inputs and the state of all digital inputs shall be available on demand at the Command Terminal. Arrange reports so that all points, points from similar devices, points from a single RSU, or a single point may be requested. The data displayed shall be from the most recently completed scan of the data without interrupting the normal scan routine.

2B.1.4.3.3 <u>Totalization</u> based on summation of instantaneous values shall be provided by the software. Totalizers may be reset at fixed times or on command. More than one totalizer may be assigned to a single point.

2B.1.4.4 <u>Computer System</u>. Furnish a computer of sufficient size and speed to accomplish this increment and be expandable in size to accomplish the indicated future increments. The computer shall be of a commercially available type which has been in manufacture for at least one year prior to 1 June 1976. The system shall monitor each point at least once each minute.

2B1.4.4.1 <u>Operating System</u>. Furnish a real-time operating system capable of performing multiple tasks simultaneously. Furnish any required licenses.

2B1.4.4.2 <u>Applications Software</u>. Furnish all software required to implement the requirements of this increment. Furnish evidence of any other software packages that are available. Reference Sections 1B.30, 2B.1.8, and 3B.4 for additional requirements concerning applications software.

2B1.4.4.3 <u>Alarm Announcements</u>. Provide three levels of alarm announcements to be assigned by the Government to each alarm. The levels of announcement shall be as follows:

Class 1. Most Severe - audible and visual announcement every three minutes while condition exists. Audible and visual announcement at termination of condition.

Class 2. Severe - audible and visual announcement at start and termination of condition.

Class 3. Minor - visual announcement at start and termination of condition.

2B.1.5 <u>Remote Terminals</u>. Provide central processor interface (current loop or EIA232C) for future remote alarm terminals in each of these buildings, i.e., Buildings 20, 22, and 1700. These alarm terminals shall be similar in design to the alarm terminals in Section 2B.1.4 above. Software programming shall enable limited command capabilities at these terminals. Communication between the remote terminals and the CCE shall be via Data Link (DL-C).

2B.1.6 <u>Data Link Type C (DL-C)</u>. These data links are a narrow band communications link between the CCE and a remote terminal. The minimum speed of a DL-C shall be 300 baud. Implementation shall be on the same basis as DL-B.

2B.1.7 Voice Communication. Furnish recommendations for a future voice communication system between the CCE located in Building 1202 and the remote terminals located in Buildings 20, 22, and 1700.

2B.1.8 Power Demand Control ~~(Optional Increment)~~. Provide a complete ~~system~~ Programs for power demand control by means of load shedding. The system shall include the following features:

a) One demand meter input (minimum).

b) Minimum of 50 loads which may be shed.

c) Correction for a missed end-of-interval signal.

d) Resynchronization of end-of-interval after power failure.

e) Forecast load control within each interval (ideal rate control is not acceptable).

f) Inhibit load shedding unless forcasted error exceeds a specified deadband.

g) Minimum off times and minimum on times for each sheddable load.

2B.2 Equipment Requirements.

2B.2.1 Enclosures-General. This CCE area will be provided with environmental conditioning suitable for computer use by the Government. Equipment cabinets, displays and consoles shall be rigidly constructed, free standing, totally self-supporting. Wiring between all equipment housings shall be enclosed in conduit or metal raceway, installation of which shall be accessible. Sharp edges, points, or overly protruding objects shall not be allowed. Overall design layout should center around the operator. Provide glare-resistant and colored finishes to produce a pleasing appearance and minimize personnel fatigue. Cover vacant shelfs, etc., with blank panels.

2B.2.2 Circuit Design/Internal Cabling. Circuit design for equipment within the confines of the CCE shall make maximum usage of solid state modular construction utilizing standard plug-in circuit boards. Provide solid state logic circuits, not electromechanical types. In order to facilitate future change and growth of the system and to minimize changes in the control room area 20% excess connection capacity shall be initially installed. Include 20% excess capacity in interconnecting raceways. Further, the proposer's design shall contain some convenient means of reterminating or adding new cabling within or to the units as required for future growth.

2B.2.3 Power Requirements.

2B.2.3.1 Central Control Equipment shall be powered by a 120/208 volt 60 Hertz. The power supply provided must be capable of providing immunity to noise on the power line. Provide battery backup to maintain at least alarm and point status information for a period of four hours. Chargers shall automatically recharge batteries when they have been used, and if equipment operates from battery float, the charger shall be capable of powering the equipment while it is recharging the batteries. Charger shall trickle charge the batteries during normal operation. Restoration of power shall not cause an alarm and shall be readily reset to again initiate control or monitoring.

2B.2.3.2 Remote Station Unit shall receive power either from some local source of 120/208 volts 60 Hertz or from batteries. In either case, it shall be capable of maintaining alarm and system status indication back to the CCE during a commercial power outage.

2B.3 see new UL Approval requirements (Adm # 1) [illegible] Power Requirements.

[illegible] Communications [illegible] equipment shall be powered by a 120/208 volt [illegible]. The power supply [illegible] [illegible] of the [illegible] batteries to maintain [illegible] load [illegible] for [illegible] hours. Chargers shall automatically recharge batteries after they have been used, [illegible] equipment [illegible] shall be capable [illegible] charge the batteries [illegible] restoration of [illegible] shall not [illegible] for monitoring.

12[illegible] Transfer [illegible] power either from local [illegible] 120/208 volt [illegible] batteries. [illegible] back to the [illegible] commercial power [illegible].

SECTION 2C SYSTEM FUNCTIONAL REQUIREMENTS FOR FIELD MOUNTED SENSORS

The overall Utility Control System First Increment to be initially installed shall monitor and provide limited control of the following types of systems located throughout the Marine Corps Base:

1) Building Air Conditioning and Heating Systems

2) Sewage Lift Stations

3) Steam Boiler Plants

4) Peak Power Demand

General locations of the facilities requiring monitoring/control systems are shown on NAVFAC Dwg. 4027144.

2C.1 <u>Building Air Conditioning and Heating Systems</u>.

2C.1.1 <u>General</u>. Table 2C.1 provides a detailed tabulation of the buildings including ID number, and usage.

2C.1.2 <u>Detail Requirements</u>. As indicated by Table 2C.1 various sensors are required to provide the functional monitoring and control capabilities desired. The detail requirements for these sensors are as follows:

2C.1.2.1 <u>Indoor Temperature Sensor</u>. Provide rugged industrial quality as opposed to standard commercial quality temperature sensors for each building. Provide sensors with a maximum range of 0 to 125 degrees F. and develop an output whose accuracy is within ±0.25% span or 0.75 degrees F. whichever is smaller. Centrally locate these sensors to provide a true and accurate measurement of building indoor temperatures. Choose locations well such that direct drafts from outside doors and windows, heating and air conditioning grills or units are avoided. Mount sensors in a manner which protects the unit from inadvertent damage or tampering by unauthorized personnel.

2C.1.2.2 <u>Outdoor Temperature Sensor</u>. Provide rugged industrial quality as opposed to standard commercial quality temperature sensor. Locate away from any direct sunlight or source of heating or cooling (radiated, convected, or conducted) other than ambient outside air temperature. Mount sensor in a manner which protects the unit from inadvertent damage or tampering by unauthorized personnel. Provide the sensor with a minimum range of 0 to +130 degrees F and provide an output whose accuracy is within ±0.25% span or ±0.75 degrees F whichever is smaller.

2C.1.2.3 Heating/Air Conditioning Monitors. Interface the existing building heating and air conditioning systems to provide outputs from the existing control systems which indicate that system activations have been requested or, develop outputs from the systems which indicates that the systems are operating. Accomplish the interface utilizing the minimum number of components and added requirements and not add additional failure modes to the existing system. Isolate added circuitry to the maximum extent from the existing circuitry.

2C.1.2.4 Air Conditioning/Heating Controls. Incorporate into each building heating and air conditioning system the capability of a remote supervisory control interlock. Install all components necessary for this capability such that both the remote supervisory circuit and the local building control circuit, if any, must be activated to allow the building system to be activated. Accomplish this new interface using good engineering practice such that full steam flow is not passed into cold pipes, valves are operated at correct speeds, auxiliary devices are appropriately positioned, activated or de-activated as required. Strive for an interface utilizing the minimum number of components and added requirements which does not add additional failure modes to the system. Isolate the added circuitry to the maximum extent from the existing circuitry. In addition, provide a secure override system bypassing the central control feature for building system maintenance and testing purposes.

2C.2 Sewage Lift Stations.

2C.2.1 General: Table 2C.2 provides a detailed tabulation of these stations. The monitoring requirements for all of these stations are identical as described below.

2C.2.2 Detail Requirements.

2C.2.2.1 Sump High Level: The installation of a high level switch for use with a future remote monitoring system was accomplished under a previous contract. Provide output from this switch to remotely indicate high sump level.

2C.2.2.2 Normal Power Failure. Provide a device which will detect and change output states when any phase of the normal source drops to 75 percent or less of its rated value. It shall be connected after service disconnect and protective equipment. There shall be an adjustment provided which shall allow the unit to be made continuously less sensitive (to less than 50 percent) to permit fine tuning the circuit in the field. This alarm shall be continued as long as a malady exists on the normal power line regardless of automatic transfer switch or emergency generator operation. It shall have an initial delay of 5 seconds (nominal) to avoid alarming on voltage transients. Some form of protective devices shall be used between the sensor and the three phase lines.

2C.3 Steam Boiler Plants.

2C.3.1 General. Table 2C.3 provides a detailed tabulation of the boiler plants.

2C.3.2 Detail Requirements. The sensor requirements for remote monitoring of the boilers are as follows:

		Analog	Limit
D-1	Fuel Oil (to Burners) Temp.	X	
D-3	Boiler Drum Level	X	
D-3	Boiler Drum Pressure	X	
	Steam Pressure Atomization	X	
	Feed Water Pressure	X	
6A	Fuel Oil Storage Low Level		X
D-1	Fuel Oil Low Temperature		X
D-2	Fuel Oil Low Pressure		X
D-4	Condensate Tank Low Level		X
? D-5	Condensate Tank Low Temperature		X
D7	Flame/Boiler Malfunction		X
	Deaerator Tank Low Level		X
	Deaerator Tank Low Temperature		X
D7	Condensate Pumps On/Off		X
	Power Failure		X
D8	Fire/Smoke Detection		X
D9	Intrusion		X

Use industrial grade in opposition to commercial grade instruments with accuracy within 0.5% of span as the sensors for the above monitors. Minimize modifications to the existing systems for inclusion of the required additional sensors with a minimum of added failure modes to the system. Existing components should be used where transducers can be added to convert outputs to a form usable by the monitoring and control system; however, added items must be of unused new manufacture. As noted from Table 2C.3, multiple boilers are installed in the buildings thus some sensor requirements may be redundant on a per boiler basis.

2C.4 Peak Power Demand.

2C.4.1 General. The Base electrical system is being updated under Contract N62470-74-C-1345. Installation of a new substation at Ash Street and Holcomb Boulevards is schedule for completion in August '76.

2C.4.2 Detail Requirements. Interface with the local Power Company sensor or add a new industrial quality peak demand kilowatt hour sensor synchronized to the Power Company sensor. In addition to local readout of power demand and usage, the unit shall provide for transmission of same within an accuracy of 0.5% span to the remote control system for use in a load shedding/starting energy management program.

2C.5 Future Sensors. This specification covers only the first increment of the Utility Control System installation. Expansion will be on a yearly basis in the future. Design for the future expansion of the below listed representative types and quantities of systems referring to the 24 sheets of annual condition maps for typical locations:

2C.5.1 Air Pollution Systems (one)

A. Radiation
B. Particulate Matter
C. Sulfur Dioxide (SO_2)
D. Carbon Monoxide (CO)
E. Total Hydrocarbons
F. Nitrogen Dioxide (NO_2)

2C.5.2 Warehouses and Cold Storage (80)

A. Equipment Operation
B. Temperature

2C.5.3 Unmanned Steam Boilers (32)

A. Boiler Feedwater Pressure
B. Boiler Drum Level
C. Boiler Drum Pressure
D. Fuel Oil Storage Low
E. Fuel Oil Pressure
F. Flame/Boiler Malfunction
G. Fire/Smoke
H. Intrusion
I. Equipment Operation

2C.5.4 Water Storage Tanks (16)

A. Water Level
B. Equipment Operation

2C.5.5 Fresh Water Wells (99)

A. Static Water Level
B. Well Draw Down
C. Pumping Rate
D. Equipment Operation

2C.5.6 Water Treatment Plants (7)

A. pH
B. $CaCO_3$ Hardness
C. Chlorine
D. Turbidity
E. Softener Addition
F. Equipment Operation

2C.5.7 Sewage Treatment Plants (7)

A. Suspended Solids
B. pH
C. Chlorine
D. Dissolved Oxygen
E. Equipment Operation

2C.5.8 Unmanned Hot Water Boilers (35)

A. Hot Water Temperature
B. Hot Water Pressure
C. Fuel Oil Level Low
D. Flame/Boiler Malfunction
E. Water/Pump
F. Fire/Smoke
G. Intrusion
H. Equipment Operation

2C.5.9 Additional Manned Steam Boilers (6)

2C.5.10 Additional Sewage Lift Stations (8)

2C.5.11 Additional Buildings (500)

2C.6 Field Communications Systems. Analyze and design the system to minimize communication system cost thereby providing maximum funds for sensor installation and additional monitoring points. Section 2B stated that Data Links A and B need not be all the same types. Existing telephone lines, coaxial cables, radios, etc. should be evaluated for their use before carte blanche installation of new circuits. Design future system growth and expansion while designing the initial installations.

2C.6.1 Existing Telephone Circuits. Limited service is available from existing base telephone circuits as shown in Table 2C.4. This listing is to be used as a guideline and is not to be interpreted as either complete or the maximum number of circuits available. In the design phase the Contractor shall closely coordinate possible communications systems with the Base Communications sections striving for the optimum system, price and quality of transmission both being considered.

2C.6.2 Outside Signal Cables. Where required or desired, provide the cable system complete and in accordance with REA Form 511a, in which the Engineer is the Owner's representative for design and the Government as Owner has review and approval authority. An exception shall be that in Paragraph 23.31 "minimum depth in soil . . 24", 18 inch depth shall be allowed for 3 pair drop cables where requested by Contractor and approved by the Government. Provide direct burial cable filled type PE-39A with 22 AWG conductors and overall shield listed in REA 344-2. Plow the cable directly into place. Install one inch conduit (minimum) under roadways without cutting roadways and the cable spliced to pass through. Place markers to insure ease of locating the cable after installation. As-built records shall accurately show the cable route as well as location of all markers placed. Provide above ground terminal housing BDF 2 or 3 as required and housings, terminal and splicing equipment listed in REA 344-2 for moisture resistant high corrosion areas. Terminate and splice cables both above and below ground in accordance with REA PC-5 and PC-2. Terminate all pairs (whether connected or spare) on protector type terminal blocks. Provide gas tube arresters rated at not less than 250 volts DC. Where cables pass through or terminate in a building, loop the cable(s) into the building and bring all pairs in via the conduit provided. Provide at least two additional circuit devices designed to protect equipment from transients: eg optical isolators, zener diodes, current limiting resistors. see Chg 5

2C.6.3 RF Systems. RF Systems may be feasible for communication links for some of the monitoring/control field sensors. Design these systems to:

a) Minimize interference to or from existing and future communications system.

b) Utilize minimum R.F. power required to provide the necessary communications.

c) Utilize directional antennas to restrict the pattern to that required for transmission and reception.

d) Utilize frequency band most advantageous for the path of transmission.

Design RF Systems per applicable Federal Communications Commission Regulations and Electronic Industries Association Standards and closely co-ordinate with the Base Communications Office. Application for government frequency allocation per DD Form 1494 (attached) shall be made through the Contracting Officer as soon as the system design provides the detail information required on the form.

2C.6.4 Coaxial Cables. Coaxial cables where required shall conform to appropriate sections of Military Standard MIL-C-17. Connectors for coaxial cables shall carry standard Military UG part numbers.

2C.7 Ancilliary Equipment. Provide all ancilliary equipment; components, wiring, conduit, piping, tubing, clamps, supports, brackets, etc. as well as all labor and other equipment required for their installation under this contract thus assuring a complete and operational monitoring and control system.

SECTION 2D. INSTALLATION REQUIREMENTS

2D.1 General. Provide all labor, equipment, tools, and materials necessary for the completion of this work. Install all panels, sensors, and other instruments and interconnect all electrical, electronic, and pneumatic connections between the various components in the system and their local source of electrical energy and/or pressure source.

2D.2 Examination. Examine the facilities requiring new installations or modifications or both in advance as that locations of sprinklers, air conditioning systems, ventilation systems, plant piping systems and all other existing equipment and facilities can be determined such that this work can be performed effectively avoiding interferences and undue co-ordinations.

2D.3 Mounting. Mount and rigidly support all equipment level and plumb, and install in such a manner as to provide accessibility, protection from damage, isolation from heat, shock, vibration and freedom from interference with other equipment, piping and electrical work.

2D.4 Workmanship. Workmanship must be of the highest quality utilizing men skilled in the trades involved. Workmanship on all mechanical fastenings, welds and electrical joints, shall equal or exceed good commercial practices. Failure to satisfy these requirements will result in termination of contract.

2D.5 Component installation. The Contractor shall calibrate and adjust all components in accordance with the manufacturers' specifications. In installing the components, the Contractor is prohibited from relocating or modifying existing equipment (except as provided for in this specification) without prior approval of the Contracting Officer. All changes made, without permission not previously approved, shall be corrected by the Contractor. The Contractor shall repair and patch any structures damaged during installation of the components. All patching shall match and blend with the existing areas. All components and wiring shall be adequately protected from sand, dirt, moisture or other debris during installation. Component housings, and electrical components shall not be exposed to weather or moisture except as necessary for installation and calibration, and covers replaced in all cases at the end of the working day.

2D.6 Co-ordination. Facilities will be in operation during the installation of components. The Contractor shall comply with all regulations governing the activity and shall perform installations so as not to interfere with or interrupt normal procedures. Arrangements must be made ten days in advance with the Contracting Officer whenever it is necessary to take telephone, electric power, or equipment out of service. Whenever it is necessary to work on a system, the Contracting Officer shall be given ten working days advance notice. All safety precautions specified by the Government Fire Inspector shall be followed. Publication NAVMAT P5100 should be reviewed for guidance as to safety requirements at Navy shore activities. This in no way relieves the Contractor of his obligations to perform the work in a safe manner nor does this remove any liability of the Contractor if damage results to personnel or property. During installation, the Contractor shall keep the premises clean and properly dispose of resultant debris. Upon completion of the work, the Contractor shall remove all his equipments and unused materials and leave the premises in a neat, clean condition satisfactory to the Contracting Officer.

SECTION 2E. TESTING AND TRAINING REQUIREMENTS

2E.1 Test Plan. Within 210 days after award of contract and before start of any testing, the Contractor shall submit 10 sets of a complete Systems Test Plan. Thirty days will be required for review by the Government. After any necessary changes have been made to the plan by the Contractor, he shall submit 10 sets to the Government. Reproducibles retained by the Contractor shall be used to include testing data obtained during the actual testing of the system for later final submittal to the Government of the plan and data collected.

2E.2 General. Provide calibration, field testing and commissioning of all system instrumentation including adjustments under simulated or actual conditions utilizing qualified personnel. Provide all equipment, temporary piping and wiring, and test equipment.

2E.3 Responsibility for Inspection. Except where specialized inspections or tests are specified for performance solely by the Government, the Contractor shall perform or have performed the inspections and tests required to substantiate that the supplies and services provided conform to the specification requirements listed herein, including the technical requirements of the components of other manufacturers. The Government reserves the right to perform any of the inspections and acceptance tests specified herein where deemed necessary to assure supplies and services provided conform to prescribed requirements. Correct all system errors, defective equipment or material, and poor workmanship noted during inspections.

2E.4 Organization and Examination of Tests. Provide an inspection schedule to the Government for conducting the component acceptance tests. The component acceptance tests may be conducted on an "as-installed" basis. Deliver all certificates of inspection of components available to the Contracting Officer.

2E.5 System Acceptance Tests will include evaluation of the complete system performance and will follow up on the Contractor's satisfactory completion of all components installation, calibration, testing, debugging, adjustment and acceptance tests. System acceptance tests will be considered satisfactorily completed after the complete system has ~~experienced thirty consecutive 24-hour days of trouble-free operation.~~ demonstrated OVER ? AT least thirty consective 24 hours days that at least 95% annual availability will be obtained.

2E.6 System Performance Characteristics. Upon completion of the system installation, and the calibrating, checking, adjusting, testing and debugging of all components, computer software and transmission media, the Contractor shall place the total system in operation, make all adjustments and perform all necessary system tests and debugging to put the system in complete and perfect working order. ~~Provide all adjustments, modifications and correction of discrepancies necessary, to put the system in complete trouble free operation. The system will be considered in acceptable working order and ready for final acceptance after thirty consecutive 24-hour days of trouble-free operation.~~

2E.7 Training and Instructions. Three individuals from the base facility will be designated by the Government. These individuals shall be instructed in the correct calibration and adjustments of the system and minor trouble-shooting techniques of the CCE, panels, communication, control and transmission links and cables. The Contractor shall give sufficient instructions (minimum 20 working days) to these individuals to permit them to accomplish minor trouble-shooting and maintenance checks of control and transmission wiring and routine calibration and adjustment. Contractor personnel shall supervise these individuals at the site as they each make one or more of each type of calibration or adjustment on installed components. It is not intended that these instructions involve major adjustments or repairs, but that they be able to correct simple defects that develop with time and which could cause incorrect operations and to accomplish minor trouble-shooting checks in the electrical control and transmission wiring system. Training for 5 operators designated by the Government shall also be provided. These individuals shall receive instructions mainly concerning the operation of the CCE at the site. Extend the instructions to cover, in general, the operation of the complete system sufficient for an understanding of the overall system operation.

SECTION 2F. DOCUMENTATION REQUIREMENTS

2F.1 Work Performance Schedule. The Contractor shall be responsible for preparation of a time-phased schedule for delivery, installation and acceptance of components and the complete system. Forward this schedule to the Government not more than 105 days after award under this contract. Submit updates and changes to this schedule promptly to the Government. During installation and acceptance testing, the Contractor shall provide in advance a weekly work schedule to the Government indicating work planned and number and type of personnel involved.

2F.2 Engineering Drawings. The successful proposer shall submit to the Contracting Officer complete engineering drawings for review and approval within 105 days after award of the contract. Manufacturer's data for equipment not approved or submitted in Step One shall be submitted for approval prior to ordering that equipment. Insure that a system block diagram is included. Drawing submittals shall conform to the applicable requirements of the "Guide for Architect/Engineer Firms Performing Services for the Atlantic Division Naval Facilities Engineering Command."

2F.3 As-built Drawings. Correct all engineering drawings to reflect as-built conditions. Submit mylar reproducibles (with changes noted) within 30 days of system acceptance.

2F.4 System Test Plan. See paragraph 2E.1 for this requirement.

2F.5 Test Equipment and Spare Parts List. With the submission of the System Test Plan, submit ten copies of a complete listing of the equipment required to operate and maintain the complete system as well as recommended spare parts list with current prices.

2F.6 Equipment and System Operation and Maintenance Manuals. Submit 4 copies of operation and maintenance instructions for all individual items of equipment provided as well as the overall system. Where literature describes more than one model of a particular piece of equipment, note the model provided on all copies of the submittal. Each set of instructions shall contain serial numbers of items of equipment bearing same. Copies shall be permanent prints, nonfading and bound in such a manner as to preclude loss of sheets during normal perusal of the document. Include detailed periodic operation and maintenance requirements list which includes frequency and time required. Calibration schedules to maintain system accuracy shall also be defined.

2F.7 Software Documentation. The Contractor shall provide 4 copies of acceptable software documentation which includes, but is not limited to:

(a) details of the operating system as installed together with all necessary parameters required to regenerate the operating system.

(b) details of all commercially available applications software installed in the system together with all parameters used in this system.

(c) source listings for all applications software written for this system along with the design criteria for each program and any existing flow charts.

(d) complete manuals for every programming language used in this system.

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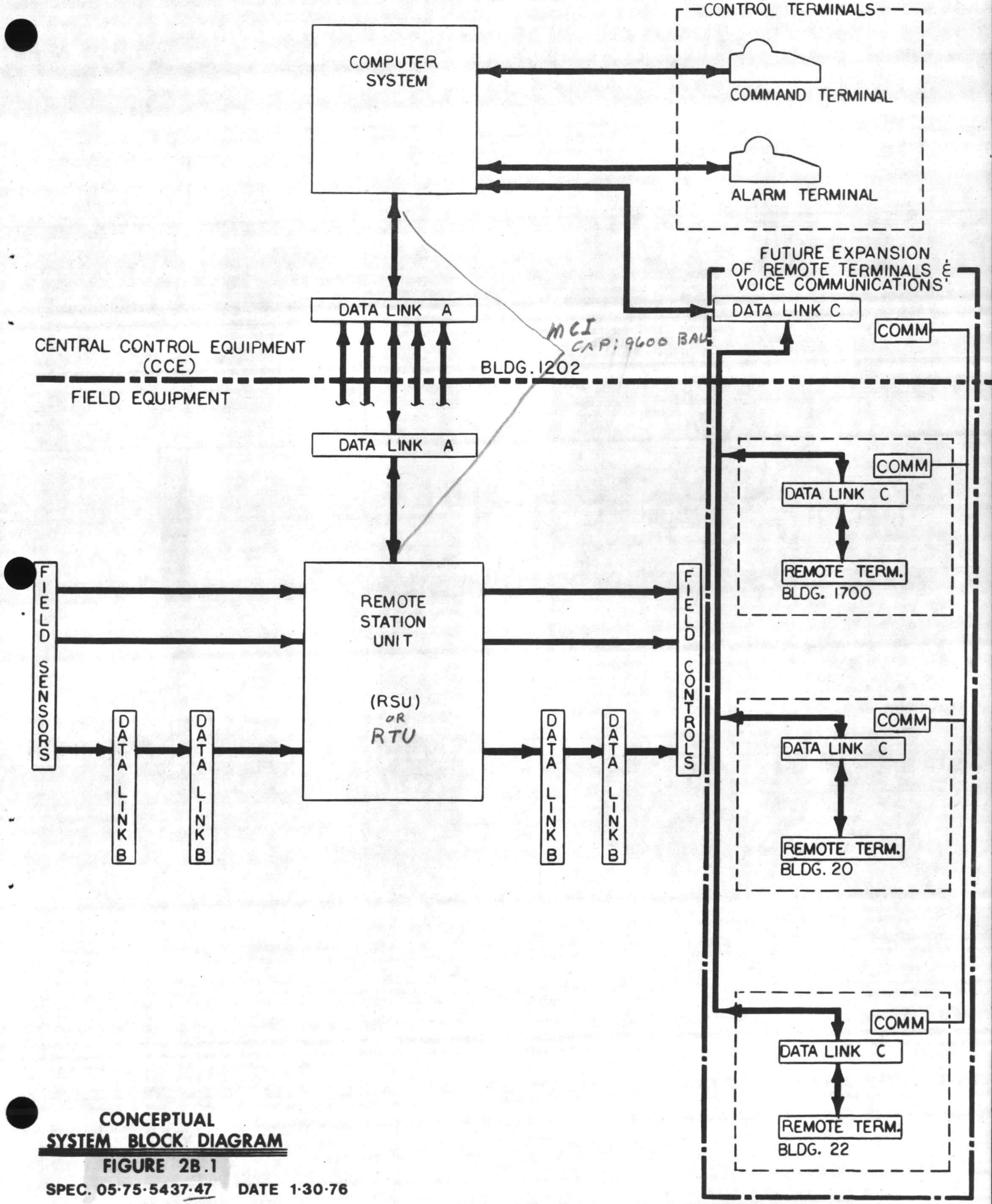
Application for Government Radio Frequency Allocation



CONCEPTUAL
SYSTEM BLOCK DIAGRAM
FIGURE 2B.1
SPEC. 05·75·5437·47 DATE 1·30·76

TABLE 2C.1

BUILDINGS DESCRIPTIVE DATA

BUILDING NUMBER	DWG. & ZONE NUMBER	USE	REMARKS
~~M-211~~	2, 10-N	Barracks	
~~M-212~~	2, 10-N	Barracks	
~~M-215~~	2, 10-N	Barracks	
~~M-216~~	2, 10-N	Barracks	
~~M-217~~	2, 10-O	Barracks	
~~M-218~~	2, 10-O	Barracks	
~~M-219~~	2, 10-O	Barracks	
~~M-220~~	2, 10-N	Barracks	
~~M-221~~	2, 10-N	Barracks	
~~M-222~~	2, 10-O	Barracks	
~~M-223~~	2, 10-O	Barracks	
~~M-224~~	2, 10-O	Barracks	
~~M-225~~	2, 10-N	Barracks	
~~M-226~~	2, 10-O	Barracks	
~~M-227~~	2, 10-O	Barracks	
~~M-228~~	2, 10-O	Barracks	
~~M-229~~	2, 10-O	Barracks	
M-231	2, 9-O	B.O.Q.	
~~M-232~~	2, 10-O	B.O.Q.	
~~M-233~~	2, 10-O	B.O.Q.	
~~M-234~~	2, 10-O	BS NCO Q	
~~M-235~~	2, 10-O	BS NCO Q	
~~M-236~~	2, 10-P	BS NCO Q	
6	10, 10-K	Barracks	
8	10, 10-K	Barracks	
10	10, 10-K	Barracks	
12	10, 10-L	Barracks	
59	10, 11-J	Barracks	
60	10, 11-J	Barracks	
63	10, 11-K	Barracks	
101	10, 9-J	Barracks	
104 ✓	10, 9-I	Barracks	
105	10, 9-J	Barracks	
108 ✓	10, 8-J	Barracks	
109	10, 8-J	Barracks	
111	10, 8-J	Barracks	
112 ✓	10, 8-J	Barracks	
118	10, 7-J	Barracks	
120 ✓	10, 7-J	Barracks	
124 ✓	10, 7-J	Barracks	
128 ✓ OR 6	10, 7-J	Barracks	
202	10, 9-K	Barracks	
204	10, 9-K	Barracks	
205	10, 9-L	Barracks	
208	10, 9-K	Barracks	
209	10, 9-L	Barracks	
212	10, 9-K	Barracks	
213	10, 9-L	Barracks	
217	10, 8-L	Barracks	
220	10, 8-L	Barracks	
224	10, 8-L	Barracks	
227	10, 8-L	Barracks	
228	10, 8-L	Barracks	
308	10, 9-M	Barracks	
309	10, 10-M	Barracks	
312	10, 9-M	Barracks	
313	10, 10-M	Barracks	
316	10, 8-M	Barracks	
318	10, 8-N	Barracks	
321	10, 9-N	Barracks	
323	10, 9-N	Barracks	
326	10, 9-N	Barracks	
327	10, 9-N	Barracks	

BUILDING NUMBER	DWG. & ZONE NUMBER	USE	REMARKS
404	10, 11-N	Barracks	
406	10, 10-N	Barracks	
407	10, 11-N	Barracks	
409	10, 11-N	Barracks	
410	10, 10-N	Barracks	
412	10, 10-N	Barracks	
415	10, 10-O	Barracks	
417	10, 10-O	Barracks	
420	10, 10-N	Barracks	
422	10, 10-O	Barracks	
426	10, 10-O	Barracks	
427	10, 9-O	Barracks	
502	10, 12-O	Barracks	
503	10, 12-O	Barracks	
506	10, 12-O	Barracks	
507	10, 12-O	Barracks	
510	10, 11-O	Barracks	
511	10, 12-O	Barracks	
514	10, 11-O	Barracks	
515	10, 12-P	Barracks	
517	10, 11-P	Barracks	
519	10, 11-P	Barracks	
523	10, 11-P	Barracks	
527	10, 11-Q	Barracks	
FC-304	11, 8-E	Barracks	Towers
FC-305	11, 8-E	Barracks	
FC-306	11, 8-E	Barracks	
FC-309	11, 7-E	Barracks	
FC-310	11, 7-E	Barracks	
FC-311	11, 7-E	Barracks	
FC-411	11, 6-F	B.E.Q.	ACCU
FC-412	11, 6-G	B.E.Q.	
FC-413	11, 7-F	B.E.Q.	
FC-414	11, 6-G	B.E.Q.	
FC-415	11, 7-F	B.E.Q.	
FC-416	11, 6-G	B.E.Q.	

Send back
supply & return temp

TABLE 2G.2

SEWAGE LIFT STATION DATA

STATION NUMBER	DWG. NO.	ZONE NO.	NORMAL POWER	STANDBY POWER	REMARKS
S-E-23	Sht. 2	14-L	Elect.	Gas/Gen	
M-241	Sht. 2	12-M	Elect.	Gas/Gen	
S-TT-34	Sht. 3	2-C	Elect.	Gas/Gen	
S-TT-32	Sht. 4	2-E	Elect.	Diesel/Gen	
S-TT-33	Sht. 4	4-D	Elect.	Gas/Gen	
S-46	Sht. 5	8-K	Elect.	Gas/Gen	
S-4005	Sht. 5	9-F	Elect.	Gas/Gen	
672	Sht. 5	10-K	Elect.	Gas/Gen	
S-2100	Sht. 7	6-H	Elect.	Gas/Gen	
S-2633	Sht. 7	11-J	Elect.	Gas/Gen	
S-1948	Sht. 7	14-N	Elect.	Gas/Gen	
H-29	Sht. 9	4-D	Elect.		
S-47	Sht. 10	6-F	Elect.	Diesel/Gen	
S-47A	Sht. 10	6-F	Elect.	Diesel/Gen	
S-85	Sht. 10	11-K	Elect.	Gas/Gen	
S-34	Sht. 10	14-I	Elect.	Gas/Gen	
S-1761	Sht. 10	14-M	Elect.	Gas/Gen	
S-1776	Sht. 10	15-M	Elect.	Diesel/Gen	
S-FC-315	Sht. 11	6-E	Elect.	Diesel/Gen	
FC-203	Sht. 11	9-C	Elect.	Gas/Gen	
RR-52	Sht. 16	11-H	Elect.	Gas/Gen	
S-BB-1	Sht. 17	14-M	Elect.	Gas/Gen	
S-BA-116	Sht. 19	16-M	Elect.	Gas/Gen	
	Sht. 17	11-I	(New Station Contract 747D6042 Under Construction)		

TABLE 2G.3

STEAM BOILER PLANT DATA

BLDG. NO.	BOILER NO.	DWG. NO.	ZONE NO.	MANNED UNMANNED	STEAM HOT WATER	STATUS FUEL	REMARKS
M-625	33	Sht. 2	14-J	M	S	No. 6	
M-625	34	Sht. 2	14-J	–	–	Surveyed	No Work
M-625	35	Sht. 2	14-J	–	–	Surveyed	No Work
M-625	36	Sht. 2	14-J	–	–	Surveyed	No Work
M-625	37	Sht. 2	14-J	–	–	Surveyed	No Work
M-625	73	Sht. 2	14-J	M	S	No. 6	
M-625	74	Sht. 2	14-J	M	S	No. 6	
PP-2615	9	Sht. 7	11-J	M	S	No. 6	
PP-2615	10	Sht. 7	11-J	M	S	No. 6	
G-650	83	Sht. 12	11-D	M	S	No. 6	
G-650	84	Sht. 12	11-D	M	S	No. 6	
G-650	85	Sht. 12	11-D	M	S	No. 6	
RR-15	46	Sht. 16	9-G	M	S	No. 6	
RR-15	47	Sht. 16	9-G	M	S	No. 6	
BB-9	53	Sht. 17	14-M	M	S	No. 6	
BB-9	54	Sht. 17	14-M	M	S	No. 6	
BB-9	55	Sht. 17	14-M	M	S	No. 6	
~~MCAS-422~~	~~1~~	~~Sht. 23~~	~~14-L~~	~~–~~	~~–~~	~~Surveyed~~	~~No Work~~
~~MCAS-422~~	~~2~~	~~Sht. 23~~	~~14-L~~	~~M~~	~~S~~	~~No. 6~~	
~~MCAS-422~~	~~7~~	~~Sht. 23~~	~~14-L~~	~~M~~	~~S~~	~~No. 6~~	
~~MCAS-422~~	~~10~~	~~Sht. 23~~	~~14-L~~	~~M~~	~~S~~	~~No. 6~~	

5 5500 6500 5 1125 6725 5 750 5750 5 375 5375

3750 Interest

TABLE 2C.4
AVAILABLE TELEPHONE CIRCUITS

AREA	FROM	TO	CABLE #	PAIR #	TERMINAL #	DISTANCE (FT
PARADISE POINT AREA	MDF	2615	22	778	71	18,805
	"	"	"	780	73	"
	2615	2602	221	77	27	665
	"	"	"	78	28	"
	"	2604	"	77	15	870
	"	"	"	78	16	"
	"	2609	"	77	2	895
	"	"	"	78	3	"
	"	2617A	"	77	6	584
	"	"	"	78	7	"
	"	2605	"	123	1	540
	"	"	"	124	2	"
	"	2607	"	123	1	765
	"	"	"	124	2	"
	"	2603	"	107	1	394
	"	"	"	108	2	"
	"	2613	"	102	1	634
	"	"	"	103	2	"
	"	2633 "	No facilities, requires new work, possibly cut into cable 22 on South Williams Boulevard.			
		S-1948 "	No facilities, requires new work, possibly cut into cable 22 on South Williams Boulevard.			
		1943 "	No facilities, requires new work, possibly cut into cable 17, Terminal 1944.			
		1915 "	No facilities, requires new work, increase count in Terminal 1900.			
U.S. NAVY HOSPITAL AREA	MDF	H-1	12	74		10,900
	"	"	"	75		"
	H-1	H-14	41	147	15	1,901
	"	"	"	143	16	"
	"	H-16	"	160	9	1,639
	"	"	"	161	10	"
		H-29	Same cable information as H-16, new work required to support building H-29, possibly cut into cable 41 on River Road.			
TARAWA TERRACE AREA	MDF	4014	17	41		30,345
	"	"	"	42		"
	4014	TT-60	212	173	8	10,037
	"	"	"	174	9	"
		TT-32	Requires all new construction			
		TT-33	Requires all new construction			
		TT-47	Requires all new construction			
		TT-43	Requires all new construction			
		TT-44	Requires all new construction			
		2475	Requires all new construction			
		2457	Requires all new construction			
		2455	Requires all new construction			
		TT-34	Requires all new construction			
		TT-36	Requires all new construction			
		TT-38	Requires all new construction			
LEJEUNE HIGH SCHOOL AREA	MDF	825	17	148	5	18,162
	"	"	"	149	6	"
	"	855	Same cable information as 825 except new work required to support building 855.			
BERKLEY MANOR ELEMENTARY SCHOOL		5400	This area served by Carolina Telephone & Telegraph Company.			

AREA	FROM	TO	CABLE #	PAIR #	TERMINAL #	DISTANCE (FT)
MIDWAY PARK AREA	MDF	4014	17	41		30,345
	"	"	"	42		"
	4014	4022	212	115	14	530
	"	"	"	116	15	"
	"	4000	"	115	14	607
	"	"	"	116	15	"
	"	4003	New construction needed to service building 4003			
	"	33	212	99	22	2,004
	"	"	"	100	23	"
	"	45	"	34	9	4,566
	"	"	"	35	10	"
		S-4005	No facilities, new construction needed			
ONSLOW BEACH AREA	MDF	BA-170	(These pairs are also used for CHB/RR areas)			
	"	"	30	52		37,588
	"	"	"	53		"
	BA-170	BA-116	303	67	5	40,987
	"	"	"	68	6	"
	"	BA-102	"	41	16	43,721
	"	"	"	42	17	"
		BA-106	No facilities (possibly increase count in Terminal BA-103 from 32-37 to 32-43 which would be same cable information as BA-102)			
AMMO DUMP AREA		SH-8	No facilities possibly new construction increase count in Terminal SH-8 from 58-63 to 52-63.			
MONTFORD POINT AREA	MDF	M-172	7	252		50,198
	"	"	"	253		"
	M-172	MDF Montford Point	6	22		9,450
	"	M-230	"	71		"
	M-230	M-200	91	32	7	4,301
	"	"	"	33	8	"
	"	M-240	"	19	14	6,491
	"	"	"	20	15	"
	"	M-231	"	19	9	5,817
	"	"	"	20	10	"
	"	M-218	"	19	9	4,948
	"	"	"	20	10	"
	"	M-216	"	19	4	4,782
	"	"	"	20	5	"
	"	M-205	"	19	4	4,955
	"	"	"	20	5	"
		M-206	Additional work required to support buildings			
		M-211	Additional work required to support buildings			
		M-212	Additional work required to support buildings			
		M-213	Additional work required to support buildings			
		M-214	Additional work required to support buildings			
		M-215	Additional work required to support buildings			
		M-217	Additional work required to support buildings			
		M-219	Additional work required to support buildings			
		M-220	Additional work required to support buildings			
		M-221	Additional work required to support buildings			
		M-222	Additional work required to support buildings			
		M-223	Additional work required to support buildings			
		M-224	Additional work required to support buildings			
		M-225	Additional work required to support buildings			
		M-226	Additional work required to support buildings			
		M-227	Additional work required to support buildings			
		M-228	Additional work required to support buildings			
		M-229	Additional work required to support buildings			
		M-232	Additional work required to support buildings			
	M-230	M-233	91	7	7	6,297
	"	"	"	13	13	"
		M-234	Additional work required to support buildings			
		M-235				
		M-236				
		SE-23	No facilities, possibly new construction from Terminal E-1.			
		M-241	No facilities, possibly new construction from Wilson Road on Cable 91.			
		S-333	No facilities, new work			
		625	No facilities, possibly new work from Terminal 622.			

AREA	FROM	TO	CABLE #	PAIR #	TERMINAL #	DISTANCE (FT)
KNOX TRAILER PARK AREA		D-24	New work required to support building			
COURTHOUSE BAY AREA	MDF	X_C244	30	52		22,057
	"	"	"	53		"
	X_C244	MDF C.H.Bay	301	23		30,421
	"	"	"	24		"
	MDF C.H.Bay	A-1	51	13	1	10,969
	"	"	"	14	2	"
	"	BB-48	52	76	1	3,584
	"	"	"	77	2	"
	"	BB-49	"	37	2	3,763
	"	"	"	38	3	"
	"	BB-14	53	51	1	
	"	"	"	54	4	
	"	BB-1	Additional work required to support building			
	"	BB-4	Additional work required to support building			
	"	BB-12	53	62	1	450
	"	"	"	63	2	"
	"	BB-13	"	62	1	1,022
	"	"	"	63	2	"
	"	BB-11	"	75	9	348
	"	"	"	76	10	"
	"	BEQ	52	1	1	2,150
	"	"	"	2	2	"
RIFLE RANGE AREA	MDF	X_C244	30	52		22,057
	"	"	"	53		"
	X_C244	MDF C.H.Bay	301	23		30,421
		"	"	24		"
	MDF C.H.Bay	RR-1	54	3		
	"	"	"	19		
	RR-1	RR-38	501	144	9	2,259
	"	"	"	145	10	"
	"	RR-52	"	144	8	1,416
	"	"	"	145	9	"
	"	RR-216	216	1	1	
	"	"	"	2	2	
	"	RR-217	"	1	1	4,472
	"	"	"	2	2	"
	"	RR-215	501	7	1	4,272
	"	"	"	8	2	"
	"	RR-212	"	26	1	4,062
	"	"	"	27	1	"
	"	RR-211	Additional work required to support building.			
	"	RR-213	Additional work required to support building			
	"	RR-222	Additional work required to support building			
GEIGER AREA	MDF	M-172	7	252		50,198
	"	"	"	253		"
	M-172	Geiger MDF	3	151		18,679
	"	"	"	152		"
		TC-633	New work required from Terminal 474			
	Geiger MDF	G-480	6	30	5	2,750
	"	"	"	31	6	"
	"	G-200	"	18	12	3,832
	"	"	"	19	13	"
	"	601	"	11	5	1,400
	"	"	"	12	6	"
	"	1500	2	251	9	4,366
	"	"	"	252	10	"
	"	CG-1	"	28	1	8,000
	"	"	"	29	2	"

AREA	FROM	TO	CABLE #	PAIR #	TERMINAL #	DISTANCE (FT
FRENCH	MDF	FC-300	32	304		9,484
CREEK	"	"	"	305		"
AREA	FC-300	FC-309	321	86	11	610
	"	"	"	87	12	"
	"	FC-303	"	86	11	889
	"	"	"	87	12	"
	"	FC-310	"	59	9	938
	"	"	"	61	11	"
	"	FC-311	"	59	2	1,268
	"	"	"	61	4	"
	"	FC-304	"	8	8	1,410
	"	"	"	9	9	"
	"	FC-260	"	8	8	2,500
	"	"	"	9	9	"
	"	FC-305	"	24	13	1,716
	"	"	"	28	17	"
	"	FC-306	"	24	2	1,891
	"	"	"	28	6	"
		FC-200	No cable available, new work required			
		FC-203	No cable available, new work required			
		FC-315	New work required from Riser Point 3.			
	FC-300	FC-400	323	102	2	3,029
	"	"	"	103	3	"
	"	FC-411	"	175	1	3,005
	"	"	"	176	2	"
	"	FC-413	"	173	11	3,448
	"	"	"	174	12	"
	"	FC-415	"	161	11	3,850
	"	"	"	162	12	"
	"	FC-420	"	1	1	5,159
	"	"	"	2	2	"
	"	FC-416	"	13	1	4,324
	"	"	"	14	2	"
	"	FC-412	"	41	5	3,726
	"	"	"	42	6	"
	"	FC-414	"	35	11	4,188
	"	"	"	36	12	"
MCAS		206	No facilities available, all circuits will have to be leased lines from Carolina Telephone & Telegraph Company.			
		211				
		212				
		213				
		214				
		215				
		216				
		217				
		230				
		426				
		619				
		850				
		902				
		1001				
		1003				
		2001				
		2808				
HADNOT PT	MDF	6	27	58	8	1,536
AREA	"	"	"	62	12	"
	"	8	"	58	8	
	"	"	"	62	12	
	"	10	"	80	15	899
	"	"	"	81	16	"
	"	12	"	80	15	
	"	"	"	81	16	
	"	101	22	297	10	
	"	"	"	301	14	
	"	105	"	297	10	
	"	"	"	301	14	
	"	109	"	283	11	3,985
	"	"	"	284	12	"

AREA	FROM	TO	CABLE #	PAIR #	TERMINAL #	DISTANCE (FT)
HADNOT PT (cont'd.)	MDF	22	283	11		
	"	"	284	12		
	"	104	No facilities available, new work required			
	"	118	22	59	9	5,349
	"	"	"	60	10	"
	"	120	"	59	9	
	"	"	"	60	10	
	"	108	No facilities available, new work required.			
	"	112	No facilities available, new work required.			
	"	124	No facilities available, new work required.			
	"	128	No facilities available, new work required.			
	"	202	22	400	12	2,450
	"	"	"	401	13	"
	"	204	"	400	12	
	"	"	"	401	13	
	"	205	"	476	2	1,755
	"	"	"	480	6	"
	"	209	"	476	2	
	"	"	"	480	6	
	"	208	No facilities available, new work required.			
	"	212	No facilities available, new work required.			
	"	213	22	465	11	2,532
	"	"	"	467	13	"
	"	217	"	465	11	
	"	"	"	467	13	
	"	226	"	350	8	3,575
	"	"	"	351	9	"
	"	220	Additional work required to support building			
	"	221	Additional work required to support building			
	"	224	Additional work required to support building			
	"	228	Additional work required to support building			
	"	308	Additional work required to support building			
	"	312	23	845	2	2,607
	"	"	"	846	3	"
	"	316	Additional work required to support building			
	"	318	23	835	7	3,111
	"	"	"	837	9	"
	"	309	"	787	20	1,864
	"	"	"	788	21	"
	"	313	Additional work required to support building			
	"	321	Additional work required to support building			
	"	323	Additional work required to support building			
	"	326	Additional work required to support building			
	"	327	23	746	19	3,154
	"	"	"	747	20	"
	"	404	"	579	14	2,256
	"	"	"	581	16	"
	"	406	Additional work required to support building			
	"	410	23	557	7	2,754
	"	"	"	561	11	"
	"	412	Additional work required to support building			
	"	420	34	232	7	5,554
	"	"	"	233	8	"
	"	422	Additional work required to support building			
	"	426	34	253	8	5,064
	"	"	"	254	9	"
	"	427	Additional work required to support building			
	"	407	23	489	5	3,327
	"	"	"	490	6	"
	"	409	Additional work required to support building			
	"	415	23	467	13	4,126
	"	"	"	469	15	"
	"	417	Additional work required to support building			
	"	502	23	201	15	3,898
	"	"	"	202	16	"

AREA	FROM	TO	CABLE #	PAIR #	TERMINAL #	DISTANCE (FT)
HADNOT PT (cont'd.)	MDF	503	Additional work required to support building			
	"	506	Additional work required to support building			
	"	507	Additional work required to support building			
	"	510	Additional work required to support building			
	"	511	23	58	3	5,069
	"	"	"	66	11	"
	"	514	23	135	4	4,659
	"	"	"	136	5	"
	"	515	Additional work required to support building			
	"	517	23	93	9	5,818
	"	"	"	94	10	"
	"	519	Additional work required to support building			
	"	523	Additional work required to support building			
	"	527	Additional work required to support building			
	"	538	23	29	4	6,562
	"	"	"	30	5	"
	"	32	No facilities available, requires new work			
	"	S-716	No facilities available, requires new work			
	"	1761	No facilities available, requires new work			
	"	1776	No facilities available, requires new work			
	"	S-46	No facilities available, requires new work			
	"	670	No facilities available, requires new work			
	"	672	No facilities available, requires new work			
	"	40	No facilities available, requires new work			
	"	PT-41	No facilities available, requires new work			
	"	730	No facilities available, requires new work			
	"	S-47	No facilities available, requires new work			
	"	S-47A	No facilities available, requires new work			
	"	S-34	No facilities available, requires new work			
	"	803	No facilities available, requires new work			
	"	S-96	28	107	6	2,650
	"	"	"	108	7	"
	"	S-86	28	128	9	2,061
	"	"	"	129	10	"
	"	85	No facilities available, requires new work			
	"	"	No facilities available, requires new work			
	"	BEQ1106/1107	No facilities available, requires new work			
	"	BEQ1309/1310	No facilities available, requires new work			
	"	738	No facilities available, requires new work			

APPLICATION FOR FREQUENCY ALLOCATION	CLASSIFICATION	Page 1 of 2 Pages	Form Approved: Bureau Budget No. 22-R248
TO:	FROM (Office making request):		

EQUIPMENT NOMENCLATURE AND/OR MODEL NUMBER

STATUS OF ALLOCATION REQUEST *(Check one)*

☐ EXPERIMENTAL RESEARCH OR EXPLORATORY DEVELOPMENT ☐ ADVANCED OR ENGINEERING DEVELOPMENT ☐ OPERATIONAL

1. EQUIPMENT USAGE

a. FUNCTION AND PURPOSE

b. METHOD OF OPERATION

c. EXTENT OF USE

d. OPERATIONAL ENVIRONMENT

e. GEOGRAPHICAL AREA OF EXPERIMENTAL RESEARCH, OR DEVELOPMENTAL EVALUATION

f. GEOGRAPHICAL AREA OF OPERATIONAL USE

g. NUMBER OF EQUIPMENTS IN INITIAL PHASE

h. NUMBER OF THESE EQUIPMENTS PLANNED FOR OPERATIONAL USE

i. NUMBER OF THESE EQUIPMENTS OPERATING SIMULTANEOUSLY IN THE SAME ENVIRONMENT

j. TARGET DATE FOR THE START AND END OF EXPERIMENTAL OR DEVELOPMENTAL EVALUATION

k. TARGET DATE FOR OPERATIONAL USE

l. PREVIOUS J/F 12 APPLICATION NUMBER TO BE

☐ CONTINUED UNCHANGED *(See Remarks)* ☐ SUPERSEDED ☐ RELATED ☐ NONE J/F 12/ ______

m. SYSTEM NOMENCLATURE

2. EQUIPMENT CHARACTERISTICS

a. TRANSMITTER	b. RECEIVER	PECULIAR TO XMTR	INTEGRAL TO XMTR
(1) NOMENCLATURE	(1) NOMENCLATURE		
(2) INSTALLATION	(2) INSTALLATION		
(3) ACTUAL TUNING RANGE	(3) ACTUAL TUNING RANGE		
(4) METHOD OF TUNING	(4) METHOD OF TUNING		
(5) CHANNELING CAPABILITY	(5) CHANNELING CAPABILITY		
(6) FREQUENCY CONTROL	(6) FREQUENCY CONTROL		
(7) STABILITY IN PARTS PER MILLION	(7) STABILITY IN PARTS PER MILLION		
(8) TYPE EMISSION	(8) EMISSION RECEPTION CAPABILITY		

NAME OF PROJECT ENGINEER	TELEPHONE NUMBER	CLASSIFICATION
		GP ______

APPLICATION FOR FREQUENCY ALLOCATION

CLASSIFICATION

a. TRANSMITTER (Cont.)

(9) EMISSION BANDWIDTH

(a) -3db

(b) -20db

(c) -60db

(d) OCCUPIED BANDWIDTH

(e) FILTER EMPLOYED ☐ YES ☐ NO TYPE

(10) POWER OUTPUT IN KW

(a) AVE

(b) PEAK

(c) PEP

(11) MODULATION AND/OR CODING

(12)

(a) PULSE RATE

(b) PULSE WIDTH

(c) RISE TIME

(d) FALL TIME

(13) OUTPUT TUBE OR DEVICE

OPERATION

(14) HARMONIC ATTENUATION IN - DB

(15) SPURIOUS ATTENUATION IN - DB

b. RECEIVER (Cont.)

(9) RF BANDWIDTH

(a) -3db

(b) -20db

(c) -60db

PRESELECTION

(10) IF BANDWIDTH

1st 2nd 3rd

(a) -3db

(b) -20db

(c) -60db

(11) POST DETECTION BANDWIDTH

(a) -3db

(b) -20db

(c) -60db

(d) BANDWIDTH CONTROL RANGE

(12) SENSITIVITY IN - DBM

(13) IF FREQUENCY

(a) 1st

(b) 2nd ☐ NA

(c) 3rd ☐ NA

(d) TRF OR HOMODYNE ☐

(14) LOCAL OSCILLATOR

FREQUENCY RANGE: (a) 1st

(b) 2nd ☐ NA

(c) 3rd ☐ NA

(d) NORMALLY TUNED:

☐ 1st ABOVE fo ☐ BELOW fo

☐ 2nd ABOVE fo ☐ BELOW fo ☐ NA

☐ 3rd ABOVE fo ☐ BELOW fo ☐ NA

(e) ADJUSTABLE ABOVE OR BELOW fo:

1st ☐ YES ☐ NO

2nd ☐ YES ☐ NO ☐ NA

3rd ☐ YES ☐ NO ☐ NA

(15) IMAGE RESPONSE IN - DB

(16) SPURIOUS RESPONSE IN - DB

3. ANTENNA

a. TRANSMITTING

(1) DESCRIPTION

(2) POLARIZATION

(3) SCAN

(4) GAIN

(5) BEAM WIDTH

AZ

EL

b. RECEIVING

(1) DESCRIPTION

(2) POLARIZATION

(3) SCAN

(4) GAIN

(5) BEAM WIDTH

AZ

EL

4. SPECTRUM SIGNATURE REQUIREMENTS AND EQUIPMENT SPECIFICATIONS

a. IS AN ECP SPECTRUM SIGNATURE BEING SCHEDULED FOR THIS EQUIPMENT IN ACCORDANCE WITH MEASUREMENT PROCEDURES DESCRIBED IN MIL-STD-449 ( )? ☐ YES ☐ NO

b. DESCRIBE BRIEFLY ANY OTHER MEASURED DATA BEING OBTAINED IN LIEU OF OR IN ADDITION TO PROCEDURES SET FORTH IN MIL-STD-449 ( )

c. EQUIPMENT SPECIFICATION NUMBER(S)

d. APPLICABLE SERVICE CONTRACT NUMBERS (Where available)

5. REMARKS

DOWNGRADING CODE

GROUP

CLASSIFICATION

DD FORM 1 FEB 68 1494

DETACH INSTRUCTION SHEET PRIOR TO SUBMISSION OF APPLICATION

INSTRUCTIONS FOR COMPLETING APPLICATION FORM *(PAGE 1)*

Type in classification and downgrading stamp and insert nomenclature and equipment type, e.g., AN/FPS-16 Instrumentation Radar. Indicate by check mark whether for Experimental Research or Exploratory Development, Advanced or Engineering Development, or Operational. The classification of the title will be appropriately indicated – e.g., (U), (C), (S). Classified information contained in the completed form will be indicated either as a general statement in the Remarks paragraph such as, " The purpose, functions, operational use, frequency band, emission bandwidths, and power are classified ______________," or by an enumeration of the applicable paragraphs and subparagraphs with their classification, or the classification may be marked alongside each entry on the form.

EXPERIMENTAL RESEARCH OR EXPLORATORY DEVELOPMENT

a. To test the feasibility of new techniques or concepts of natural phenomena and environment and efforts towards solution of problems in the physical behavioral and social sciences that have no direct military application.

b. To test the feasibility of adapting conventional techniques to new purposes prior to projection into development planning. Includes all effort directed toward solution of specific military problems, short or major development projects.

ADVANCED OR ENGINEERING DEVELOPMENT

a. To develop equipments which have moved into the development of hardware for experimental or operational test.

b. To modify existing operational equipments for improved performance.

c. To develop programs being engineered for service use but which have not yet been approved for production and service deployment.

d. To continue development of equipment/systems that have been approved for production and service use.

OPERATIONAL

To operate and test equipments which have passed the development phase and are planned for operational use for:

(1) Tactical and training purposes.

(2) Non-tactical purposes, such as for test range instrumentation purposes.

1.a. Describe the function and purpose to be performed as specifically as possible. For example: Guided Missile Control Radar; Troposcatter Communications equipment; provides acquisition and tracking information ; short range communications; telemetering for quality control.

1.b. Describe the method of operation. For example: Radar activates beacon transponder in missile with coded pulses. Beacon provides missile track. Radar also transmits coded pulse command signals to missile beacon receiver for guidance.

1.c. Describe operational extent of usage. For example: Continuous or intermittent – expected duty cycle during mission, expected number of hours of operation per day or other appropriate time period. Indicate any conditions governing intermittent use. When appropriate, describe mission phase during which system operates.

1.d. Give brief description of ultimate operational environment. For example: Amphibious landing operations; defense of strategic target area, sea areas; field army. Provide any additional environment factors pertinent to a meaningful assessment of electromagnetic compatibility, such as: specific vehicle/platform types, expected mobility, or other factors affecting the environment variability.

1.e. & 1.f. State geographical point or area of use for each phase from experimental, through development to operational use. For Example: Gilfillan Plant, Los Angeles, during experimental phase; White Sands Proving Grounds, New Mexico, during developmental evaluation; and sea areas world-wide for operational use.

1.g. List number of equipments planned for experimental or developmental phase.

1.h. List number of equipments planned for operational use.

1.i. Indicate maximum number of these equipments which will be operating simultaneously in the same environment. For example: 3 missiles will be flown simultaneously in an operating area.

1.j. Indicate the dates on which it is expected that experimental or developmental phase will start and finish.

1.k. Indicate target date for operational use as defined in Paragraph 1.d.

1.l. Indicate previous J/F 12 application number which is unchanged; superseded, or related application. Check appropriate box and enter J/F 12/ number if required. Amplify changes and/or modifications in Paragraph 5,Remarks.

1.m. Identify any known system or major sub-system of which this equipment is a component thereof or used therewith. For example: AN/ARC-27 part of AN/ASQ-17 system.

2.a.(1) 2.b.(1) List Joint Equipment nomenclature if assigned or manufacturer's model number for both transmitter and receiver and indicate if receiver is integral with or peculiar to transmitter by inserting yes or no.

2.a.(2) 2.b.(2) List specific type of vehicle, ship or place where system will be installed. For example: Fixed ground at Air Defense Command*(ADC)* sites *(list sites)*, mobile shipborne on DD and CLG classes, vehicular, mobile tactical command net at battalion level.

2.a.(3) 2.b.(3) List actual frequency band through which the transmitter and/or receiver have tuning capabilities.

2.a.(4) 2.b.(4) Indicate method of tuning. For example: Continuous, fixed tuned, crystal synthesizer, etc.

2.a.(5) 2.b.(5) Indicate channeling capability. For example: Frequency of first channel and channel spacing *(225.1 MHz, 100 kHz increments)*. If equipment does not have channeling capability, indicate "None".

2.a.(6) 2.b.(6) List type of frequency control. For example: Crystal automatic frequency control *(AFC)* or tunable magnetron type 5J26.

2.a.(7) 2.b.(7) Indicate long-term frequency stability of transmitter and receiver under normal operating conditions in parts per million and the time duration for which it applies. For example: 5 parts per million after 24 hours warmup.

2.a.(8) 2.b.(8) List all appropriate types of emission, including necessary bandwidth, if known, such as 3A7j for data, 16F3 for voice, 1000 P9 for pulse compression, and 0.01 A0 for Continuous Wave *(no modulation)*.

2.a.(9) List the emission bandwidth for specified power level points, preferably at –3db, –20db and –60db. The emission bandwidth is defined as that appearing at the antenna terminals and includes any significant attenuation contributed by any form of filtering in the output circuit or transmission line. List the occupied bandwidth. The occupied bandwidth is defined as the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5% of the total mean power radiated.

Calculated values of emission bandwidth and occupied bandwidth should be so indicated and will be accepted only if measured data are unobtainable.

Indicate if some form of filtering is used and, if used, the type employed.

2.b.(9) List the RF bandwidth, at –3db, –20db and –60db points state the type of pre-selection used, if any. For example: Fixed filter or tuned RF stage.

PERMISSIBLE ABBREVIATIONS

cycles per second	: Hz	Megawatt	: MW
kilocycles per second	: kHz	microsecond	: usec
Megacycles per second	: MHz	decibel	: db
Gigacycles per second	: GHz	unknown	: unk
milliwatt	: milli W	Not applicable	: NA
Watt	: W	Not available	: N Avail
kilowatt	: kW	pulses per second	: pps
		parts per million	: ppm

INSTRUCTIONS FOR COMPLETING APPLICATION FORM *(PAGE 2)*

2.a.(10) List power applied to the antenna in kilowatts. Use peak power in the case of pulse emission, peak envelope power in cases of single side band, and average power for all others.

2.b.(10) List the IF bandwidth at −3db, −20db and −60db points for each IF amplifier.

2.a.(11) Describe in detail the modulation and/or coding techniques employed. Include modulation index, pulse compression ratio, etc., as appropriate.

2.b.(11) If Post detection filtering is incorporated in the receiver, list the Post Detection Bandwidth at −3db, −20db and −60db points.

If the bandwidth is variable, specify nominal bandwidth control ranges.

2.a.(12) Specify standard Pulse Repetition Rate *(PRR)* and pulse width combinations and functions *(such as search, track, etc.)* associated with these combinations. Specify width at half voltage points unless otherwise specified. For example: 0.2-1.0 microseconds. Rise and Fall time of pulse should also be indicated. Pulse rate should be stated in pulses per second.

2.b.(12) List the minimum signal level in −dbm required at the receiver input for acceptable or standard output signal. Specify criteria used. For example: −100 dbm for a 6db S/N ratio, −110dbm for a 20db quieting.

2.a.(13) List output tube or device and class of operation. For example: WL 480 operated Class C.

2.b.(13) List the frequency or frequencies of the I.F. amplifier or amplifiers. If Homodyne or TRF, so indicate.

2.b.(14) Where local oscillator is tunable, give the actual frequency range. Indicate specifically whether normally tuned above or below operating or tuned frequency, fo. State whether local oscillator can be adjusted for operation either above or below operating or tuned frequency, fo. Indicate cross-over point where applicable.

2.a.(14) & 15
2.b.(15) & 16 Indicate levels of: (1) harmonic attenuation, (2) spurious attenuation, (3) image response, (4) spurious response. For example: (1) harmonic attenuation: 60db minimum.

3.a.(1)
3.b.(1) Indicate whether antenna is same for transmitter and receiver, give type of antenna. Describe antenna. For example: 8 foot parabolic reflector with horn feed, quarter wave stub, phase array, etc. If available, give pattern data indicating maximum side lobe and back lobe levels. If available, give data on wave-guide type number.

3.a.(2)
3.b.(2) Indicate whether horizontal, vertical, linear, or other polarization. If circular, indicate left or right hand polarization.

3.a.(3)
3.b.(3) Indicate whether antenna is fixed, directional, or scans horizontally or vertically, and rate and extent of scan. Indicate range of scan rate, if variable. For example: Horizontal Scan 360° from 4 to 15 R.P.M.: Vertical Scan 0° to 40°; Sector Scan 30°.

3.a.(4)
3.b.(4) Indicate maximum antenna gain in db relative to isotropic.

3.a.(5)
3.b.(5) Indicate the beamwidth for azimuth and elevation included between half power points in degrees. For example: AZ: 13°, EL 3°. Also indicate any known beam shaping, such as, cosecant squared in elevation from + 3° to + 30°.

4. The term ECP spectrum signature refers to Electromagnetic Compatibility Program spectrum signature taken in accordance with MIL-STD-449 ( ) and amendments thereto. State specification and contract numbers, if available.

5. Under "REMARKS," it is intended that the applicant give full consideration to the circumstances under which the proposed system or equipment will be operated *(operational environment)*. If known, include information as to the other equipments and systems which must be accommodated for simultaneous operation in the same general frequency range and geographical area. There should be indicated, to the extent possible, any limitations which it is believed necessary to impose on present operations in order to avoid interference between present equipments and the proposed equipment. Add any information which is believed will assist in evaluating the probability of interference between the proposed operation and operations present and planned, such as any known minimum frequency and distance separations which will permit compatible frequency assignments with like or other equipments. Attach curves based on tests or theory, or include any other means of justification. If available, information is requested regarding interference criteria *(or acceptance criteria)* indicating relative db needed *(S/I ratio or S+I ratio)* for satisfactory operation when interfering systems have conventional modulation and emission bandwidth characteristics. Also any available information on performance degradation criteria is desirable *(such as no more than 1% message loss acceptable)*. Include security classification information required by page 1 of instruction sheet.

PERMISSIBLE ABBREVIATIONS

cycles per second	: Hz	Megawatt	: MW
kilocycles per second	: kHz	microsecond	: usec
Megacycles per second	: MHz	decibel	: db
Gigacycles per second	: GHz	unknown	: unk
milliwatt	: milli W	Not applicable	: NA
Watt	: W	Not available	: N Avail
kilowatt	: kW	pulses per second	: pps
		parts per million	: ppm

C-24160

DIVISION 3 GUIDELINES FOR TECHNICAL PROPOSAL DATA

Section 3A. General
3B. Equipment
3C. Systems Design
3D. Management and Organization

SECTION 3A GENERAL

3A.1 Purpose. This division provides the prospective proposers with general guidelines for the desired technical and management details which the Government desires to be included in the Step One technical proposal document. It is intended to supplement the applicable sections of Division 1 and 2. It is requested that the Government's specifications not be repeated back to the Government in the proposals.

SECTION 3B EQUIPMENT

3B.1 Design. It is not the intent of Division 2 to require newly designed equipment per se. What actually is desired is a complete and competent systems engineering effort to provide a design which operates utilizing leading manufacturers' latest and standardized line of equipment. Where newly designed "one of a kind" items are required specific mention of this fact must be made in the proposal.

3B.2 Options. As most systems of the type envisioned have numerous options, i.e., alarm sytems, graphic displays, CRT's, teletypes, etc., these options should be presented. However, the desired system is the most cost-effective system.

3B.3 Combination Manufacturers. Where major components or sub-systems are the product of different manufacturers, full and complete manufacturers' data should be submitted.

3B.4 Applications Software. Proposers are reminded that proof of existence of the required applications software is required. ~~Submit names, addresses, and telephone numbers of users of these software packages.~~ This proof may be in the form of the manufacturer's literature describing the program and its capabilities.

SECTION 28 SYSTEMS

28.1 Design. It is the intent of the [illegible] new, standard equipment [illegible] and competent systems engineering [illegible] of equipment [illegible] specific mention of this fact must be made in [illegible]

28.2 Options. [illegible] options, [illegible] etc. These options should be [illegible] a cost-effective system.

28.3 [illegible] such systems are the product of different manufacturers. Full [illegible]

28.4 Publications [illegible]

[illegible]

SECTION 3C SYSTEMS DESIGN

3C.1 Systems Approach. The system, as specified herein, is a complex one. Its future growth must be anticipated in the initial installation. Specific information is therefore required in the proposals which indicates the proposer's competence in performing this system's integration task. If multiple systems approaches are envisioned, multiple proposals should be submitted.

3C.2 Communications Subsystem. The communications subsystem will be the heart of this initial effort. The proposers shall include in their proposals sufficient details that indicate:

a) How the proposer plans to approach the technical problems.

b) Types of systems that could be used with his equipment.

c) Initial recommendations and justification of his solution for the communications subsystem.

3C.3 Additional Required Data. In any engineering effort it is desirable to have all the answers and volumes of data. However, this never occurs in reality. Thus it is requested the proposers indicate in their proposal additional data they desire that would facilitate the design and provide a more realistic bid required in Step Two of this offering. This is not to imply that all desired data will be provided before Step Two; however, it will help identify common areas of concern among proposers for which some answers may be generated.

SECTION 9.0 SYSTEMS DESIGN

9.1 [illegible] [illegible] specifications [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] programs [illegible] which [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]

[illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]

a) How [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] technical [illegible]

9.2 Types of [illegible] [illegible] [illegible] [illegible] with [illegible] [illegible]

[illegible] [illegible]

SECTION 3D MANAGEMENT AND ORGANIZATION

3D.1 Organizational Charts. Furnish a proposed organization chart for the design and installation services for this program. Show the lines of authority and furnish a narrative statement describing just how the organization will function. Designate the individual who will be authorized to speak for your firm in contacts with the Government Project Manager. Show the names of all personnel proposed for key positions and provide a summary of the education and experience record of each such team member. The experience record should show clearly the actual work performed by the individual, the period of such performance and the degree of responsibility therefor, rather than general statements of employment history as ordinarily appear in brochures.

3D.2 Facilities Where Work Will Be Performed. It is contemplated that the design work described herein will be performed in home office type company facilities. It is requested that all of this work be performed in one central work area to facilitate the proper coordination of each detail thereof. State in the proposal the location of the office in which the design work for this project will be performed.

3D.3 Classified Information. No classified information will need to be provided to or received from the Contractor. However, the Contractor shall treat data received from the Government such as Base Annual Condition Maps, etc. as "For Official Use Only."

3D.4 Similar Work. Furnish a summary of your firm's experience or similar work which you believe provides background experience and qualification for the work described herein and indicate whether you were a prime or subcontractor. Provide names of these projects, location of work, name of person or firm for whom the work was performed, estimated or actual construction cost, and brief description of each project. Clearly indicate the extent to which your firm and personnel proposed for our project actually participated in the design and installation of the projects you describe.

3D.5 Subcontracting. Provide a detailed statement as to the percentage and nature of subcontracting of services and equipment manufacturing you contemplate for this project. If subcontracting is to be used give scope of services to be subcontracted and names and locations of firms.

3D.6 Time Frame. The proposers Under step I, shall provide in their proposals an estimated schedule for completion of the work described herein. The schedule will show appropiate milestones and include but not be limited to the following:

a) Design phase

1) Central Control Subsystem

2) Communications Subsystem

3) Field Sensor Subsystem

b) Manufacturing phase

1) Central Control Subsystem

2) Communications Subsystem

3) Field Sensor Subsystem

c) Installation phase

1) Central Control Subsystem

2) Communications Subsystem

3) Field Sensor Subsystem

d) Software preparation

e) Operations and Maintenance Manual Preparation

f) Testing and Checkout Phase

SUPERSEDEAS DECISION

STATE: North Carolina COUNTIES: See below*
DECISION NUMBER: NC76-1019 DATE: Date of Publication
Supersedes Decision No.: NC75-1116 dated December 29, 1975 in 40 FR 59685
DESCRIPTION OF WORK: Building Construction (excluding single family homes and garden type apartments up to and including 4 stories).

*Counties:
Carteret, Craven, Jones, Lenior, Onslow, and Pamlico

	Basic Hourly Rates	Fringe Benefits Payments			
		H & W	Pensions	Vacation	Education and/or Appr. Tr.
Bricklayers	5.50				
Carpenters	4.50				
Cement masons	4.23				
Electricians	4.33				
Glaziers	3.55				
Ironworkers:					
Structural	4.75				
Reinforcing	4.25				
Laborers:					
Laborers	2.50				
Air tool operators	2.60				
Mason tenders	3.00				
Mortar mixers	3.00				
Pipelayers	4.35				
Plasterers' tenders	3.50				
Painters, brush	3.00				
Plasterers	6.00				
Plumbers & Steamfitters	5.51				
Roofers	2.90				
Sheet metal workers	3.88				
Sprinkler fitters	6.25				
Soft floor layers	5.10				
Tile setters	6.00				
Truck drivers	2.50				
Welders - rate for craft					
POWER EQUIPMENT OPERATORS:					
Backhoes	4.50				
Motor graders	4.00				
Rollers	5.00				
Tractors	3.00				

NAVFAC
SPECIFICATION
NO. 05-75-5437
AMENDMENT NO. 6

TWO-STEP FORMAL ADVERTISING (TURNKEY)
UTILITY CONTROL SYSTEM, FIRST INCREMENT

at the

MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

DIVISION 1. GENERAL REQUIREMENTS

SECTION 1C. PROPOSALS

1C.8 Time for review and acceptance by the Government of Technical Proposals.

1C.8.2 Step II. Delete the first sentence of this subparagraph in its entirety and substitute the following therefor: "Proposers who are advised that their technical proposals are acceptable under Step I shall have until 2:00 P.M. (Local Time) 22 October 1976 to submit their lump sum price with guaranty bond and fully executed Standard Form 19B."

DIVISION 2. DESIGN, INSTALLATION, TESTING AND DOCUMENTATION REQUIREMENTS

SECTION 2B. SYSTEM FUNCTIONAL REQUIREMENTS FOR CENTRALIZED AND TRANSMISSION SYSTEMS

2B.1 Conceptual System Configuration.

2B.1.1 Remote Station Unit (RSU). Where reference is made to this subparagraph by Amendment No. 5, change "Remove Station Unit (RSU)." to "Remote Station Unit (RSU)."

2B.1.4 Central Control Equipment (CCE)

2B.1.4.4 Computer System. Delete the second sentence of this subparagraph in its entirety and substitute the following therefor: "The computer shall be of a commercially available type which has been in manufacture for at least one year prior to 22 October 1976."

2B.1.4.4.4 Main Memory. In the second line, change "240 kilo bytes" to "128 kilo bytes".

2B.2 Equipment Requirements.

2B.2.3 Power Requirements. Delete this subparagraph in its entirety and substitute the following therefor:

"2B.2.3X Power Requirements.

2B.2.3X.1 Central Control Equipment shall be powered by 120/208 volt 60 Hertz. An uninterruptible power supply (UPS) shall be provided that is capable of the following minimum requirements:

(a) It shall have sufficient capacity to print out normal alarm and point status information for a period of four hours.

(b) Utilize lead-calcium wet cell batteries.

(c) Maintain a float charge between 2.20 and 2.25 volts dc per cell.

(d) Include all racks and necessary interconnecting cabling to the Central Control Equipment.

(e) Low battery lamp and print out shall be provided that indicates discharge to a certain fixed voltage level before causing inverter shutdown.

(f) Restoration of normal power to the system shall not cause unnecessary alarms.

(g) Include a voltmeter to monitor battery voltage.

(h) Include a voltmeter to monitor AC voltage from both the inverter output and the input line voltage.

(i) Include a by-pass switch that automatically transfers the critical load to the AC line if a failure occurs within the UPS. The transfer shall cause no interruption in power to the load.

(j) Include an alarm lamp that indicates that the UPS has failed and the critical load is transferred to by-pass or when manually transferred to by-pass.

2B.2.3X.2 Remote Station Unit shall be powered by 120 or 208 volt 60 Hertz. Only those RSU's provided in the Boiler Plants shall be equipped with battery backup capability as herein specified. All other RSU's shall have the capability of adding battery backup without altering the basic RSU.

(a) Maintain alarm and system status indication back to the CCE during a commercial power outage for a minimum of four hours.

(b) Utilize nickel-cadmium battery with trickle-charge adequate to maintain them fully charged under all conditions of normal operation. They shall be protected from injury due to an excessive rate of charge or to the reversal or interruption of supply current. The battery shall be protected

by over current devices having a rating of not less than 150 percent and not more than 200 percent of the maximum operating load applied to the battery."

2B.3 U. L. Approval for Fire Reporting Signalling Systems. Delete this paragraph in its entirety.

NOTICE

Each proposer shall refer in his proposal to all amendments to this specification; failure to do so may constitute an informality in the proposal.

Atlantic Division, Naval Facilities Engineering Command
Naval Station, Norfolk, Virginia 23511
28 September 1976

C. C. HEID, RADM, CEC, USN
Contracting Officer

NAVFAC
SPECIFICATION
NO. 05-75-5437
AMENDMENT NO. 5

TWO-STEP FORMAL ADVERTISING (TURNKEY)
UTILITY CONTROL SYSTEM, FIRST INCREMENT

at the

MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

DIVISION 1. GENERAL REQUIREMENTS

FILE COPY

SECTION 1C. PROPOSALS

1C.2 Contents of proposals.

(b) Step II

(1) The lump sum price.....Immediately following the first sentence, delete the following sentence which was added by Amendment No. 1: "Bids must be submitted on both items." Delete subparagraphs "a" and "b" which were added by Amendment No. 1.

1C.8 Time for review and acceptance by the Government of Technical Proposals.

1C.8.2 Step II. In the third line change "23 September 1976" to "15 October 1976".

DIVISION 2. DESIGN, INSTALLATION, TESTING AND DOCUMENTATION REQUIREMENTS

SECTION 2A. DESIGN CRITERIA

2A.3 Products. Immediately following the last sentence, add the following: "Within 270 days of award of contract, Contractor shall provide a schedule of prices for at least two forms of maintenance provisions: Full and Partial Maintenance."

SECTION 2B. SYSTEM FUNCTIONAL REQUIREMENTS FOR CENTRALIZED AND TRANSMISSION SYSTEMS

2B.1 Conceptual System Configuration.

2B.1.1 Remove Station Unit (RSU). In the 11th line, immediately following "circuitry.", insert the following: "Overall accuracy shall be assured through the use of eight bit (minimum) analog to digital converters."

2B.1.2 Data Link Type A (DL-A). At the end of this subparagraph, add the following:

"2B.1.2.1 Reduced Data Rate. DL-A may be less than 4800 Baud only on specific approval of the government at the time of engineering drawing approval. Contractor must show that any reduced transmission rates on DL-A's will still meet all other sections of this specification.

2B.1.2.2 Error Detection and Retransmission. A message on DL-A is in error if one bit is received incorrectly. Furnish error detection that will detect any error of only 1 bit. All messages with detected errors must be retransmitted. The system shall maintain a count of the number of retransmitted messages on a line by line basis.

2B.1.2.3 Error Rate. Include at engineering drawing submittal a statistical analysis showing the expected ratio of undetected errors to detected errors for each type of DL-A. The total system error rate shall be less than six (6) undetected errors per year. The undetected error rate is estimated using the number of detected errors and the expected ratio of undetected errors to detected errors.

2B.1.2.4 Forced Errors. Provide a means of forcing errors in each DL-A so that the error detection and counting may be verified. This may be on a per unit basis or a single item of ancillary equipment."

2B.1.4.2 Control Terminal/Console. At the top of Page No. 30 change the phrase "In addition, provisions shall be made to the console to provide:" to read: "In addition, provide:". At the end of this subparagraph, add the following:

"d) A CRT terminal with the capacity of at least 960 characters in the display. This terminal shall operate at least 2 speeds, one of which shall be 2400 baud or greater and the other shall be the same as the printing terminals. This terminal must be plug compatable with both printing terminals."

2B.1.4.3 Terminal Features - At the end of this subparagraph, add the following:

"2B.1.4.3.4 Message Size. Alarm, Status and Totalization messages shall be capable of being at least 64 characters in length."

2B.1.4.4 Computer System. At the end of this subparagraph, add the following:

"2B.1.4.4.4 Main Memory. The computer shall be capable of expansion of main memory to at least 240 kilo bytes without discarding or changing any portion of the computer.

2B.1.4.4.5 Mass Storage. Provide on line, random access mass storage for the computer system in the form of 2 identical removable media devices with a minimum capacity of 2 megabytes each. Provide four (4) such removable items.

2B.1.4.4.6 High Level Language. Provide a compiler and run time system to impliment American National Standard X3.9-1966 Fortran. Implimentations of the draft standard X3J3/76 may be furnished upon specific approval by the government."

SECTION 2C. SYSTEM FUNCTIONAL REQUIREMENTS FOR FIELD MOUNTED SENSORS

2C.1 Building Air Conditioning and Heating Systems.

2C.1.2 Detail Requirements.

2C.1.2.2 Outdoor Temperature Sensor. At the end of this subparagraph add the following: "Only one such sensor shall be provided."

2C.1.2.3 Heating/Air Conditioning Monitors. Delete the first sentence in its entirety and substitute the following therefor: "Interface the existing building heating and air conditioning systems to provide outputs which indicate that the systems are actually operating."

2C.3 Steam Boiler Plants.

2C.3.2 Detail Requirements. Omit the period at the end of the last sentence and add "and this redundancy is not a requirement.".

2C.6 Field Communications Systems.

2C.6.2 Outside Signal Cables. At the end of this subparagraph, add the following: "No aerial cable runs shall be permitted."

SECTION 2E. TESTING AND TRAINING REQUIREMENTS

2E.1 Test Plan. In the second line change "10 sets" to "5 sets". In the fifth line change "Deproducibles" to "Reproducibles". At the end of this paragraph, add the following: "Test plan shall include but not be limited to all items of this specification which are applicable to the system provided."

SECTION 2F. DOCUMENTATION REQUIREMENTS - At the end of this section, add the following:

2F.8 Design Review. The successful proposer shall convene two design review meetings for government review at the location in which the design work for this project is being performed. They shall be within 40 and 80 days of contract award. Notification shall be given two weeks in advance of each meeting. Notification shall be to: Design Division Code 404, Naval Facilities Engineering Command, U. S. Naval Station, Norfolk, Virginia 23511."

NOTICE

Each proposer shall refer in his proposal to all amendments to this specification; failure to do so may constitute an informality in the proposal.

Atlantic Division, Naval Facilities Engineering Command
Naval Station, Norfolk, Virginia 23511
2 September 1976

C. C. HEID, RADM, CEC, USN
Contracting Officer

N62470-75-B-5437

NAVFAC SPECIFICATION

No. 05-75-5437

AMENDMENT NO. 2

IMPORTANT

THIS AMENDMENT SHOULD BE ACKNOWLEDGED WHEN YOUR PROPOSAL IS SUBMITTED. FAILURE TO ACKNOWLEDGE THE AMENDMENT MAY CONSTITUTE GROUNDS FOR REJECTION OF THE PROPOSAL.

IF YOUR PROPOSAL HAS BEEN SUBMITTED PRIOR TO THE RECEIPT OF THIS AMENDMENT, ACKNOWLEDGMENT SHOULD BE MADE BY TELEGRAM, WHICH SHOULD STATE WHETHER THE PRICE CONTAINED IN YOUR PROPOSAL IS TO REMAIN UNCHANGED, IS TO BE DECREASED BY AN AMOUNT, OR IS TO BE INCREASED BY AN AMOUNT. THE ACKNOWLEDGMENT MUST BE RECEIVED PRIOR TO TIME SPECIFIED FOR RECEIPT OF PROPOSALS.

NAVFAC
SPECIFICATION
NO. 05-75-5437
AMENDMENT NO. 2

TWO-STEP FORMAL ADVERTISING (TURNKEY)
UTILITY CONTROL SYSTEM, FIRST INCREMENT

at the

MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

DIVISION 2. DESIGN, INSTALLATION, TESTING AND DOCUMENTATION REQUIREMENTS

SECTION 2G. FIGURES, TABLES & FORMS

On Page No. 48, TABLE 2C.1 BUILDINGS DESCRIPTIVE DATA, delete from list Building Number's M-211 through M-229 and M-232 through M-236 inclusively.

On Page No. 51, TABLE 2G.3 STEAM BOILER PLANT DATA, delete from the list Building No. MCAS-422, Boilers 1, 2, 7, and 10 inclusively.

NOTICE

Each proposer shall refer in his proposal to all amendments to this specification; failure to do so may constitute an informality in the proposal.

Atlantic Division, Naval Facilities Engineering Command
Naval Station, Norfolk, Virginia 23511
14 July 1976

C. C. HEID, RADM, CEC, USN
Contracting Officer

N62470-75-B-5437

NAVFAC SPECIFICATION

No. 05-75-5437
AMENDMENT NO. 1

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N62470-75-B-5437

NAVFAC
SPECIFICATION
NO. 05-75-5437
AMENDMENT NO. 1

TWO-STEP FORMAL ADVERTISING (TURNKEY)
UTILITY CONTROL SYSTEM, FIRST INCREMENT

at the

MARINE CORPS BASE
CAMP LEJUENE, NORTH CAROLINA

DIVISION 1. GENERAL REQUIREMENTS

SECTION 1B. GENERAL PARAGRAPHS

1B.4 Form of Contract.

Delete Clause 102 of the General Provisions and substitute the following therefor:

"102. AFFIRMATIVE ACTION FOR HANDICAPPED WORKERS (MAY 1976)

(A) The Contractor will not discriminate against any employee or applicant for employment because of physical or mental handicap in regard to any position for which the employee or applicant for employment is qualified. The Contractor agrees to take affirmative action to employ, advance in employment and otherwise treat qualified handicapped individuals without discrimination based upon either physical or mental handicap in all employment practices such as the following: Employment, Upgrading, Demotion or Transfer, Recruitment, Advertising, Layoff or Termination, Rates of Pay or other forms of compensation, and selection for training, including apprenticeship.

(B) The Contractor agrees to comply with the rules, regulations, and relevant orders of the Secretary of Labor issued pursuant to the Act.

(C) In the event of the Contractor's noncompliance with the requirements of this clause, action for noncompliance may be taken in accordance with the rules, regulations, and relevant orders of the Secretary of Labor issued pursuant to the Act.

(D) The Contractor agrees to post in conspicious places, available to employees and applicants for employment, notices in a form to be prescribed by the director, provided by or through the Contracting Officer. Such notices shall state the Contractor's obligation under the law to take affirmative action to employ and advance in employment qualified handicapped employees and applicants for employment, and the rights of applicants and employees.

(E) The Contractor will notify each labor union or representative of workers with which it has a collective bargaining agreement or other contract understanding, that the Contractor is bound by the terms of Section 503 of the Rehabilitation Act of 1973, and is committed to take affirmative action to employ and advance in employment physically and mentally handicapped individuals.

(F) The Contractor will include the provisions of this clause in every subcontract or purchase order of $2,500 or more unless exempted by rules, regulations, or orders of the Secretary issued pursuant to Section 503 of the Act, so that such provisions will be binding upon each subcontract or vendor. The Contractor will take such action with respect to any subcontract or purchase order as the Director of the Office of Federal Contract Compliance Programs may direct to enforce such provisions, including action for noncompliance."

1B.17 <u>Submission of construction drawings and specifications</u>.

(a) Within 105 days.....In the third line, change "10 sets" to "5 sets".

1B.26 <u>Minimum wage rates and other labor standards</u>. In the last line immediately following "Labor No. NC76-1019", delete the period and insert "with Modification No. 1.".

Modification No. 1 to wage decision NC76-1019 accompanies this amendment.

1B.30 <u>Separate Pricing</u>. Delete this paragraph in its entirety.

SECTION 1C. PROPOSALS

1C.2 Contents of proposals.

(b) <u>Step II</u>

(1) The lump sum price......Immediately following the first sentence, add the following: "Bids must be submitted on both items."

Immediately following this subparagraph, add the following:

"a. Price for all work, except Power Demand Control Systems.

b. Price for Power Demand Control System as specified in paragraph 2B.1.8."

1C.3 Number of copies, time of receipt. In the last sentence of this paragraph, change "see 1C.2(b)" to "see 1C.8.2"

DIVISION 2. DESIGN, INSTALLATION, TESTING AND DOCUMENTATION REQUIREMENTS

SECTION 2B. SYSTEM FUNCTIONAL REQUIREMENTS FOR CENTRALIZED AND TRANSMISSION SYSTEMS

2B.1 Conceptual System Configuration.

2B.1.8 Power Demand Control (Optional Increment). In the first line, immediately following "Control", delete "(Optional Increment)". In the second line immediately following "complete", delete "system" and substitute "programs" therefor:

At the end of this section, add the following new paragraph:

"2B.3 U. L. Approval for Fire Reporting Signalling Systems. That portion of the presently proposed system equipment that could be used in the future as part of a Fire Reporting Signalling System must have Underwriters Laboratory Inc. (U.L.) testing approval and listing for such use in compliance with the requirements of NFPA 72D, Class A Proprietary Type Protective Signalling Systems. Further, adequate proof of past performance, display of understanding of testing, and listing procedures of U.L., etc., must be established by the proposer that he can supply the required interface portions as listed equipment in accordance with NFPA 72B in order to implement a complete Fire Reporting Signalling System at a future date."

DIVISION 3. GUIDELINES FOR TECHNICAL PROPOSAL DATA

SECTION 3B. EQUIPMENT

3B.4 Applications Software. Delete the last sentence of this paragraph and substitute the following therefor: "This proof may be in the form of the manufacturer's literature describing the program and its capabilities."

SECTION 3D. MANAGEMENT AND ORGANIZATION

3D.6 Time Frame. In the first line immediately preceding "The proposers", insert "Under Step I," and change "The" to "the".

NOTICE

Each proposer shall refer in his proposal to all amendments to this specification; failure to do so may constitute an informality in the proposal.

Atlantic Division, Naval Facilities Engineering Command
Naval Station, Norfolk, Virginia 23511
30 June 1976

C. C. HEID, RADM, CEC, USN
Contracting Officer

	Basic Hourly Rates	Fringe Benefits Payments			
		H & W	Pensions	Vacation	Education and/or Appr. Tr.
Decision # NC76-1019 - Mod. # 1 (41 FR-4796 - January 30, 1976) Carteret, Craven, Jones, Lenior, Onslow, & Pamlico Counties, North Carolina.					
Change:					
Electricians	4.56				
Laborers:					
Laborers	2.71				
Sprinkler fitters	6.50				
Truck drivers	2.71				
Omit:					
Laborers:					
Air tool operator	2.60				

N62470-75-B-5437

NAVFAC
SPECIFICATION

No. 05-75-5437
AMENDMENT NO. 2

IMPORTANT

THIS AMENDMENT SHOULD BE ACKNOWLEDGED WHEN YOUR PROPOSAL IS SUBMITTED. FAILURE TO ACKNOWLEDGE THE AMENDMENT MAY CONSTITUTE GROUNDS FOR REJECTION OF THE PROPOSAL.

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N62470-75-B-5437

NAVFAC
SPECIFICATION
NO. 05-75-5437
AMENDMENT NO. 2

TWO-STEP FORMAL ADVERTISING (TURNKEY)
UTILITY CONTROL SYSTEM, FIRST INCREMENT

at the

MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

DIVISION 2. DESIGN, INSTALLATION, TESTING AND DOCUMENTATION REQUIREMENTS

SECTION 2G. FIGURES, TABLES & FORMS

On Page No. 48, TABLE 2C.1 BUILDINGS DESCRIPTIVE DATA, delete from list Building Number's M-211 through M-229 and M-232 through M-236 inclusively.

On Page No. 51, TABLE 2G.3 STEAM BOILER PLANT DATA, delete from the list Building No. MCAS-422, Boilers 1, 2, 7, and 10 inclusively.

NOTICE

Each proposer shall refer in his proposal to all amendments to this specification; failure to do so may constitute an informality in the proposal.

Atlantic Division, Naval Facilities Engineering Command
Naval Station, Norfolk, Virginia 23511
14 July 1976

C. C. HEID, RADM, CEC, USN
Contracting Officer

Week 13-19 Sept

143^{31}

$$\begin{array}{r} 115^{31} \\ 300 \\ \hline 415^{31} \end{array}$$

N62470-75-B-5437

NAVFAC SPECIFICATION

No. 05-75-5437
AMENDMENT NO. 3

IMPORTANT

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N62470-75-B-5437

NAVFAC
SPECIFICATION
NO. 05-75-5437
AMENDMENT NO. 3

TWO-STEP FORMAL ADVERTISING (TURNKEY)
UTILITY CONTROL SYSTEM, FIRST INCREMENT

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MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

In Notice No. 1, under "NOTICE", change the word "bid" to "proposal" in two places.

DIVISION 1. GENERAL REQUIREMENTS

SECTION 1C. PROPOSALS

1C.8 Time for review and acceptance by the Government of Technical Proposals.

1C.8.1 Step I. In the second line change "20 August 1976" to "3 September 1976".

1C.8.2 Step II. In the third line change "16 September 1976" to "23 September 1976".

DIVISION 2. DESIGN, INSTALLATION, TESTING AND DOCUMENTATION REQUIREMENTS

SECTION 2E. TESTING AND TRAINING REQUIREMENTS

2E.5 System Acceptance Tests.....Delete the last sentence in its entirety and substitute the following therefor: "System acceptance tests will be considered satisfactorily completed after the complete system has demonstrated over at least thirty consecutive 24 hour days that at least 95 percent annual availability will be obtained."

2E.6 System Performance Characteristics. Delete the last two sentences in their entirety and substitute the following therefor: "Provide all adjustments, modifications and correction of discrepancies necessary to bring the system in compliance with the specified availability figure which shall be clearly stated and elaborated on in the Contractor's technical proposal."

<u>NOTICE</u>

Each proposer shall refer in his proposal to all amendments to this specification; failure to do so may constitute an informality in the proposal.

Atlantic Division, Naval Facilities Engineering Command
Naval Station, Norfolk, Virginia 23511
21 July 1976

C. C. HEID, RADM, CEC, USN
Contracting Officer

N62470-75-B-5437

NAVFAC
SPECIFICATION

No. 05-75-5437
AMENDMENT NO. 4

IMPORTANT

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N62470-75-B-5437

NAVFAC
SPECIFICATION
NO. 05-75-5437
AMENDMENT NO. 4

TWO-STEP FORMAL ADVERTISING (TURNKEY)
UTILITY CONTROL SYSTEM, FIRST INCREMENT

at the

MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

ON STANDARD FORM 20, REQUEST FOR TECHNICAL PROPOSALS, IN THE FIRST PARAGRAPH, CHANGE THE DATE PROPOSALS ARE TO BE RECEIVED FROM "29 JULY 1976" to "12 AUGUST 1976".

NOTICE

Each proposer shall refer in his proposal to all amendments to this specification; failure to do so may constitute an informality in the proposal.

Atlantic Division, Naval Facilities Engineering Command
Naval Station, Norfolk, Virginia 23511
23 July 1976

C. C. HEID, RADM, CEC, USN
Contracting Officer

N62470-75-B-5437

NAVFAC SPECIFICATION

No. 05-75-5437

AMENDMENT NO. 2

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IMPORTANT

N62470-75-B-5437

NAVFAC
SPECIFICATION
NO. 05-75-5437
AMENDMENT NO. 2

TWO-STEP FORMAL ADVERTISING (TURNKEY)
UTILITY CONTROL SYSTEM, FIRST INCREMENT

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MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

DIVISION 2. DESIGN, INSTALLATION, TESTING AND DOCUMENTATION REQUIREMENTS

SECTION 2G. FIGURES, TABLES & FORMS

On Page No. 48, TABLE 2C.1 BUILDINGS DESCRIPTIVE DATA, delete from list Building Number's M-211 through M-229 and M-232 through M-236 inclusively.

On Page No. 51, TABLE 2G.3 STEAM BOILER PLANT DATA, delete from the list Building No. MCAS-422, Boilers 1, 2, 7, and 10 inclusively.

NOTICE

Each proposer shall refer in his proposal to all amendments to this specification; failure to do so may constitute an informality in the proposal.

Atlantic Division, Naval Facilities Engineering Command
Naval Station, Norfolk, Virginia 23511
14 July 1976

C. C. HEID, RADM, CEC, USN
Contracting Officer

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15 JANUARY 1984

Public Works Officer
Building 1005
Camp Lejeune, NC 28542

Utilities Director
Building 1202
Camp Lejeune, NC 28542

Re: PROGRESS REPORT NO. 4

Contract No. N62470-83-B-6126

Preparation of Facility Energy Conservation Analysis
Marine Corps Base
Camp Lejeune, North Carolina

Gentlemen:

The field work has just been completed and our next objective is to evaluate the field surveys. Copies of the field surveys will be forwarded in the near future.

DELAYS OF SCHEDULING

No major delays have been experienced.

SPECIAL PROBLEMS

None at this time.

WORK ACCOMPLISHED

Work in progress thus far includes the work reported last month plus the following:

- Conclusion of field survey work.

- Reduction of field survey notes to Field Survey Report.

- Preparing energy saving calculations for potential projects.

- Assembling information and material for potential ECIP projects.

PERCENT OF WORK COMPLETE

We estimate that the total project is 35% complete as of this date.

PLANS FOR THE MONTH

The work scheduled for the coming month includes the following:

- Production of Field Survey Report.
- Continuation of potential project definition, estimating, and preliminary economic analysis.

Please contact the writer for any revisions to the above.

Respectfully submitted,

W. E. GILBERT & ASSOCIATES, INC.

J. Michael Vaughn

J. Michael Vaughn
Mechanical Group Manager

JMV/eg

Distribution:

Public Works Officer
Utilities Director
Terry Burton
W. E. Gilbert
Tony Langley
Project File #8305600

CSC

COMPUTER SCIENCES CORPORATION

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