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MILITARY STANDARD

ENERGY MONITORING AND CONTROL SYSTEMS PERFORMANCE VERIFICATION AND ENDURANCE TESTS

AMSC N6992 **AREA ATTS**

FOREWORD

1. This military standard is approved for use by all Departments and Agencies of the Department of Defense.

2. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commanding Officer (Code 156), Naval Construction Battalion Center, 1000 23rd Avenue, Port Hueneme, CA 93043-4301, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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1. SCOPE

1.1 Scope. The purpose of this Military Standard is to define generic Performance Verification and Endurance Tests for Energy Monitoring and Control Systems (EMCS), Utility Monitor and Control Systems (UMCS) and Utility Control Systems (UCS). These tests are to be used to assure that the physical and performance requirements of guide specifications for EMCS are tested, and that the test results are adequately documented. The Government shall base certain contractual decisions on the results of these tests. The EMCS, UMCS or UCS systems will typically have different names for the various devices used. For example, computer based devices used in the field are referred to as FIDs, smart field panels, RTUs, RCUs, or other names. Regardless of what the devices are named, the appropriate tests should be performed.

2. APPLICABLE DOCUMENTS

2.1 Government documents. This paragraph is not applicable.

2.2 Non-Government publications. The following document(s) form a part of this standard to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted shall be those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of the documents not listed in the DODISS are the issues of the documents cited in the solicitation (see 6.2).

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR CONDITIONING ENGINEERS (ASHRAE)

ASHRAE Handbook of Fundamentals.

(Application for copies should be addressed to the American Society of Heating, Refrigerating and Air-Conditioning Engineers, 1791 Tullie Circle, NE, Atlanta, GA 30329-2305.)

(Non-Government standards and other publications are normally available from the organizations that prepare or that distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.3 Order of precedence. In the event of a conflict between the text of this standard and the references cited herein (except for associated detail specifications, specification sheets or MS standards), the text of this standard shall take precedence. Nothing in this standard, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

3. DEFINITIONS

3.1 Algorithm. An algorithm is a set of well-defined rules or procedures for solving a problem or providing an output from a specific set of inputs.

3.2 Analog. An analog is a continuously varying signal value temperature, current pressure, etc.

3.3 Analog to digital (A/D) converter. An A/D converter is a circuit or device whose input is information in analog form and whose output is the same information in digital form.

3.4 Architecture. Architecture is the general organization and structure of hardware and software.

3.5 American Standard Code for Information Interchange (ASCII). ASCII is an 8-bit coded character set to be used for the general interchange of data among information processing systems, communications systems, process control systems, and associated equipment.

3.6 Assembler. An assembler is a utility program which translates assembly language source code into the machine executable object code.

3.7 Assembly language. Assembly language is a low-level computer language used to program and manage the operations of a computer.

3.8 Asynchronous computer. An asynchronous computer is an automatic digital computer in which each operation starts as a result of a signal generated by the completion of the previous event or operation, or by the availability of the parts of the computer required by the next event or operation.

3.9 Asynchronous transmission. Asynchronous transmission is data transmission in which each character contains its own start and stop bits.

3.10 Automatic temperature control (ATC). ATC is a local loop network of pneumatic or electric/electronic devices which are interconnected to control temperature.

3.11 Auxiliary Control Unit (ACU). An ACU is a microcomputer based device that connects field sensors and control devices to a RCU.

3.12 Background programming. Background programming is a feature of computer hardware to provide a means of writing,

testing, and debugging a software program on the computer at the same time the computer is performing other "Real Time" programs.

3.13 BASIC. BASIC is an acronym for Beginners All-Purpose Symbolic Instruction Code, a high-level, English-like programming language used for general applications.

3.14 Baud. A baud is a unit of signaling speed equal to the number of discrete conditions, or signal events, per second.

3.15 Bit. Bit is an acronym for binary digit, the smallest unit of information which can be represented. A bit may be in one of two states, represented by the binary digits 0 and 1.

3.16 Bit error rate. The bit error rate is the number of incorrect or erroneous bits divided by the total number (correct plus incorrect) over some stipulated period of time.

3.17 Bootstrap. A bootstrap is a technique or device designed to bring a computer into a desired state by means of its own action.

3.18 Break point. A break point is a point in a program where an instruction or other condition enables a programmer to interrupt the running of a program by external intervention or a monitor routine. Break point is used in debugging.

3.19 Buffer. A buffer is a temporary data storage device used to compensate for a difference in data flow rate or event times, when transmitting data from one device to another.

3.20 Bus. A bus is a circuit path (or parallel paths) over which data instructions are transferred to all points in the computer system. Computers have several separate busses: the data, address, and control busses are those of greatest importance.

3.21 Byte. One byte is equal to eight bits.

3.22 Call. Call is a term used to designate the software procedure by which software control is transferred to a callable subroutine.

3.23 Callable. Callable is a subroutine module to which software control can be transferred.

3.24 Central control unit (CCU). The CCU is a process control digital computer that includes a CPU, central memory, and I/O bus.

3.25 Central operator station (COS). The COS is typically made up of a computer, monitor, disk drives, printers, and communication

devices. The COS allows an operator to control the EMCS, UMCS, or UCS.

3.26 Central processing unit (CPU). The CPU is the portion of a computer that performs the interpretation and execution of instructions. It does not include memory or I/O.

3.27 Character. A character is one of a set of elementary symbols which normally include both alpha and numeric codes plus punctuation marks and any other symbol which may be read, stored, or written.

3.28 Clock. A clock is a device or a part of a device that generates all the timing pulses for the coordination of a digital system. System clocks usually generate two or more clock phases. Each phase is a separate, square wave pulse train output.

3.29 Communications link terminations (CLT). The CLT is an independent piece of hardware that provides an interface point between the CCU and the Data Transmission Media.

3.30 Compiler. The compiler is a language translator which converts source statements written in a high level language into multiple machine instructions. A compiler translates the entire program before it is executed.

3.31 Control point adjustment (CPA). CPA is the procedure of changing the operating point of a local loop controller from a relocation.

3.32 Control sequence. The control sequence is an equipment operating order established upon a correlated set of data environment conditions.

3.33 Memory resident. The memory resident specifies a program which currently resides in central memory (and may thus be considered active) as opposed to programs residing on the disk which must be loaded into central memory for execution.

3.34 Cycle time. The cycle time, in microseconds/word for central memory, is the minimum time interval that must elapse between the starts of two successive accesses to any one storage location.

3.35 Data communications equipment. The data communications equipment is a device for transmitting digital information to and from any other system.

3.36 Data environment (DE). DE are the sensors and control devices connected to a single FID/MUX from the equipment and systems sampled or controlled.

3.37 Data terminal cabinet (DTC). The DTC is an independent metallic enclosure that provides an interface point between the FID/MUX Field Wiring Terminals and the Data Environment.

3.38 Data transmission media (DTM). DTM is transmission equipment including cables and interface modules (excluding MODEMs) permitting transmission of digital and analog information.

3.39 dbm. dbm is a measure of absolute power values. Zero dbm equals one milliwatt.

3.40 Debugging. Debugging is the procedure for detecting and correcting errors in a program.

3.41 Decibel (dB). A decibel is the standard unit for expressing transmission gain or loss utilizing logarithmic power and voltage ratios.

3.42 Deck. In HVAC terminology, the deck is the air discharge of the hot or cold coil in a duct serving a conditioned space.

3.43 Demand. Demand is the term used to describe the maximum rate of use of electrical energy averaged over a specific interval of time and usually expressed in kW.

3.44 Demultiplexer. A demultiplexer is a device used to separate two or more signals previously combined by compatible multiplexer for transmission over a single circuit.

3.45 Diagnostic program. A diagnostic program is machine-executable instructions used to detect and isolate malfunctions.

3.46 Digital signal. A digital signal is a discontinuous signal, the various states of which are discrete intervals apart. In some systems, the signal is either on or off (zero or one) and is referred to as binary.

3.47 Digital to analog (D/A) converter. The D/A converter is a hardware device which converts a digital signal into a voltage or current proportional to the digital input.

3.48 Direct digital control (DDC). The DDC is the sensing and control of processes directly with digital control electronics.

3.49 Direct memory access (DMA). The DMA is a provision for transfer of data blocks directly between memory and an external device interface.

3.50 Disk storage. The disk storage is a bulk storage, random access device for storing digital information. Usually consists of a thin rotating circular plate having a magnetizable coating, a read/write head with associated control equipment.

3.51 Distributed processing system. A distributed processing system is a system of multiple processors each performing its own task, yet working together a complete system under the supervision of a central computer, to perform multiple associated tasks.

3.52 Download. The download is the transfer of digital data or programs from a host computer to another data processing system such as central computer to microcomputer.

3.53 Driver/handler. The driver/handler is software which manages input/output to and from a given peripheral device.

3.54 Duplex. Duplex is a method of operation of a communications line in which each terminal can simultaneously transmit and receive.

3.55 Energy monitoring control system (EMCS). EMCS is a distributed processing system used to monitor and control energy usage.

a. A medium EMCS consists of the following major components. Distributed processing architecture is required.

(1) Minicomputer based CCU or COS (16 bit minimum).
(2) Color graphics monitor based operator's console.
(3) Alphanumeric monitor based system terminal.
(4) Alarm printer.
(5) Logging printer.
(6) Rigid disk systems.
(7) Bulk software loading device.
(8) System RTC.
(9) FID and MUX panels.
(10) Magnetic tape system.
(11) CLT.

b. A large EMCS, is identical to a medium EMCS except for a second CCU or COS and associated failover controller. Distributed processing architecture is required.

c. A micro EMCS, less than 125 points, consists of the following major components. Distributed processing

architecture is not utilized. Portable device(s) utilized for programming, bulk loading, and diagnostics. Continuous operator interaction is not required. Alarm reporting or data display is accomplished via digital or analog I/O.

(1) Microcomputer based CCU or COS.
(2) System RTC.
(3) RCU panels.
(4) Programming and service panel (removable).
(5) CLT.

3.56 Executive program. The executive program is the main system program designed to establish priorities and to process and control other programs.

3.57 Failover controller. The failover controller is a hardware device or software to transfer functions from one CCU or COS to another CCU or COS in the event of CCU or COS failure.

3.58 Fall-back mode. The fall-back mode is the pre-selected operating mode of a FID when communications cease with the MCR or the operating sequence of each local control loop when the FID or RTU to which it is connected ceases to function.

3.59 Field interface device or remote terminal unit (FID or RTU). The FID or RTU is a small, intelligent hardware device containing software which implements the distributed processing aspects of operation with the central computer as well as maintaining effective control of field control loops in the absence of higher level influence. Operating constants are changed by down-line loading from the CCU or COS as well as from within the FID or RTU.

3.60 Firmware. Firmware is a procedure for accomplishing arithmetic operations where the instruction set is resident in ROM or PROM.

3.61 FORTRAN. FORTRAN is an acronym for FORmula TRANslation, a high-level, English-like programming language used for technical applications.

3.62 Function keys. Function keys are keys which, when depressed, send more than one character and are interpreted by the computer as a specific command.

3.63 Half duplex. Half duplex is a method of operation of a communications line in which each terminal can transmit and receive, but not simultaneously.

3.64 Hardware. Hardware is equipment, such as a CPU, memory, peripherals, sensors, and relays.

3.65 Hardware vectored interrupts. Hardware vectored interrupts is a hardware feature which allows the CPU to directly determine the identity of an interrupting device and to automatically transfer control to a program which will service the interrupt.

3.66 Heating, ventilating, and air conditioning. Equipment used to heat, cool or circulate air in building or equipment.

3.67 Initialization (of the system). Initialization is the process of loading the operating system with the computer. Initialization is required to start normal operation of the computer after the computer has been out of service.

3.68 Input/output bus. The input/output bus is the connection through which data is transmitted and received from peripheral devices interacting with the processor. Heating, ventilating, and air conditioning (HVAC) equipment used to heat, cool or circulate air in buildings or equipment.

3.69 Input/output (I/O) device. The I/O device is digital hardware that transmits or receives data.

3.70 Interactive. Interactive functions are functions performed by an operator with the machine prompting or otherwise assisting these endeavors, while continuing to perform all other tasks as scheduled.

3.71 Interpreter. An interpreter is a language translator which converts individual source statements into machine instructions by translating and executing each statement as it is encountered.

3.72 Interrupt. An interrupt is an external or internal signal requesting that current operations be suspended to perform more important tasks.

3.73 Large scale integration (LSI). LSI is the technology of manufacturing integrated circuits (IC) capable of performing complex functions. Devices of this class contain 100 or more logic gates of a single chip.

3.74 Line conditioning. Line conditioning is electronic modification of the characteristic response of a line to meet certain standards. The characteristics include frequency response, signal levels, noise suppression impedance, and time delay.

3.75 Line driver. A line driver is a hardware element which enables signals to be directly transmitted over circuits to other devices some distance away.

3.76 Loader. A loader is a program used to prepare the computer and store other programs into memory location preparation for machine execution.

3.77 Local loop control. The local loop control is the control for any system or subsystem which existed prior to the installation of an EMCS and which will continue to function when the EMCS is non-operative.

3.78 Macro. Macro is a single programming symbolic instruction that generates multiple assembly language instructions.

3.79 Machine language. Machine language is the binary code corresponding to the instruction set of the CPU.

3.80 Master control room (MCR). The MCR is the central facility containing the operator console, CCU, and related equipment for control and supervision of the complete EMCS.

3.81 Medium scale integration (MSI). An MSI is the same as an LSI but to a lesser degree.

3.82 Memory. A memory is any device that can store logic 1 and logic 0 bits in such a manner that a single bit or group of bits can be accessed and retrieved.

3.83 Memory address. A memory address is a binary number that specifies the precise memory location of a stored word.

3.84 Microcomputer. A microcomputer is a computer system based on a microprocessor and containing all the memory and interface hardware necessary to perform calculations and specified transformations.

3.85 Microprocessor. A microprocessor is a central processing unit fabricated as one integrated circuit.

3.86 Mnemonic. A mnemonic is a symbolic representation or abbreviation to help operators remember and understand.

3.87 MODEM. MODEM, an acronym for MOdulator/DEModulater, is a hardware device used for changing digital information to and from an analog form to allow transmission over voice grade circuits.

3.88 Monitor. A screen on which graphics and alphanumeric data can be displayed.

3.89 Multiplexer (MUX). An MUX is a device which combines multiple signals on one transmission media.

3.90 Multi-tasking. Multi-tasking is the procedure allowing a computer to perform a number of programs simultaneously under the management of the operating system.

3.91 Non-volatile memory. Non-volatile memory is memory which retains information in the absence of applied power (i.e., magnetic core, ROM, and PROM).

3.92 Normal mode operation. Normal mode operation describes equipment operating and performing its assigned tasks.

3.93 Object code. An object code is a term used to describe machine language.

3.94 Operating system. The operating system is a complex software system which manages the computer and its components and allows human interaction.

3.95 Optical isolation. Optical isolation is the electrical isolation of a portion of an electronic circuit by using an optical semiconductor and modulated light to carry the signal.

3.96 Parameter. A parameter is a variable that is given a constant value for a specific purpose or process.

3.97 Parity. Parity is a checking code within a binary word used to help identify errors.

3.98 PASCAL. PASCAL is a "structured programming" high level computer language.

3.99 Peripheral equipment. Peripheral equipment is equipment used for man-machine communications and further support of a processor.

3.100 Point. A point is an individual connected monitor or control devices (i.e., relay, temperature sensor).

3.101 Prediction program. A prediction program is applications software which allows continuous prediction of a future value and subsequent correction based on actual measurements.

3.102 Process automation. Process automation is process control without human intervention.

3.103 Process control. Process control is the collective functions performed by the equipment which is to control a variable.

3.104 Program. A program is a sequence of instructions causing the computer to perform a specified function.

3.105 Prompt/response sequence. Prompt/response sequence is man-machine dialogue by which the computer asks questions and requests responses from the operator.

3.106 Protocol. Protocol is a formal set of conventions governing the format and relative timing of message exchange between two terminals.

3.107 Random access memory (RAM). RAM is a volatile semiconductor data storage device in which data may be stored or retrieved. Access time is effectively independent of data location.

3.108 ROM, PROM, EPROM, and EEPROM. ROM, PROM, EPROM, and EEPROM are acronyms for Read-Only-Memory, Programmable ROM, Erasable PROM, Electrically Erasable PROM; a non-volatile semiconductor memory.

3.109 Real time. Real time is a situation in which a computer monitors, evaluates, reaches decisions, and effects controls within the response time of the fastest phenomenon.

3.110 Real time clock (RTC). A real time clock is a device which maintains accurate time of day, day of week, and date information for the computer. The RTC may be updated by hardware.

3.111 Register. A register is a digital device capable of retaining information.

3.112 Reinitialization. Refer to initialization.

3.113 Remote control unit (RCU). The RCU is an intelligent hardware device containing software which implements the distribution process aspects of operating with the central computer as well as maintaining effective control of field control loops.

3.114 Remote operator station (ROS). Identical to a COS except remotely located.

3.115 Resistance temperature detector (RTD). An RTD is a device where resistance changes linearly as a function of temperature.

3.116 Selective generation. Selective generation is where the management of input/output is restricted to selected peripherals.

3.117 Sensors. Sensors are devices used to detect or measure physical phenomena.

3.118 Single stepping. Single stepping is the procedure by which the next statement in a memory resident program is executed by depressing a switch.

3.119 Snapshot. A snapshot is a picture of the instantaneous status and state of a system.

3.120 Software. Software is a term used to describe all programs whether in machine, assembly, or high-level language.

3.121 Source code. Source code is a term used to describe assembler and high-level programmer developed code.

3.122 Stand-alone. Stand-alone is a term used to designate a device or system which can perform its function totally independent of any other device or system.

3.123 Standard panel. A control panel developed by the U.S. Army Corps of Engineers to control heating, ventilating, and air conditioning equipment.

3.124 Supervisory control. Supervisory control is a separate (and usually remote) control and monitoring of local control loops. (See Direct digital control.)

3.125 System normal heavy. System normal heavy load conditions are defined as the occurrence throughout the system of a total of three status changes, three digital alarms, three analog high or low limit alarms, and three analog quantity changes within the high and low limits during a single 1-second interval. This number of similar occurrences shall repeat on a continuous basis during successive 1 second intervals for up to 30 seconds. The system normal heavy load conditions shall have 50 percent of the changes and alarms, including no less than one of each type, occurring at a single FID or MUX with the remaining changes and alarms distributed among the remaining FID/MUX. No DTM link shall be more than 65 percent loaded during this normal heavy load condition and the alarm printer shall continue to print out all occurrences.

3.126 Throughput. Throughput is the total capability of equipment to process or transmit data during a specified time period.

3.127 Time base generator (TBG). See Clock.

3.128 Time tag. A time tag is the date and time of occurrence of an event.

3.129 True digital. A true digital is a representation of any value by symmetric digits, used to form fixed length words.

3.130 Unitary control unit (UCU). UCU is a microprocessor based, dedicated purpose device designed and programmed to control air distribution system mixing boxes, terminal units or variable air volume (VAV) boxes.

3.131 Utility control system (UCS). A computer based system for monitoring and for controlling utility systems. A typical system would include a COS, DTM and RTSs/ACUs.

3.132 Utility monitoring and control systems (UMCS). A computer based system for monitoring and controlling utility systems and energy usage. A typical system would include COSs, DTM, and RCUs/ACUs.

3.133 Volatile memory. A volatile memory is a semiconductor device in which the stored digital data is lost when power is removed.

3.134 Word. A word is a set of binary bits handled by the computer as the primary unit of information.

3.135 Zone. A zone is an area composed of a building, a portion of a building, or a group of buildings affected by a single device or piece of equipment.

3.136 Definitions of acronyms used in this standard. The following acronyms listed in this Military Standard are defined as follows:

A/D - Analog to digital.
AA - Analog alarm.
AC - Alternating current.
ACU - Auxiliary control unit.
AHU - Air handling unit.
AI - Analog input.
AO - Analog output.
ASCII - American standard code for information interchange.
ATC - Automatic temperature control.
B/C - Benefit to cost ratio.
BASIC - Beginners all-purpose symbolic instruction code.
BCD - Binary coded decimal.
bit - Binary digit.

bps - Bits per second.
Btu/hr - British thermal unit per hour.
CCU - Central control unit.
CHW - Chilled water.
CLT - Communications link termination.
COS - Central operator station.
CPA - Control point adjustment.
cps - Characters per second.
CPU - Central processing unit.
CT - Current transformer.
D/A - Digital to analog.
dB - Decibel.
DC - Direct current.
DDC - Direct digital control.
DE - Data environment.
DI - Digital input.
DMA - Direct memory access.
DO - Digital output.
DPS - Differential pressure switch.
DTC - Data terminal cabinet.
DTM - Data transmission media.
DX - Direct expansion.
E/C - Energy to cost ratio.
EEPROM - Electrically erasable PROM.
EMCS - Energy monitoring and control system.
EMI - Electromagnetic interference.
EPROM - Erasable PROM.
FCB - Failover control board.
FID - Field interface device.
FORTRAN - Formula translation.
FS - Flow switch.
FSK - Frequency shift keying.
H/C - Hot/cold.
HOA - Hand-off-automatic.
hp - Horsepower.
HVAC - Heating, ventilating, and air conditioning.
HW - Hot water.
Hz - Hertz.
I&C - Instrumentation and control.
I/O - Input/output.
IC - Integrated circuit.
IMUX - Intelligent multiplexer.
kHz - Kilohertz.
kW - Kilowatt.
kWh - Kilowatt-hour.
lpm - Lines per minute.
LSI - Large scale integration.
mA - Milliamp.
MBtu - Btu (millions).
MCR - Master control room.

MHz - Megahertz.
MODEM - Modulator/demodulator.
MSI - Medium scale integration.
MUX - Multiplexer.
Mb - Megabyte.
OA - Outside air.
PROM - Programmable ROM.
PS - Pressure switch.
psi - Pound-force per square inch.
psia - Pound-force per square inch, absolute.
psid - Pound-force per square inch, differential.
psig - Pound-force per square inch, gage.
PT - Potential transformer.
RA - Return air.
RAM - Random access memory.
RCU - Remote control unit.
RF - Radio frequency.
RFI - Radio frequency interference.
RH - Relative humidity.
RHT - Reheat.
RMS - Root mean square.
ROM - Read only memory.
RT - Run-time.
RTC - Real time clock.
RTD - Resistance temperature detector.
RTU - Remote terminal unit
S/N - Signal to noise ratio.
S/S - Start/stop.
TBG - Time base generator.
TTL - Transistor-transistor logic.
UCS - Utility control system.
UMCS - Utility monitoring and control system.
VAC - Volt, alternating current.

4. GENERAL REQUIREMENTS

4.1 General. Performance Verification and Endurance Tests shall be conducted under normal mode operation unless otherwise indicated in initial conditions description for each test. System normal mode describes a condition in which the system is performing its assigned tasks in accordance with the contract requirements.

Performance Verification and Endurance Tests shall be conducted on hardware and software installed at the job site to assure that the physical and performance requirements of guide specifications are met. Tests on data transmission media (DTM) shall include all contractor furnished DTM. Tests on FID or RTU and MUX or ACU operation shall include at least one FID or RTU and MUX or ACU on each DTM. Tests on I/O functions shall include each type of installed I/O function and failure mode in each DTM.

Micro EMCS shall use a portable diagnostic programming, and bulk loading device for operator interface for display and control of digital and analog points, and for display of memory locations. For large/medium EMCS, UMCS, and UCS these tasks shall be accomplished at the operator's console.

4.2 Test plans. Prior to the scheduling of the tests, the contractor shall provide the Government with a Performance Verification and Endurance Test Plan (see 6.3), including the following:

- Installed system block diagram.
- System hardware description.
- System software description.
- Operator's commands.
- I/O summary tables with failure modes for test points.
- Required passwords for each operator access level.
- Description of each type of digital I/O and analog I/O to be used in the test.
- List of test equipment.

For each application program shown in the I/O summary table, the contractor shall provide:

- Inputs required for each program (I/O point values and status) and corresponding expected results for each set of input values.
- Default values for the program inputs not implemented or provided for in the contract documents for the application programs to be tested.
- Failure modes for each I/O function to be tested.

4.2.1 Data requirements for test plans. EMCS Performance Verification and Endurance Test Plans (see 6.3), applies to this requirement. Deliverable data identified on the DD Form 1423 shall be prepared in accordance with instructions specified in the DID.

4.3 Test procedures. The Contractor shall provide the approved EMCS Performance Verification and Endurance Test Procedures (see 6.3). Test procedures shall be developed from the test plans. The test procedures shall consist of detailed instructions for test setup, execution, and evaluation of test results.

4.3.1 Data requirements for test procedures. EMCS Performance Verification and Endurance Test Procedures (see 6.3), applies to this requirement. Deliverable data identified on the DD Form 1423 shall be prepared in accordance with instructions specified in the DID.

4.4 Test reports. The Contractor shall provide EMCS Performance Verification and Endurance Test Reports (see 6.3). The test reports shall document the results of the tests.

4.4.1 Data requirements for test reports. EMCS Performance Verification and Endurance Test Reports (see 6.3), applies to this requirement. Deliverable data identified on the DD Form 1423 shall be prepared in accordance with instructions specified in the DID.

4.5 Test equipment and set up. All test equipment calibrations shall be traceable to NBS Standards or verified against a primary standard. The accuracy of the test equipment and overall test method shall be at least twice the maximum accuracy required for the test. For example, if the temperature sensor has an accuracy of $\pm 1^{o}F$ over the executed range, the test instrument used shall have an accuracy of at least $\pm 0.5^{o}F$. All test equipment shall be provided by the contractor unless otherwise noted in the contract documents.

Test equipment for the Performance Verification and Endurance Tests shall include the following:

. Surge Generator.
. 480 VAC, RMS, at 60 Hz power source.
. 180 VAC, peak, at 60 Hz power source.
. Storage oscilloscope.
. AC Signal Generator.
. DC Signal Source.
. Portable diagnostic programming and bulk loading device.
. Test set.
. Equipment that can generate 10 dry contact closures per second and
indicate the number of pulses transmitted.

. Equipment to test system accuracy - certified standard traceable to NBS. Accuracy should be at least twice the accuracy of the most accurate sensor to be tested.
. Stop watch with 0.1 second time intervals.
. White noise generator or communication error generator.

5. DETAILED REQUIREMENTS

5.1 General. This section presents the generic EMCS Performance Verification and Endurance Test Procedures (see 4.3 and 6.3) with the following information:

- Test identification number.
- Test title.
- Objective.
- Generic EMCS configuration to be tested (large & medium).
- Initial conditions (if applicable).
- Test equipment (if required).
- Sequence of events.
- Expected results.

A space has been left open for the project specification paragraph number since the project specifications will vary for each job. The label has been included as a reminder that each Performance Verification and Endurance Test shall refer to the appropriate project specification paragraph(s).

5.2 Performance verification tests. The following are the Performance Verification Tests to be conducted on the EMCS.

TEST NO: PVT-1A Page 1 of 1 OBJECTIVE: To verify that the
TITLE: Initial System Equipment hardware components of the system
Verification provided by the contractor are in
APPLIES TO: Large/Medium EMCS, UMCS, accordance with the contract plans
and UCS and specifications and all approved REFERENCE: Proj. Spec. Paragraph _____ submittals.

INITIAL CONDITIONS

1. The contractor provides a list of approved system hardware components, including the name of the component, manufacturer, and model number. This list is based on the contract plans, specifications, change orders (if any) and approved submittals which must be available for reference purposes during the test.

EVENT	EXPECTED RESULTS
1. The model numbers of each hardware equipment component should be examined and checked against the model numbers of the equipment provided by the contractor.	1. Model numbers of provided must match the model numbers of the approved submittals and which was successfully tested at the factory test.

Test No: PVT-1A
10 June 1994

TEST NO: PVT-2A Page 1 of 1 OBJECTIVE: To demonstrate that the TITLE: System Startup system normal startup procedures can
APPLIES TO: Large/Medium EMCS, UMCS, initiate operation including
and UCS initializing CCU/COS and FIDs/RCUs. REFERENCE: Proj. Spec. Paragraph _____

INITIAL CONDITIONS

1. All equipment is off.

2. The contractor provides the EMCS performance verification test software and data points to be loaded into the system.

EVENT	EXPECTED RESULTS
1. Energize the equipment (CCU or COS, and FIDs or RCU/ACU and peripherals).	1. The equipment is ready for operation.
2. Initiate system startup using procedures (bootstrap) specified by the computer manufacturer.	2. System loads CCU or COS, or RTUs with required software.
3. Load and run all software, which includes all data points required for the complete performance verification test.	3. System loads software and begins execution of performance verification test.
4. Using system terminal, display or print memory map.	4. Memory map shows amount of memory installed and programs loaded.

Test No:

PVT-2A

10 June 1994

TEST NO: PVT-3A Page 1 of 1 OBJECTIVE: To demonstrate the system accuracy and resolution from analog inputs to the operator's monitor display is within the specified limits.

TITLE: System Accuracy and Resolution

APPLIES TO: Large/Medium EMCS, UMCS, and UCS

REFERENCE: Proj. Spec. Paragraph _____

TEST EQUIPMENT

1. A currently certified standard traceable to the National Bureau of Standards for each type analog signal to be tested.

2. The accuracy of the test equipment and overall test method is at least twice the accuracy of the most accurate sensor to be tested.

EVENT	EXPECTED RESULTS
1. Place certified standard at the analog values terminals of each type of AI to be used in the system. Command the system to display analog values.	1. The system displays within 0.5 percent of the standard test equipment readout across the entire range of analog input (zero, mid range size and full range).
2. Vary the output of a calibrated new analog test device connected to each type of analog I/O to be installed so that the output change in value is one-half the specified accuracy of the measured variable.	2. The system displays a value within 0.5 percent of the standard test equipment readout.
3. Connect one of each type of analog input sensor and transmitter required by the Contract configuration	3. Select each analog configuration for display, the accuracy should be

specification into analog inputs.	$(AI)^2 + (Sensor)^2 + (Transmitter)^2$.	
Demonstrate the accuracy of each analog sensor configuration over their respective spans in five equal steps.	For a calibrated temperature sensor (RTD), the accuracy should be the $(.5)^2 + (.1)^2 + (.1)^2 = .52\%$ of temperature span.	

Test No: PVT-3A
10 June 1994

TEST NO: PVT-4A Page 1 of 1 OBJECTIVE: To demonstrate that the TITLE: FID or RTU Memory and FIDs/RCUs have the specified amount
FID/MUX or RCU/ACU Spare of memory and the specified spare
I/O Capacity I/O capacity.
APPLIES TO: Large/Medium EMCS, UMCS,
and UCS
REFERENCE: Proj. Spec. Paragraph _____

TEST EQUIPMENT

1. A FID or RTU portable tester.

EVENT	EXPECTED RESULTS
1. Command the FID or RTU to display have at least the memory size. memory.	1. FID or RTU should specified amount of
2. Count spare I/Os in selected spare I/Os FID/MUX or RCU/ACU. maximum number required by drawings for FIDs ACUs.	2. Verify the number of corresponds with the of active and spare I/Os the approved shop and MUXs or RCUs and

Test No:

PVT-4A

10 June 1994

TEST NO: PVT-5A Page 1 of 2
TITLE: FID or RTU Startup and Functions
APPLIES TO: Large/Medium EMCS, UMCS, and UCS
REFERENCE: Proj. Spec. Paragraph _____

OBJECTIVE: To demonstrate that the FID or RTU can start operation automatically without human intervention. To demonstrate FID or RCU monitoring and control functions in normal operational mode and in stand-alone mode.

INITIAL CONDITIONS

1. The FID or RTU power switch is off. Battery backup is disabled. There is no data stored in the FID or RTU RAM. The DTM line to the CCU or COS is disconnected.

TEST EQUIPMENT

1. A portable test set.

EVENT	EXPECTED RESULTS
1. Power up the FID or RTU.	1. Visually verify "POWER ON" lamps are lit. FID or RTU automatically performs self-test diagnostics and displays NO GO condition. All FID or RTU and associated MUX or ACU outputs in the predetermined failure mode defined in the I/O tables.
2. Enable the DTM to CCU or COS.	2. FID or RTU establishes communication with CCU or COS. The CCU or COS automatically sets the FID or RTU time clock, and downloads all parameters: alarms, constraints, and application programs. The FID or RTU indicates that it is on-line.

3.	Verify operation of the following functions: . Scanning of inputs. . Control of outputs. . Report to CCU or COS of DE changes only. . Report to CCU or COS of DE status. . Averaging or filtering of all analog inputs.	3. Operator console display matches DE FID/MUX or RCU/ACU monitoring conditions.

Test No: PVT-5A
10 June 1994

TEST NO: PVT-5A Page 2 of 2 OBJECTIVE: To demonstrate that the
TITLE: FID or RTU Startup and Functions FID or RTU can start operation automatically with human intervention. To demonstrate FID or
APPLIES TO: Large/Medium EMCS, UMCS, and UCS RTU monitoring and control functions
REFERENCE: Proj. Spec. Paragraph _____ in normal operational mode and in stand-alone mode.

EVENT	EXPECTED RESULTS
4. Enter commands to operate the following FID/MUX or RCU/ACU control functions: . Constraints checks (prior to command issuance). . Control functions: digital output. . Control functions: analog output.	4. Operator command matches DE status.
5. Initiate a change in an analog point so that its value exceeds a high or low reasonableness value. Select a point that provides input into an application program.	5. FID or RTU rejects value and sends an alarm message to the CCU or COS.
6. Disconnect DTM to FID or RTU. Connect FID or RTU portable tester and reset FID or RTU real time clock (RTC) to be out of are not synchronization.	6. The system reports an alarm indicating loss of communication. Verify FID or RTU RTC and CCU or COS time base generator synchronized.
7. Reconnect the DTM to the FID or corrects the RTU. (minutes	7. System automatically FID or RTU RTC so that it agrees with the CCU or COS RTC

		and seconds and issues an alarm for FID or RTU accuracy error.
8.	Connect FID or RTU portable tester and read FID or RTU RTC.	8. Verify FID or RTU RTC and CCU or COS are synchronized.

Test No: PVT-5A

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TEST NO: PVT-6A Page 1 of 1 OBJECTIVE: To demonstrate the
TITLE: FID or RTU RTC and RAM ability of the FID or RTU RTC and RAM
Battery Backup to continue to operate and the RAM to
APPLIES TO: Large/Medium EMCS, UMCS, maintain memory contents during power
and UCS failures.
REFERENCE: Proj. Spec. Paragraph _____

TEST EQUIPMENT

1. Portable diagnostic tester.

EVENT	EXPECTED RESULTS
1. Remove the 120 VAC service from the FID or RTU for the duration of the RTC and RAM battery backup period minus 30 minutes for the FID or RTU RTC and RAM as specified in the contract documents. Disconnect FID or RTU from DTM.	1. FID or RTU RTC continues to operate and RAM contents are not lost. Alarm printer indicates last of communication with FID or RTU.
2. At the end of the specified battery backup period, minus 30 minutes, repower FID or RTU with 120 VAC and read RTC and selected RAM locations with portable tester.	2. Verify the FID or RTU time clock is operational with the correct time, and the FID or RTU RAM contents are maintained for the period of time specified.
3. Reconnect FID or RTU to DTM. Operator issue command to establish communication with FID or RTU.	3. Alarm printer indicates communication with FID or RTU established.

Test No: PVT-6A
10 June 1994

TEST NO: PVT-7A Page 1 of 1 OBJECTIVE: To demonstrate the
TITLE: FID/MUX or RCU/ACU Batteryability of designated complete
Backup FID/MUX or RCU/ACU to operate under APPLIES TO: Large/Medium EMCS, UMCS, battery backup during power failures
and UCS and to demonstrate recharging
REFERENCE: Proj. Spec. Paragraph _____ capabilities.

EVENT	EXPECTED RESULTS
1. Remove the 120 VAC from the FID/MUX or RCU/ACU continues to operate under battery backup without degradation. Exercise FID/MUX or RCU/ACU by performing monitoring and control functions.	1. The FID/MUX or RCU/ACU power source and operate normally for the specified period required in the contract documents. An alarm is printed and displayed at the operator's console to indicate the FID/MUX or RCU/ACU is operating under battery backup.
2. Reconnect the 120 VAC to the FID/MUX or RCU/ACU continues to operate normally and return to normal operation.	2. The FID/MUX or RCU/ACU power source. printer prints
3. Manually change status of selected I/O points of I/O points. Request I/O status.	3. Displayed status corresponds to new status.
4. Measure charging current to backup battery.	4. Verify batteries are being charged.

Test No:

PVT-7A

10 June 1994

TEST NO: PVT-8A Page 1 of 2
TITLE: Portable Tester
APPLIES TO: Large/Medium EMCS, UMCS, and UCS
REFERENCE: Proj. Spec. Paragraph _____

OBJECTIVE: Demonstrate the capability of the device to perform diagnostics, debug, exercise all points in FID/MUX or RCU/ACU, and load all information for complete FID/MUX or RCU/ACU operation.

INITIAL CONDITIONS

1. The contractor provides the set of commands and inputs required to execute the test, including:

   . Listing of operator alphanumeric and decimal interface with diagnostic device.
   . Expected output from FID/MUX or RCU/ACU diagnostics.
   . Listing of a program that is not PROM-ROM resident in the FID or RTU, plus the input and predicted output.
   . Analog/digital point identification (with known values). Select points such that input for point control requires alphanumeric and decimal operation interface.
   . Display of a specific memory location.
   . Input for modification of a specific RAM location.
   . Input application programs that are not PROM-ROM resident in the FID or RTU, all field points (I/Os) and data-base parameters for complete FID or RTU stand-alone operation.

2. Portable tester loaded from CCU or COS with FID or RTU information.

3. The portable tester is connected to the FID/MUX or RCU/ACU.

4. FID/MUX or RCU/ACU are set up to contain known diagnosable errors.

EVENT	EXPECTED RESULTS
1. Portable tester connected to CCU or COS CCU or COS, command issued to load or RTU portable tester.	1. Information loaded from to FID

	specified FID or RTU information.	
2.	Run FID or RTU diagnostics using the FID or RTU self-test switch.	2. Displayed results of diagnostics agree with the predicted results.

Test No: PVT-8A
10 June 1994

TEST NO: PVT-8A Page 2 of 2
TITLE: Portable Tester
APPLIES TO: Large/Medium EMCS, UMCS, and UCS
REFERENCE: Proj. Spec. Paragraph _____

OBJECTIVE: Demonstrate the capability of the device to perform diagnostics, debug, exercise all points in FID/MUX or RCU/ACU, and load all information for complete FID or RTU operation.

EVENT	EXPECTED RESULTS
3. Run MUX or ACU diagnostics.	3. Displayed results of diagnostics agree with the predicted results.
4. Command the system to display the diagnostics contents of a specific memory location which contains a selected program. Command the system to display program listing in the specified memory location.	4. Displayed results of agree with the predicted results.
5. Enter command to bulk load all contain the programs into memory. Command the system to display specified matches contractor listing.	5. Displayed contents selected program(s) and that program listing supplied program
6. Enter command to display digital analog and and analog inputs. with	6. Displayed status of digital input corresponds predicted results.
7. Enter command to control analog commands are and digital outputs. analog and DE status.	7. Analog and digital executed. Status of digital outputs match the
8. Enter command to modify specific modification. RAM location.	8. System enters

9. Enter command to display the RAM include contents of modified RAM location. the modification.	9. Displayed contents of	

Test No:

PVT-8A

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TEST NO: PVT-9A Page 1 of 1 OBJECTIVE: To verify the
TITLE: Test Set capabilities of the FID or
RTU and APPLIES TO: Large/Medium EMCS, UMCS, associated
DE simulator.
and UCS
REFERENCE: Proj. Spec. Paragraph _____

INITIAL CONDITIONS

1. The test set is connected via MODEM in the CLT to the CCU or COS. DE simulator input and outputs are part of the system data base.

EVENT	EXPECTED RESULTS
1. Exercise the Digital Outputs (DOs) from the operator's console.	1. DE simulator displays the DO signals received.
2. Exercise the Analog Outputs (AOs) the AO signal from the operator's	2. DE simulator displays console. received.
3. Exercise the Digital Inputs (DIs) from the test set.	3. Change of status is displayed at operator's console.
4. Exercise the Analog Inputs (AIs) from the test set.	4. Change of status is displayed at operator's console.
5. Exercise the pulse accumulator displayed at inputs from the test	5. Change of value is set. operator's console.
6. Execute in the test set a FID or RTU resident application program.	6. Verify output of program executed at test set matches output of program executed at FID or RTU.

Test No: PVT-9A
10 June 1994

TEST NO: PVT-10A Page 1 of 2 OBJECTIVE: To demonstrate the
TITLE: Analog and Digital I/O ability of the FID or RTU to execute Functions commands from central control and
APPLIES TO: Large/Medium EMCS, UMCS, monitor analog and digital functions.
and UCS
REFERENCE: Proj. Spec. Paragraph _____

TEST EQUIPMENT

1. A device that can generate 10 dry contact closures per second and can indicate the number of pulses transmitted.

2. Test set.

EVENT	EXPECTED RESULTS
1. Change the state of two DE digital change of status of points (for example, from on to off or from open to close) at selected FIDs or RTUs, MUXs or ACUs.	1. System displays designated points.
2. Connect a 24 VAC, 60 Hz source to a digital output of a FID/MUX or RCU/ACU. Connect a load to this digital output that draws 1 ampere.	2. Visually verify digital output operates as commanded.
3. Connect a pulse generator to a engineering units pulse accumulator input function. Generate contact closure at a rate of 10 pulses per second. Convert the total number of pulses generated, as shown on the pulse total indicator of the test equipment, into engineering units.	3. The number the displayed at the operator's console agrees with the converted number of total number of pulses generated.

PVT-10A

Test No:

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TEST NO: PVT-10A Page 2 of 2 OBJECTIVE: To demonstrate the
TITLE: Analog and Digital I/O ability of the FID or RTU to execute
Functions commands and monitor analog and
APPLIES TO: Large/Medium EMCS, UMCS, digital functions.
and UCS
REFERENCE: Proj. Spec. Paragraph _____

EVENT	EXPECTED RESULTS
4. Connect a known analog signal to an analog input function of a FID/MUX or RCU/ACU. Provide conversion of the engineering unit analog signal input.	4. The analog signal displayed at the operator's console agrees with the engineering unit conversion. known
5. Connect an analog dual input CPA controller controller with remote reset capabilities to an analog output function of a FID or RTU, MUX or feedback status ACU. Provide engineering unit conversion. From the operator's console, command analog output to increase and decrease controller setpoint.	5. Visually verify that setpoints agree with operator's console setpoint commands, and system provides a on the controller setpoint.
6. Disconnect control device from analog control device output (voltage source) for one minute. Reconnect control device and exercise analog output from the central system. Command the system to operate the control device.	6. Visually verify control device operates in accordance with command.

Test No: PVT-10A
10 June 1994

TEST NO: PVT-11A Page 1 of 1 OBJECTIVE: To demonstrate the
TITLE: Analog Input Function Noise ability of differential analog
Protection (Common Mode) input hardware to withstand noise on
APPLIES TO: Large/Medium EMCS, UMCS, the wiring connected to the analog
and UCS input. The common mode voltage
REFERENCE: Proj. Spec. Paragraph _____ appears as a voltage signal common
to both inputs of a differential
amplifier referenced to the signal
common of the system.

INITIAL CONDITIONS

1. At least two of each type of analog input hardware to be installed is selected for testing.

TEST EQUIPMENT

1. AC Signal Generator (0 - 120 Hz).

2. DC Signal Source.

EVENT	EXPECTED RESULTS
1. Connect a DC Signal Source between system display	1. Visually verify

the analog input and system ground. Adjust the source for 50 percent of full scale. Command the system to display the values of each tested analog input.	matches values of analog input in the DE.
2. Remove the ground connection from AC common mode the DC Signal Source and connect an AC Signal between the point where the system ground was connected and system ground. Adjust the value of the AC voltage source to the maximum allowable common mode voltage. The AC signal frequency should be equal to the nominal power line frequency.	2. The rejection to the signal should be at a dB level that is in accordance with contract requirements.
3. Repeat Event 2 for a frequency signal range of 0-120 Hz.	3. The rejection to the AC should be at a dB level that is in accordance with the contract requirements.

Test No: PVT-11A

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TEST NO: PVT-12A Page 1 of 1

TITLE: Analog Input Function Noise Protection (Normal Mode)

APPLIES TO: Large/Medium EMCS, UMCS, and UCS

REFERENCE: Proj. Spec. Paragraph _____

OBJECTIVE: To demonstrate the ability of the single ended analog input hardware to withstand noise on the wiring connected to the analog input. The noise appears as an AC voltage in series with the signal source.

INITIAL CONDITIONS

1. At least two of each type of analog input hardware to be installed is selected for testing.

TEST EQUIPMENT

1. 60 Cycle AC Signal Generator.

2. DC Signal Source.

EVENT	EXPECTED RESULTS
1. Connect a DC Signal Source between the input and system ground. Command the system to display values of each tested analog input.	1. Visually verify system display matches values of analog input in the DE.
2. Connect the DC Signal Source in series with the 60 Cycle AC Signal Generator. Connect these sources ground. Turn on the generators and adjust the DC level for 50 percent of the maximum input signal value. Read the output with the AC signal at zero. Adjust the AC signal level so that the sum of the DC and peak AC values do not exceed the maximum allowable input signal amplitude. The AC signal frequency should be equal to the nominal power line frequency. Request display of tested analog signal and verify display against actual DE values.	2. The rejection to the AC signal should be at a dB level that is in accordance with the contract between the analog input and signal requirements.

Test No: PVT-12A

10 June 1994

TEST NO: PVT-13A Page 1 of 1 OBJECTIVE: To demonstrate the
TITLE: Digital Input and Output ability of the digital input and
Function Isolation and output function hardware to withstand
Protection a steady-state voltage on the control
APPLIES TO: Large/Medium EMCS, UMCS, wiring connected to the digital
and UCS input/output function hardware.
REFERENCE: Proj. Spec. Paragraph _____

INITIAL CONDITIONS

1. At least one of each type of digital I/O function hardware (DI, DO, and pulse accumulator) to be installed is randomly selected for testing.

TEST EQUIPMENT

1. The test equipment is a 180 VAC, peak, 60 Hz single phase source.

EVENT	EXPECTED RESULTS
1. Command the system to display status of status of each selected digital points in the DE.	1. System display matches the I/O
2. Connect the test equipment across the digital input/output terminals at the FID/MUX or RCU/ACU, and apply the test voltage for a period of at least five minutes across the input of each type of digital input/output function hardware.	2. After the application of the test waveform, the digital input/output equipment does not exhibit any malfunctions, degradation of performance, or deviation from its normal mode of operation.

3. Command the system to display status of status of each tested digital I/O function.	3. System display matches the I/O points in the DE.	
4. Change status of digital I/O new status function.	4. System display matches of I/O points in the DE.	

Test No:

PVT-13A

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TEST NO: PVT-14A Page 1 of 2 OBJECTIVE: To demonstrate CCU or
TITLE: System Power Failure/Restart COS and FID or RTU response to
APPLIES TO: Large/Medium EMCS, UMCS, power failures and to restoration
and UCS of power
REFERENCE: Proj. Spec. Paragraph _____

INITIAL CONDITIONS

1. Selected I/O points are set up to change status during the test.

2. The contractor provides I/O summary tables for each type of analog and digital point used in the test. The I/O summary table identifies the failure mode for each point such that the failure mode is easily distinguished from normal mode.

3. FIDs or RTUs and MUXs or ACUs have the necessary I/O and associated instrumentation and control (I&C) required documents to demonstrate for each type of I/O and I&C combination failure modes required.

EVENT	EXPECTED RESULTS
1. Enter command to display status of I/O status. selected I/O points.	1. System displays
2. Initiate a power failure to the shutdown of CCU or COS, but maintain power to the FIDs or RTUs.	2. System initiates CCU or COS. The FIDs or RTUs operate in stand-alone mode.
3. Restore power to CCU or COS after automatically obtains two minutes. from RTC, CCU or human	3. The system the current time-of-day performs a warm start of COS operation without

	intervention, and is in full operation within the specified time period.
4. Enter command for display of the status which previously selected I/O status.	4. System displays I/O status corresponds with I/O status prior to power failure.

Test No: PVT-14A
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TEST NO: PVT-14A Page 2 of 2 OBJECTIVE: To demonstrate CCU or
TITLE: System Power Failure/Restart COS and FID or RTU response to
APPLIES TO: Large/Medium EMCS, UMCS, power failures and to restoration
and UCS of power
REFERENCE: Proj. Spec. Paragraph _____

EVENT	EXPECTED RESULTS
5. Initiate a power failure to the entire system.	5. System initiates an orderly shutdown of CCU or COS and without loss of contents of memory, registers, or machine status. Verify FID/MUX or RCU/ACU I/O and I&C combinations go into failure modes as defined in the I/O summary tables. Verify that I&C work in combination with I/O to perform the failure mode required by the contract documents.
6. After five minutes, restore all power and perform system startup using procedures specified by the computer manufacturer.	6. The system is automatically reinitialized before the EMCS functions are restarted. The entire system is placed in operation within the time period specified. Visually verify resumption of normal mode operation.

PVT-14A

1994

Test No:

10 June

TEST NO: PVT-15A Page 1 of 1 OBJECTIVE: To demonstrate that the
TITLE: CCU or COS Programmer Control Function CCU or COS contains the required programmer control functions.
APPLIES TO: Large/Medium EMCS, UMCS, and UCS
REFERENCE: Proj. Spec. Paragraph _____

INITIAL CONDITIONS

1. The contractor provides a listing of location and contents of selected memory locations on the CCU or COS.

2. The contractor provides a listing of CCU or COS instructions to execute a set of tasks that can be visually verified.

EVENT	EXPECTED RESULTS
1. Command the system to load software required for system operation.	1. System loads software.
2. Command the system to display contents of a specified main memory location.	2. System displays contents of designated main memory location. Visually verify that the display agrees with contractor supplied listing.

Test No: PVT-15A
10 June 1994

TEST NO: PVT-16A Page 1 of 1 OBJECTIVE: To demonstrate that the TITLE: CCU or COS Time Base difference between the CCU or COS
Generator (TBG) time base generator (TBG) and the APPLIES TO: Large/Medium EMCS, UMCS, system RTC is within specified
and UCS limits of error.
REFERENCE: Proj. Spec. Paragraph _____

INITIAL CONDITIONS

1. RTC and CCU or COS TBG are synchronized.

EVENT	EXPECTED RESULTS
1. Manually reset the RTC so that it automatically Read the RTC at the next scan cycle.	1. At the next scan cycle, the system differs from the CCU or COS TBG. interrogates the RTC and corrects the CCU or COS TBG so that it agrees with the RTC (to within one second). Alarm printer indicates a time error.

Test No: PVT-16A

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TEST NO: PVT-17A Page 1 of 1
TITLE: CCU or COS/FID or RTU Error Detection and Retransmission
APPLIES TO: Large/Medium EMCS, UMCS, and UCS
REFERENCE: Proj. Spec. Paragraph _____

OBJECTIVE: To demonstrate error detection and retransmission capabilities between the FID or RTU and CCU or COS. This test also shutdown of the DTM link when retransmission attempts exceed an operator assigned maximum.

INITIAL CONDITIONS

1. A maximum number of transmission errors are assigned for each of the DTM.

TEST EQUIPMENT

1. White noise generator on communication error generator.

EVENT	EXPECTED RESULTS
1. Generate and superimpose a white noise or communication error on each DTM.	1. CCU or COS closes down transmission on DTM originating errors and prints an alarm message after the maximum number of transmission errors is reached.
2. Operator reopens closed down DTM communications circuits after the shutdown device or DTM. or communication error generator are removed.	2. CCU or COS reopens transmission to white noise generator
3. Initiate a DTM circuit report.	3. System displays the DTM circuit report.
4. Enable the DTM to CCU or COS.	4. FID or RTU establishes communications with CCU or COS. The CCU or COS automatically sets the FID or RTU time clock, clock, and downloads all parameters, if necessary, such as: constraints, and application programs. The FID or RTU indicates that it is on-line.

Test No: PVT-17A
10 June 1994

TEST NO: PVT-18A Page 1 of 3 OBJECTIVE: To demonstrate the
TITLE: Backup Mode for CCU Failure software that detects failure of the
APPLIES TO: Large EMCS Only CCU causing the CCU to begin backup
REFERENCE: Proj. Spec. Paragraph _____ operation of the EMCS. This test also demonstrates CCU programmer control functions and CCU time base generator accuracy.

INITIAL CONDITIONS

1. Selected points in the DE are set up to initiate alarms during the test and to indicate the status of equipment to be used in the power demand limiting function.

2. The contractor provides the list of operator's commands. The contractor provides an explanation of each operator command, including expected system response to the command.

3. The electrical demand is set up to exceed allowed limits for peak demand.

4. The contractor provides a description of power demand limiting functions.

5. The system is programmed to execute the power demand limiting function.

6. The contractor provides the location and a listing of contents of selected memory locations on the CCU.

7. The contractor must provide a listing of CPU instructions to execute a set of tasks that can be visually verified by the operator.

8. RTC and CCU TBG are synchronized.

EVENT	EXPECTED RESULTS
1. Select one of the CCUs and immediately, initiate a CCU failure.	1. The system controller and automatically switches CLT

		datalines, the logging and alarm printers to the other CCU.
2. Initiate DE alarms.		2. The other CCU takes over all functions.
3. Command the system to display the corresponds list of available operator's commands from the CCU during the CCU failure.		3. Verify displayed list to contract requirements.

Test No: PVT-18A

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TEST NO: PVT-18A Page 2 of 3 OBJECTIVE: To demonstrate the
TITLE: Backup Mode for CCU Failure software that detects failure of the
APPLIES TO: Large EMCS Only CCU causing the CCU to begin backup
REFERENCE: Proj. Spec. Paragraph _____ operation of the EMCS. This test also demonstrates CCU programmer control functions and CCU time base generator accuracy.

EVENT	EXPECTED RESULTS
4. Command the system to perform each of the operator's commands listed by the system, including:	4. The system responds to each operator command in accordance with responses provided by the contractor, including:
(a) Command for status of specified points.	(a) System displays point status.
(b) Command the system to display the parameters of specific points.	(b) System displays point identification and associated parameters.
(c) Command the system to change specified point parameter(s) and input the new parameters.	(c) System acknowledges input.
(d) Command the system to display the modified parameters of the points.	(d) System displays point identification and associated parameters, including those which were modified.
(e) Command the system to control analog and digital output points.	(e) Commands are executed.

(f) Command the system to change limits designated alarms with on specified points which will longer in bring them out of alarm condition.	(f) Verify new limits are no alarm condition.
5. Initiate conditions for power demand demand limiting function and causes the system to display equipment status.	5. System executes limiting function. Command equipment to be controlled in accordance with the power demand limiting function sequence. System displays equipment status that corresponds to shutdown requirements for power demand limiting function. Verify equipment status corresponds to predicted results.

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10 June 1994

TEST NO: PVT-18A Page 3 of 3
TITLE: Backup Mode for CCU Failure
APPLIES TO: Large EMCS Only
REFERENCE: Proj. Spec. Paragraph _____

OBJECTIVE: To demonstrate the software that detects failure of the CCU causing the CCU to begin backup operation of the EMCS. This test also demonstrates CCU programmer control functions and CCU time base generator accuracy.

EVENT	EXPECTED RESULTS
6. Erase all memory resident programs in CCU. Command the system to	6. No memory resident programs are displayed.

	display directory of programs.	
7.	Reload all memory resident CCU7. Verify system performs according to programs using the bulk loader. Repeat operator interface events.	results.
8.	Command the system to load CCU8. System loads required software.	software.
9.	Command the system to display contents of a specified main memory location.	System displays contents of designated main memory location. Verify that display agrees with contractor supplied listing.
10.	Manually reset the RTC so that it cycle, the system differs from the CCU TBG. Read the automatically RTC at the next scan cycle.	10. At the next scan interrogates the RTC and corrects the CCU TBG so that it agrees with the RTC (to within one second).

TEST NO: PVT-19A Page 1 of 1 OBJECTIVE: To demonstrate that a
TITLE: CLT Device and DTM Failure single failure of any CLT device will
APPLIES TO: Large/Medium EMCS, UMCS, result in the loss of no more than
and UCS one DTM link.
REFERENCE: Proj. Spec. Paragraph _____

EVENT	EXPECTED RESULTS
1. Command the system to display data status of FIDs or from selected FIDs or RTUs. Initiate failure of a CLT device in the contract in each DTM link. Command the system to display FIDs or RTUs not responding.	1. System displays RTUs not responding, which corresponds to drawings for the CLT/DTM arrangement. Data from FIDs or RTUs not responding is highlighted as not current.
2. Initiate alarms at I/Os associated with the DTMs in service.	2. System displays alarms.
3. Initiate a failure of one DTM link between CLT and CCU or COS. Command the system to display FIDs or RTUs not responding.	3. System displays status of FIDs or RTUs not responding, which corresponds to the FID/MUX or RCU/ACU associated with the failed DTM link. FIDs/MUXs or RCUs/ACUs associated with each DTM must be as shown in the contract requirements.
4. Initiate alarms at the I/Os associated with the DTMs in service.	4. System displays alarms.
5. Repeat Events 3 and 4 for each DTM link.	5. System responds as in Events 3 and 4.

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TEST NO: PVT-20A Page 1 of 1
TITLE: Backup to Disk Storage System Failure
APPLIES TO: Large/Medium EMCS Only
REFERENCE: Proj. Spec. Paragraph ___

OBJECTIVE: To demonstrate performance of the duplicate disk system in the event of primary disk system failure.

INITIAL CONDITIONS

1. Selected points in the DE are set up to change status during the test period.

EVENT	EXPECTED RESULTS
1. Initiate a failure in the primary disk system.	1. System will not respond to any commands.
2. Bring the second disk system "on-line" by use of the programmer's or a pre-programmed bootstrap routine (rewiring or reconnecting is not permissible). Institute change of status for selected DE points.	2. System updates the data base automatically and is fully operational within 15 minutes after placing the backup disk system on-line.
3. Within fifteen minutes after display of second disk is brought on-line, corresponds command the system to display the status of the selected points in DE that changed status during the disk failure.	3. Verify that the system selected point status to the DE status.

PVT-20A

Test No:

10 June 1994

TEST NO: PVT-21A Page 1 of 1 OBJECTIVE: To demonstrate that
TITLE: Magnetic Tape Validation files can be successfully
APPLIES TO: Large/Medium EMCS, UMCS, transferred from disk to magnetic
and UCS tape and from magnetic tape to disk.
REFERENCE: Proj. Spec. Paragraph _____

INITIAL CONDITIONS

1. The contractor provides a directory of disk files containing the CCU or COS software required in the contract documents.

EVENT	EXPECTED RESULTS
1. Command the system to display the directory of the directory of all files (name and size) containing EMCS, UMCS, or UCS software.	1. System displays disk files which corresponds to contractor supplied list.
2. Transfer files from disk to that were magnetic tape. Clear directory on disk and command the system to display directory of files.	2. The list of those files transferred is not displayed.
3. Transfer files from magnetic tape to disk. Command the system to display directory of files.	3. System displays directory of files that corresponds to contractor supplied list.

Test No: PVT-21A
10 June 1994

TEST NO: PVT-22A Page 1 of 1 OBJECTIVE: To demonstrate that the EMCS system contains all system
TITLE: Software Validation
APPLIES TO: Large/Medium EMCS, UMCS, and UCS software and disk capacity required in the contract documents to manage the CCU or COS and associated peripherals as well as supporting command software and application programs.
REFERENCE: Proj. Spec. Paragraph _____

INITIAL CONDITIONS

1. The contractor provides a directory of disk files containing the CCU or COS software required in the contract documents.

2. Written description of system software must be provided by the manufacturer of the EMCS, UMCS, or UCS software. The system software description can be augmented by the EMCS, UMCS, or UCS manufacturers for those items that are EMCS, UMCS, UCS specific.

EVENT	EXPECTED RESULTS
1. Command the system to display the directory of the directory of all files (name and disk files. Name of the files and size) containing EMCS, UMCS, UCS size must match the written software. description of the files required in each of the system programs specified in the contract documents. Verify the total disk capacity (used plus spare) corresponds with contract requirements.	1. System displays
2. Command the system to print the programs randomly selected application which are	2. System prints out the

written in a high-level software program files.
language. Verify printouts agree
with the contractor furnished
documentation.

Test No:

PVT-22A

10 June 1994

TEST NO: PVT-23A Page 1 of 1 OBJECTIVE: To demonstrate the
TITLE: Program Development operation of the program development
APPLIES TO: Large/Medium EMCS, UMCS, and debugging of control programs
and UCS while running the system in the
REFERENCE: Proj. Spec. Paragraph _____ on-line mode.

INITIAL CONDITIONS

1. The contractor provides a source program written in a high-level language with known errors that perform a verifiable operation in the DE. (For example, provide a program that starts and stops equipment based on time and indoor/outdoor temperatures.) The contractor also provides input data and expected results.

2. The system is performing on-line monitoring and control functions throughout the test.

3. Operator is logged onto system at a level that enables operator access to the custom programming capabilities.

EVENT	EXPECTED RESULTS
1. Enter source program with name of program file via the editor. (This program will be called the "test program" contractor hereafter.) Command the system to generate hard copy output.	1. System loads and compiles program into object code. Verify a hard copy listing matches supplied listing, and that system displays error messages on known errors.
2. Correct errors via the editor and compiles corrected program. Command the system to generate hard copy output.	2. System loads and program. Verify hard copy printout corresponds to contractor supplied document without errors.
3. Command the system to save the program on disk test program on designated disk file.	3. System saves test file.

4. Initiate the debugging software to check program logic. Check output information for the operator to follow, line by line, the execution of the program. Verify program output agrees with expected results using the FID or RTU test set.	4. System provides necessary program against expected results using FID or RTU test set and its associated DE.
5. Command the system to actuate the program to the program in the CCU or COS using a status FID/MUX or RTU/ACU and its associated DE.	5. System transfers the CCU or COS on-line mode using a FID/MUX or RCU/ACU.
6. Command the system to display the of active directory programs active in the CCU or COS.	6. Verify system display programs includes the test program.

Test No: PVT-23A
10 June 1994

TEST NO: PVT-24A Page 1 of 1 OBJECTIVE: To demonstrate capability
TITLE: Diagnostics of the diagnostic programs to detect
APPLIES TO: Large/Medium EMCS, UMCS, hardware and software problems and
and UCS display the corresponding error
REFERENCE: Proj. Spec. Paragraph _____ messages.

EVENT	EXPECTED RESULTS
1. Initiate diagnostic program to test the CCU or COS as designated in the contract documents.	1. System initiates diagnostic programs and displays the status of each diagnostic routine performed.
2. Initiate diagnostic program for each peripheral device as designated in the contract.	2. System displays status for each diagnostic routine performed.

Test No:

PVT-24A

10 June 1994

TEST NO: PVT-25A Page 1 of 1 OBJECTIVE: To demonstrate the
TITLE: System Access Control ability of the system to control
APPLIES TO: Large/Medium EMCS, UMCS, operator access to software based
and UCS on selectable passwords.
REFERENCE: Proj. Spec. Paragraph _____

INITIAL CONDITIONS

1. The contractor provides a list of passwords for each access level and a list of software and commands accessible at each access level. All access levels required in the contract documents are tested.

EVENT	EXPECTED RESULTS
1. Log on with the password that corresponds to an access level and command the system to display software accessible at the given access level. Visually verify the display matches the contractor's list. Repeat for each access level.	1. System acknowledges log on and displays software accessible at the given access level.
2. For all but the highest access level, command the system to perform a function that cannot be performed at the current access level.	2. System indicates command cannot be executed at the current access level.
3. Log on with a password to access (For example, software for performing a specific function. (For example, command the system to set up high/low limits on analog point.)	3. Command is executed. observe change in high/low limit in a designated analog point.)
4. Log on with a higher access password and repeat software command in Event 3.	4. Command is executed.

5. Log on with a lower access password (that prevents access to software in Event 3) and repeat software command in Event 3.	5. System indicates command cannot be executed at current access level.	
6. Repeat Events 3, 4, and 5 for every remaining level.	6. Commands are executed only when the software and/or command is accessible at the given access level.	
7. Change an existing password to a new password with a higher access level and repeat Events 2 and 3.	7. Commands are executed only when the software and/or command is accessible at the given access level.	

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10 June 1994

TEST NO: PVT-26A Page 1 of 6
TITLE Operator Commands
APPLIES TO: Large/Medium EMCS, UMCS, and UCS
REFERENCE: Proj. Spec. Paragraph _____ associated with daily operation of the system.

OBJECTIVE: To demonstrate the operation of the software which enables the operator to interface with the system for all functions

INITIAL CONDITIONS

1. The contractor must provide a list of Operator Commands and an explanation of the expected response to each command.

2. The DE contains disabled points not in communication with the System.

3. Operable points in the DE include one of each type of I/O points to be installed.

4. The contractor provides a listing of the I/O points to be addressed during the test.

SPECIAL COMMENTS

After entering an operator command, the system responds with a request for operator verification that the command is to be executed. In the following events which command the system to execute an operator command, it is assumed, in each case, the system will request operator verification and the operator will confirm the request prior to execution. It is assumed that the system will acknowledge the command and commence processing within five seconds of command entry. Operator commands can be entered using English words, acronyms and either special function keys, light pen, or touch screen. All commands must be issued using both full English command and specified enhancements.

EVENT	EXPECTED RESULTS
1. Log on to the system with an password incorrect password.	1. The system indicates the is not valid and does not allow the

	operator to log on.
2. Log on to the system with a on and password that allows total access to all operator commands.	2. System acknowledges log operator displays operator's name or initials in the operator's console first field. The password should not be displayed or printed. The operator's name, the action, date and time of log-on is printed on the logging printer.

Test No: PVT-26A

10 June 1994

TEST NO: PVT-26A Page 2 of 6
TITLE Operator Commands
APPLIES TO: Large/Medium EMCS, UMCS, and UCS
REFERENCE: Proj. Spec. Paragraph _____

OBJECTIVE: To demonstrate the operation of the software which enables the operator to interface with the system for all functions associated with daily operation of the system.

EVENT	EXPECTED RESULTS
3. Enter the operator command for the all operator help function.	3. System displays commands available to the operator at the password access level. The list must match the list of commands provided by the contractor.
4. Enter the help command followed by a specific operator command.	4. System displays the purpose, use, and expected system reaction to the command. This explanation must agree with the contractor supplied documentation.
5. Command the system to print succeeding operator's commands at inputs on the logging printer.	5. System prints all logging operator printer.
6. Enter an abbreviated mode operator the system executes command.	6. Visually verify the command.
7. Enter an operator command without operator operator confirming action.	7. System requests verification.
8. Enter the cancel action.	8. Command is canceled.
9. Enter a command not listed in is	9. System indicates command

the set of operator commands.	incorrect and does not request operator verification for execution.
10. Enter command for display of I/O requested I/O functions defined in the data base, in accordance with the following address levels: . Installation. . Area. . Building. . Unit. . Point.	10. System displays function data on the selected output device.

Test No: PVT-26A
10 June 1994

TEST NO: PVT-26A Page 3 of 6
TITLE Operator Commands
APPLIES TO: Large/Medium EMCS, UMCS, and UCS
REFERENCE: Proj. Spec. Paragraph _____ associated with daily operation of the system.

OBJECTIVE: To demonstrate the operation of the software which enables the operator to interface with the system for all functions

EVENT	EXPECTED RESULTS
11. Command the system to display data status of selected digital points and analog points.	11. System commences display of data status of selected digital points within 10 seconds from command entry.
12. Command the system to shut down specified equipment at a designated location FID/MUX or RCU/ACU by entering the STOP/DISABLE command.	12. Designated equipment commences shutdown at the specified location within 10 seconds from command entry.
13. Command the system to start up a device at a designated FID/MUX or designated location RCU/ACU by entering the START/ENABLE command command.	13. Designated equipment commences start up at the specified location within 10 seconds from command entry. System displays change in equipment status within 20 seconds from command entry, plus response time for the start up of controlled equipment.
14. Command the system to change the limit of limits of a designated analog function. (For example, command a change in the high/low limit. Then system displays change the DE condition to exceed the analog point in alarm.	14. The system modifies each analog function within 10 seconds from command entry. Visually verify

high or low analog set points.)

15. Command the system to adjust the set points of designated controllers by entering the set points/limits command.	15. Visually verify the system commences to adjust the set points of the designated controllers within 10 seconds of command entry. The system commences to display a change in point status within 20 seconds from command entry, plus response time for the shutdown of controlled equipment.
16. Command the system to convert in control designated control functions from automatic mode to manual control (from the operator's console).	16. Visually verify change mode from automatic to manual.

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TEST NO: PVT-26A Page 4 of 6
TITLE Operator Commands
APPLIES TO: Large/Medium EMCS, UMCS, and UCS
REFERENCE: Proj. Spec. Paragraph _____ associated with daily operation of the system.

OBJECTIVE: To demonstrate the operation of the software which enables the operator to interface with the system for all functions

EVENT	EXPECTED RESULTS
17. Command the system to initiate a change in the DE via the designated command command the system to shut down equipment.)	17. Visually verify the system commences to initiate a change in command function. (For example, the DE within 10 seconds of entry. The system commences to display a change in point status within 20 seconds from command entry, plus response time for the shutdown of controlled equipment.
18. Command the system to change in control equipment control modes currently in manual control to automatic control. Reset the time to initiate automatic control of equipment. (For example, reset the equipment stop time so that equipment will automatically shut down in five minutes.)	18. Visually verify change from manual to automatic mode.
19. Command the system to disable specified inputs selected I/O points in a FID or RTU.	19. Visually verify I/O points in a FID or are disabled (in failure mode) within 10 seconds of command entry.

20. Command the system to disable selected I/O points in a MUX or ACU.	20. System disables selected I/O points.
21. Command the system to address the command addresses disabled point identified in initial conditions.	21. System indicates a point which is disabled.
22. Command the system to enable the designated points that were just disabled.	22. Visually verify each point is enabled (in normal mode) within 10 seconds from command entry.
23. Command the system to disable a the I/O designated FID or RTU.	23. Visually verify that functions of disabled FID are in the failure mode within 10 seconds from command entry.

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TEST NO: PVT-26A Page 5 of 6 OBJECTIVE: To demonstrate
TITLE Operator Commands the operation of the software which
APPLIES TO: Large/Medium EMCS, UMCS, enables the operator to interface
and UCS with the system for all functions
REFERENCE: Proj. Spec. Paragraph _____ associated with daily operation of
the system.

EVENT	EXPECTED RESULTS
24. Command the system to enable the FID or RTU is disabled FID or RTU.	24. Visually verify the enabled within 10 seconds from command entry. Visually verify change of status for the FID or RTU I/O functions to be the same as prior to disabling FID or RTU.
25. Command the system to disable the the MUX or ACU designated MUX or ACU.	25. Visually verify that functions are in the failure mode within 10 seconds from command entry.
26. Command the system to enable the MUX or ACU is disabled MUX or ACU.	26. Visually verify each enabled within 10 seconds from command entry. Visually verify change of status for the MUX or ACU I/O functions to be the same as prior to disabling outputs within 10 seconds from command entry.
27. Command the system to modify the equipment schedule automatic schedule selected equipment.	27. Visually verify of operation for has been altered.

28. Command the system to execute a command task on an analog point that contains a value outside the given point parameter definition.	28. System indicates that the task would violate constraints.
29. Command the system to execute a command task without providing sufficient information for execution.	29. System indicates that the data used is incorrect or incomplete.
30. Command the system to execute a task on an existing point that is currently not in communication with the system.	30. System indicates that the point addressed is out of service.

Test No: PVT-26A

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TEST NO: PVT-26A Page 6 of 6 OBJECTIVE: To demonstrate
TITLE Operator Commands the operation of the software which
APPLIES TO: Large/Medium EMCS, UMCS, enables the operator to interface
and UCS with the system for all functions
REFERENCE: Proj. Spec. Paragraph _____ associated with daily operation of
the system.

EVENT	EXPECTED RESULTS
31. Command the system to execute a the command task on a nonexistent point. point which does not exist.	31. System indicates that addressed a
32. Command the system to execute any purpose, use, operator commands displayed in and expected system reaction to the response to the help command but not command. This explanation must yet tested in the preceding events. agree with the contractor supplied Include any data necessary to documentation. execute the command.	32. System displays the
33. Log off the system.	33. System acknowledges log off and displays operator's name or initials in the operator's console first field. Operator's name, date and log-on time are printed on the logging printer.
34. Log on to the system with a on and password that allows minimum operator access to commands.	34. System acknowledges log displays operator's name or initials in the operator's console first field.
35. Enter a command that requires a operator is higher level password for from using that command.	35. System indicates the restricted

for execution.

Test No: PVT-26A
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TEST NO: PVT-27A Page 1 of 3 OBJECTIVE: To verify that point(s)
TITLE Data Environment (DE) in the data base can be defined by Definition Process the operator from the operator's
APPLIES TO: Large/Medium EMCS, UMCS, console with its own set of
and UCS parameters, definitions and
REFERENCE: Proj. Spec. Paragraph _____ constraints.

INITIAL CONDITIONS

1. The contractor provides the necessary input data for an operator to define selected analog and digital point(s) using English language commands and environments. The points selected for the test must include at least one of each type of I/O points to be installed, and at least one pulse accumulation point.

2. An allowed range of input has been assigned to each tested I/O point.

SPECIAL COMMENTS

After entering an operator command, the system responds with a request for operator verification that the command is to be executed. In the following events which command the system to execute an operator command, it is assumed, in each case, the system will request operator verification and the operator will confirm the request prior to execution. It is assumed that the system will acknowledge the command and commence processing within five seconds of command entry.

EVENT	EXPECTED RESULTS
1. Log on to the system with a password that allows operator access to the DE definition process.	1. System acknowledges log on, displays and prints data in accordance with contract documents.
2. Command the system to accept input for point definition.	2. System request inputs.

3. Input data for each point. . Name . Device or sensor type (i.e., shall be sensor, control relay, motors). . Building unit and point. . Area and installation. . FID or RTU number and channel. . MUX or ACU number and channel address. . kW (starting). . kW (running) (digital kW demand function). . Range (analog functions only). . Span (analog functions only).	3. System acknowledges input for each point. At each step of the process, inputs outside the predefined system ranges rejected with a reason stated.

Test No: PVT-27A

10 June 1994

TEST NO: PVT-27A Page 2 of 3 OBJECTIVE: To verify that point(s) in the data base can be defined by the operator from the operator's console with its own set of parameters, definitions and constraints.

TITLE: Data Environment (DE) Definition Process

APPLIES TO: Large/Medium EMCS, UMCS, and UCS

REFERENCE: Proj. Spec. Paragraph _____

EVENT	EXPECTED RESULTS
3. (continued) . Engineering units conversion (scale factor). . Low limit alarm (value in engineering units) (analog alarm functions only). . High limit alarm (value in engineering units) (analog alarm functions only). . Alarm class and associated message text.	

- Run-time target (digital functions with run-time targets).
- Failure modes as specified in the I/O summary tables.
- High reasonableness value (analog function).
- Low reasonableness value (analog function).
- High limit alarm differential (analog).
- Low limit alarm differential (analog).
- Analog value change differential.
- Other data required by the system as specified in the contract documents.

4. Command the system to modify data for modified points. 4. System requests input for several but not all previously entered data. values.

5. Command the system to display data includes 5. Verify displayed data includes modified values.

6. Command the system to accept the input for each following FID or RTU resident constraints: 6. System acknowledges point.

- Maximum starts (cycles) per hour (digital control functions only).

Test No: PVT-27A
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TEST NO: PVT-27A Page 3 of 3 OBJECTIVE: To verify that point(s)
TITLE Data Environment (DE) in the data base can be defined by Definition Process the operator from the operator's
APPLIES TO: Large/Medium EMCS, UMCS, console with its own set of
and UCS parameters, definitions and
REFERENCE: Proj. Spec. Paragraph _____ constraints.

EVENT
EXPECTED RESULTS

6. (continued)

. Minimum off time (digital control functions only). . Minimum on time (digital control functions only). . Maximum off time (digital control functions only). . High constraint limit (value in engineering units) (analog control functions only). . Low constraint limit (value in engineering units) (analog control functions only).	
7. Command the system to schedule equipment operations that exceed the FID or RTU resident constraints defined for each I/O control function in the test. . For example, for the digital control point, command the system to schedule: - More than the maximum allowed starts per hour. - An off time that is shorter than the allowed minimum. - An on time that is shorter than the allowed minimum. . For example, for analog control point, assign limits that exceed: - High limit. - Low limit.	7. System indicates that cannot be executed because the FID or RTU memory resident constraints have been exceeded.
8. Command the system to display the system display of point definition data for each point defined in the test.	8. Visually verify each point in the test corresponds to initial input.

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TEST NO: PVT-28A Page 1 of 12 OBJECTIVE: To demonstrate the
TITLE: Report Generator software which generates reports in a
APPLIES TO: Large/Medium EMCS, UMCS, and UCS fixed format either by operator request or in periodic automatic
REFERENCE: Proj. Spec. Paragraph _____ mode.

INITIAL CONDITIONS

1. The DE is set up to generate at least 64 alarm conditions. Each alarm must have correlated dependent parameters. (For example, a start/stop alarm on a fan would also result in temperature alarms.) At least one alarm must have 32 dependent parameters.

2. The DE must provide the necessary input data to the system for the required reports to be generated.

3. The contractor must indicate how much storage is allocated for each type of report and relate this value to the size and quantity of profile reports required by the contract documents as well as the disk storage system sizing requirements.

4. The system is programmed to generate hourly, daily, and monthly values for each type of report. The data for the reports is stored concurrently and automatically.

5. The preselected points to be included in the reports must include the following address levels:

   . Point.
   . Equipment unit.
   . Building.
   . Area.
   . Installation.

6. Preselected output points for each specified report type are set up to become disabled during the test period.

7. Preselected output points for each specified report type are set up to be in alarm condition during the test period. Select alarm points so that each alarm class is represented.

8. Electric demand intervals are defined in the system software.

9. Target run-times have been established for each selected equipment item via the DE definition process.

10. Selected equipment run-time totals are set up to be 9,999 hours. Other selected equipment are set up to have reached their target.

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TEST NO: PVT-28A Page 2 of 12 OBJECTIVE: To demonstrate the
TITLE: Report Generator software which generates reports in a
APPLIES TO: Large/Medium EMCS, UMCS, fixed format either by operator
and UCS request or in periodic automatic
REFERENCE: Proj. Spec. Paragraph _____ mode.

INITIAL CONDITIONS (continued)

11. The system is set up to have chiller utilization data for at least 10 discrete loading levels, including run-time for each load level and total run-time.

12. Selected building indoor temperature points are set up to maintain temperature levels below required occupancy temperatures throughout test period.

SPECIAL COMMENTS

1. Each report must indicate the date and time the data was obtained and the date and time the report was generated.

EVENT	EXPECTED RESULTS
1. Command the system to automatically information to collect data for all the reports to	1. System requests collect data for all reports to

be generated. Command the system to generate all the reports automatically without operator interaction at different times of the day.	be generated automatically.
2. Command the system to generate and display a status report of a list of equipment, sensors or control devices by each of the following categories: . Building. . Point. . Unit. . Area. . Installation.	2. System displays status of equipment, sensors, or control devices in the selected category.

Test No: PVT-28A

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TEST NO: PVT-28A Page 3 of 12 OBJECTIVE: To demonstrate the
TITLE: Report Generator software which generates reports in a
APPLIES TO: Large/Medium EMCS, UMCS, fixed format either by operator
and UCS request or in periodic automatic
REFERENCE: Proj. Spec. Paragraph _____ mode.

EVENT	EXPECTED RESULTS
3. Command the system to generate a time, the time status report automatically at fixed intervals between reports, and intervals. (For example, report on status of selected temperature sensors.)	3. System requests a device on which report will be displayed.
. Enter desired time intervals. (At least four reports must be generated during the test period.)	. System acknowledges input.
. Specify the printer as the output report is generated at device.	. Automatic specified time(s) and displayed on the printer in fixed format.
. Command the system to cancel the command.	. System acknowledges report. Visually verify the periodic automatic report is not generated at the programmed time.
. Command the system to change the the change. generation mode for a specified that was formally periodic report - from automatic to automatic will be generated as request mode.	. System acknowledges Report periodic requested by the operator.

. Command the system to generate an immediate printout of the latest status report using the PRINT REPORT enhancement function.	. System generates and displays the latest status report that was previously generated automatically.
. Command the system to change the time interval.	. System generates and displays status report with new time interval.
4. Command the system to store the data by type of data from the latest status report, date and time.	4. System stores report.

Test No: PVT-28A
10 June 1994

TEST NO: PVT-28A Page 4 of 12 OBJECTIVE: To demonstrate the
TITLE: Report Generator software which generates reports in a
APPLIES TO: Large/Medium EMCS, UMCS, fixed format either by operator
and UCS request or in periodic automatic
REFERENCE: Proj. Spec. Paragraph _____ mode.

EVENT	EXPECTED RESULTS
5. Generate the maximum number of correlated alarm alarm conditions in the DE that are reports which contain at least the specified in the contract documents following: for correlated alarm reports.	5. System generates . Date and time of alarm. . Identification of the initiating alarm. . Identification of correlated dependent parameters.
6. Command the system to generate profile reports. Specify at least one of each type of the following profile reports: . Power consumption (value vs time). . Power demand (value vs time). . Temperatures (value vs time). . Equipment subsystem profiles (value vs value, value vs time). The total number of profile reports requested must be equal to the maximum number specified in the contract documents and must contain the maximum number of samples and parameters.	6. System requests report data. Systems requests time interval between reports. System acknowledges input.

Specify output device to be the requested printer.	The system generates profile reports on the printer.

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TEST NO: PVT-28A Page 5 of 12 OBJECTIVE: To demonstrate the
TITLE: Report Generator software which generates reports in a
APPLIES TO: Large/Medium EMCS, UMCS, fixed format either by operator
and UCS request or in periodic automatic
REFERENCE: Proj. Spec. Paragraph _____ mode.

EVENT	EXPECTED RESULTS
7. Command the system to display the sufficient storage system to display the storage disk to store space allocated for each report.	7. Verify that space is allocated on the number of profiles for each of the number of samples in accordance with the contractor's method of storing input parameters.
8. Command the system to terminate profile report reports.	8. System terminates generation.

ELECTRICAL POWER UTILIZATION SUMMARY:

1. Command the system to generate the Electrical Power Utilization Summary.	1. System requests meter identification and time period.
2. Enter meter identification(s). Specify the date of beginning day of the month.	2. System generates the following data for each meter: Request daily and monthly totals. . Total daily consumption. . Total monthly consumption for the specified period. . Peak electric demand interval for the month and day, with time of occurrence. . Consumption over each demand interval for the month. . OA temperature for each demand interval. . OA relative humidity (RH) for each demand interval. . Calculated heating and cooling degree days.

Test No: PVT-28A
10 June 1994

TEST NO: PVT-28A Page 6 of 12 OBJECTIVE: To demonstrate the
TITLE: Report Generator software which generates reports in a
APPLIES TO: Large/Medium EMCS, UMCS, fixed format either by operator
and UCS request or in periodic automatic
REFERENCE: Proj. Spec. Paragraph _____ mode.

EVENT	EXPECTED RESULTS
ENERGY UTILIZATION SUMMARY:	
1. Command the system to generate the identification of Energy Utilization Summary. System requests beginning and ending times	1. System requests the point, unit, building, area, and/or [installation]. for sampling intervals.
2. Enter identification of desired report for each I/O points according to each of the following address levels: . A specific point in each DTM. . A unit in each DTM. . A building in each DTM. . An area. . [Installation.] . The entire EMCS.	2. System generates a addresss level. Each report must contain: . Beginning and ending dates and times. . Total energy usage for the current and previous day. . Total energy usage for the current and previous month. . Maximum rate of consumption for the current and previous day. . Maximum rate of consumption for the current and previous month.

	. OA temperature and relative humidity (RH) for the sampling period (high, low, average). . Calculated heating and cooling degree days.
ALARM REPORT:	
1. Command the system to generate the report listing Alarm Report.	1. System generates a all outstanding alarms by class, including time of occurrence.

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TEST NO: PVT-28A Page 7 of 12
TITLE: Report Generator
APPLIES TO: Large/Medium EMCS, UMCS, and UCS
REFERENCE: Proj. Spec. Paragraph _____

OBJECTIVE: To demonstrate the software which generates reports in a fixed format either by operator request or in periodic automatic mode.

EVENT	EXPECTED RESULTS
LOCKOUT REPORT:	
1. Command the system to generate the report listing Lockout Report.	1. System generates a all points currently disabled, including time disabled, and identification of operator disabling the point.

ANALOG LIMIT REPORT:

1. Command the system to generate the report with the Analog Limit Report.	1. System generates a following data for each analog point including those with suppressed alarm functions. . Identification. . Current analog value. . Engineering units. . High and low limits. . High and low limit differentials. . High and low reasonableness limit. . Value change differentials.
2. Command the system to generate the report with the Analog Limit Summary by building and by unit.	2. System generates a following data for each analog point including those with suppressed alarm functions. . Identification. . Current analog value. . Engineering units. . High and low limits. . High and low limit differentials. . High and low reasonableness limit. . Value change differentials.

Test No: PVT-28A
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TEST NO: PVT-28A Page 8 of 12 OBJECTIVE: To demonstrate the
TITLE: Report Generator software which generates reports in a
APPLIES TO: Large/Medium EMCS, UMCS, fixed format either by operator
and UCS request or in periodic automatic
REFERENCE: Proj. Spec. Paragraph _____ mode.

EVENT	EXPECTED RESULTS
RUN-TIME REPORTS:	
1. Command the system to generate the identification of Run-Time Report.	1. System requests equipment.
2. Enter identification of desired report that equipment according to each of the for following address levels: . Individual equipment items (for example, fan unit A in Building 1). . An equipment type (for example, all air handling units (AHUs)). . An equipment type and size (for example, all AHUs over 10 hp). . Equipment by physical grouping (for example, HVAC System I). Equipment must have run-times of 9,999 hours (as established in initial conditions). Include equipment which has reached their respective run-time target (as established in initial conditions). . All equipment.	2. System generates a provides the total run-time each equipment unit in each address level.
3. Manually reset run-time to zero for a Run-Time Report selected equipment and request Run-Time Report for the equipment.	3. System generates based on new time origin.

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TEST NO: PVT-28A Page 9 of 12 OBJECTIVE: To demonstrate the
TITLE: Report Generator software which generates reports in a
APPLIES TO: Large/Medium EMCS, UMCS, fixed format either by operator
and UCS request or in periodic automatic
REFERENCE: Proj. Spec. Paragraph _____ mode.

EVENT	EXPECTED RESULTS
COOLING TOWER PROFILES:	
1. Command the system to generate the cooling tower Cooling Tower Profile.	1. System requests identification.
2. Enter cooling tower identification.	2. System acknowledges input and generates a report that provides: . Total daily and monthly on-time (each fan). . Number of ON and OFF transitions (each fan). . Maximum and minimum daily condenser water temperature at the time the cooling tower was turned on, and the time of occurrence. . Maximum and minimum daily condenser water

	temperature for the current month.

ELECTRICAL PEAK DEMAND PREDICTION REPORT:

1. Command the system to generate the meter Electrical Peak Demand Prediction Report.	1. System requests identification.
2. Enter definition for individual input and meter or groups of meters to be each meter totalized.	2. System acknowledges generates a report for that provides: . Target. . Actual peak and predicted peak for each demand interval for that day. . Predicted demand for the next demand interval.

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TEST NO: PVT-28A Page 10 of 12 OBJECTIVE: To demonstrate the
TITLE: Report Generator software which generates reports in a
APPLIES TO: Large/Medium EMCS, UMCS, fixed format either by operator
and UCS request or in periodic automatic
REFERENCE: Proj. Spec. Paragraph _____ mode.

EVENT	EXPECTED RESULTS
CHILLER UTILIZATION SUMMARY:	
1. Command the system to generate the Chiller Utilization Summary.	1. System requests chiller identification.
2. Enter chiller identification.	2. System generates the chiller utilization summary report that provides: . Daily run-time in each one of at least 10 discrete loading levels. . Daily run-time average for the above discrete loading levels. . Total on-time for each level for the current month. . Run-time monthly average expressed in kWh and Btu/hr for the total on-time at each level.
OPTIMUM START/STOP REPORT:	
1. Command the system to generate the report that lists Optimum Start and buildings.	1. System generates Report for all systems the systems or buildings not meeting occupancy temperature

or minus time, request.	requirements within plus 20 minutes of designated updated daily or upon
	The report provides:
schedule.	. System and building identification. . Building occupancy . Actual start time. . Calculated start time. . Space temperature at beginning of occupancy. . OA temperature at beginning of occupancy.
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TEST NO: PVT-28A Page 11 of 12 OBJECTIVE: To demonstrate the
TITLE: Report Generator software which generates reports in a
APPLIES TO: Large/Medium EMCS, UMCS, fixed format either by operator
and UCS request or in periodic automatic
REFERENCE: Proj. Spec. Paragraph _____ mode.

EVENT	EXPECTED RESULTS
2. Command the system to generate the report that lists Optimum Stop and buildings.	2. System generates Report for all systems the systems or buildings not maintaining occupancy temperature within 20 minutes of designated time, updated daily or upon request. The report provides: . System and building identification. . Building occupancy schedule. . Actual stop time. . Calculated stop time. . Space temperature at end of occupancy. . OA temperature at end of occupancy.
OUT OF SERVICE REPORT:	
1. Command the system to generate the report schedule and locations to be reported.	1. System requests Out-of-Service Report.
2. Enter requests for reports on service equipment at each of the following locations:	2. System generates out of reports for each location. The reports list all disabled points.

. MCR.
. DTM link.
. FID or RTU panel.
. MUX or ACU panel.

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TEST NO: PVT-28A Page 12 of 12 OBJECTIVE: To demonstrate the
TITLE: Report Generator software which generates reports in a
APPLIES TO: Large/Medium EMCS, UMCS, fixed format either by operator
and UCS request or in periodic automatic
REFERENCE: Proj. Spec. Paragraph _____ mode.

EVENT	EXPECTED RESULTS
STATIC DATA BASE REPORT:	
1. Command the system to generate a list of the Static Data Base Report by building, zone, FID or RTU and all points.	1. System generates a list of the active data base in categories of building, zone, FID or RTU, and all points. The points have fixed parameters and constraints.
REAL-TIME DATA BASE REPORT:	
1. Command the system to generate a list of the Real-Time Data Base Report by building, zone, FID or RTU and all points.	1. System generates a real-time data base. The list will include analog input, digital input and calculated points. The points shall be concurrent by the year, month, day, hour, and minute.
DTM CIRCUIT REPORT:	
1. Command the system to generate a DTM circuit DTM circuit report on all communication circuits with the	1. System generates the report.

following information:

. Operator selected number (1-99) retransmission attempts.
. Total number of transmissions attempted (0-128,000 - minimum).
. Present consecutive retries (in progress) (1-99).
. Total number of retries (cumulative to 32,000).
. Status of DTM circuit (enabled or disabled).

Test No:

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TEST NO: PVT-29A Page 1 of 5 OBJECTIVE: To demonstrate the
TITLE: Operator's Console Color software that operates the operator's
Display console and generates graphic
APPLIES TO: Large/Medium EMCS, UMCS, displays.
and UCS
REFERENCE: Proj. Spec. Paragraph _____

INITIAL CONDITIONS

1. The contractor provides an I/O summary of the DE list associated with each graphic display requested during the test.

2. The DE is set up to generate an event (such as an alarm) to test the software for displaying a graphic after a specified event.

3. The contractor provides a sample new graphic to be developed during the test.

4. The contractor provides a list of standard graphic symbols required in the contract documents, plus some additional graphic symbols to be added to the system during the test.

5. Second operator's console is being used to monitor a graphic display.

EVENT	EXPECTED RESULTS
ALPHANUMERIC DISPLAY	
1. Enter operator password to access the highest operator level.	1. System acknowledges password.
2. Command the system to generate an alphanumeric monitor display of I/O points by system or individual I/O points. (For example, request a monitor display of an air handling unit (AHU).)	2. Visually verify that the system displays the following data in fixed format: . Time of day (first field) (hours, minutes, seconds).

points (first

. Date (first field) (month, day, year: i.e., 10/25/86).
. Value of two analog field).
. Operator name or initials (first field).
. Alarm display and operator commands (second field). System displays, in varying format, the requested data (third field).

Test No: PVT-29A
10 June 1994

TEST NO: PVT-29A Page 2 of 5 OBJECTIVE: To demonstrate the
TITLE: Operator's Console Color software that operates the operator's
Display console and generates graphic
APPLIES TO: Large/Medium EMCS, UMCS, displays.
and UCS
REFERENCE: Proj. Spec. Paragraph _____

EVENT	EXPECTED RESULTS
GRAPHIC DISPLAY	
3. Command the system to list the of graphic the graphic displays in the system.	3. System displays a list displays available to the operator.
	Verify list corresponds to contract documents.
4. Command the system to display a displays fixed graphic from the prior list information plus graphic generated by the system.	4. Operator console format display with associated live data.
5. Command the system to display all system displays standard graphic symbols in the system library. These symbols	5. Visually verify the all symbols required in the contract documents. conform to the ASHRAE Handbook of Fundamentals and include:
	. Pump: Right hand (RH), left hand (LH), upflow (U), downflow (D).
	. Valve, two-way: horizontal (H), vertical (V).
	. Valve, three-way: H, V.
	. Flow element: H, V.
	. Temperature sensor: H, V.
	. Pressure sensor: H, V.

. Humidity sensor: H, V.
. AHU, single deck.
. AHU, double deck.
. Fan: RH, LH, U, D.
. Chiller.
. Boiler.
. Vertical piping.
. Horizontal piping.
. Unit heater.
. Pressure reducing valve: H, V.
. Damper: H, V.
. Electric meter.
. Limit switch: H, V.
. Flow switch (FS): H, V.

Test No: PVT-29A

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TEST NO: PVT-29A Page 3 of 5 OBJECTIVE: To demonstrate the
TITLE: Operator's Console Color software that operates the operator's
Display console and generates graphic
APPLIES TO: Large/Medium EMCS, UMCS, displays.
and UCS
REFERENCE: Proj. Spec. Paragraph _____

EVENT	EXPECTED RESULTS
GRAPHIC DISPLAY	
5. (continued)	
	. Temperature switch: H, V.
	. Pressure switch (PS).
	. Coil: H, V.
	. Solenoid valve.
	. Filter.
	. Air-cooled condensing unit.
	. Cooling tower.
6. Command the system to add custom symbols to the Library.	6. System requests input.
7. Enter custom symbols.	7. System accepts input.
8. Command the system to display all that all symbols, graphic symbols. symbols, are	8. Visually verify including custom displayed.
9. Enter command to define a graphic commands as display:	9. System executes follows:
. Define the background color.	. Visually verify system displays requested background color.

. Define the foreground color.	. Visually verify system displays requested foreground color.
. Command the system to position locations of I/O descriptors at selected locations on the graphic.	. System requests I/O the I/O function Alphanumeric function and executes command. Visually verify descriptors are located.
. Command the system to display new system displays connecting lines between designated points points.	. Visually verify lines between designated on the graphic display.

Test No: PVT-29A
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TEST NO: PVT-29A Page 4 of 5 OBJECTIVE: To demonstrate the
TITLE: Operator's Console Color Display software that operates the operator's console and generates graphic displays.
APPLIES TO: Large/Medium EMCS, UMCS, and UCS
REFERENCE: Proj. Spec. Paragraph _____

EVENT	EXPECTED RESULTS
GRAPHIC DISPLAY	
9. (continued.)	
. Command the system to position system positions standard graphic symbols from system of graphic symbols at selected library at selected locations on the locations. graphics.	. Visually verify
. Command the system to save the command and display.	. System acknowledges saves the display.
. Initiate an alarm in the DE, not second field associated with the generated	. Alarm appears on the

(color monitor) and prints on the graphic. alarm printer.	
10. Modify a portion of the display system overlays new previously stored. (For example, add a new value, a controller or sensor.) Display is saved under the new name.	10. Visually verify alphanumeric and graphics on the existing display. Identify sources of live data and location of their readouts. Command the system to save the display under a new name and graphic designation.
11. Call up a Graphic Display with the system displays latest data on a specific system. (For example, request the latest data on an air handling unit (AHU).)	11. Visually verify latest data as called for by the I/O Summary Tables, fully integrated with graphic display to at least 3 significant figures. Verify completeness of output against the I/O summary table provided by the contractor.
12. Initiate alarm condition(s) on a displays red blinking designated graphic.	12. Verify system alarm(s) on the designated graphic.
13. Acknowledge alarm.	13. Verify system displays steady red alarms on the graphic.

Test No: PVT-29A

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TEST NO: PVT-29A Page 5 of 5 OBJECTIVE: To demonstrate the
TITLE: Operator's Console Color software that operates the operator's
Display console and generates graphic
APPLIES TO: Large/Medium EMCS, UMCS, and UCS displays.
REFERENCE: Proj. Spec. Paragraph _____

EVENT	EXPECTED RESULTS
GRAPHIC DISPLAY	
14. Eliminate alarm condition.	14. Verify steady red alarms are no longer displayed.
15. Disconnect DTM associated with the graphic display.	15. System displays data by highlighting or flagging.
16. Command the system to cancel the display of a graphic picture. Reconnect DTM.	16. System removes display from monitor.
17. Command the system to display the graphic from library graphic previously canceled.	17. System recalls and displays on monitor.
18. Assign conditions which displayed automatically initiate the display. (For example, display after an alarm condition for the graphic.)	18. Graphic will be automatically by events established in initial conditions.
19. Command the system to duplicate the the graphic, graphic, assign it a new name and saves save it.	19. System duplicates assigned it a new name, and it.
20. Delete the original graphic.	20. System deletes original graphic from library and cancels display on monitor.

21. Call up the original deleted graphic and graphic. in library.	21. System does not display indicates graphic is not
22. Log off the system.	22. System performs according to expected results.

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TEST NO: PVT-30A Page 1 of 2 OBJECTIVE: To demonstrate the
TITLE: Control Sequences software that permits the creation
APPLIES TO: Large/Medium EMCS, UMCS, and execution of control sequences
and UCS for automated control of equipment
REFERENCE: Proj. Spec. Paragraph _____ based on operational parameters,
including those defined in the data base.

INITIAL CONDITIONS

1. The contractor provides a control sequence with at least __ terms and known errors that utilize the mathematic package functions stored in the system. The contractor also provides input values for the control sequences with appropriate output.

2. The contractor indicates total storage allocated for algorithmic control sequences and method of storage.

3. The system contains the number of control sequences, each with the number of terms required by the contract documents. Contractor provides list of sequences stored, the number of terms in each sequence, and the amount of storage allocated to the sequence.

4. The system is performing on-line monitoring and control functions throughout the test.

5. Operator is logged onto system at a level that enables operator access to control sequences.

EVENT	EXPECTED RESULTS
1. Enter the control sequence via the and compiles designated terminal.	1. CCU or COS loads program. System generates a hard copy listing with error messages.
2. Correct error via editor program. Verify hard copy output against System	2. CCU or COS loads and compiles corrected program.

contractor supplied document. generates a hard copy listing.		
3. Command the system to save the test program.	3. CCU or COS saves test program.	

Test No:

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TEST NO: PVT-30A Page 2 of 2 OBJECTIVE: To demonstrate the
TITLE: Control Sequences software that permits the creation
APPLIES TO: Large/Medium EMCS, UMCS, and execution of control sequences
and UCS for automated control of equipment
REFERENCE: Proj. Spec. Paragraph _____ based on operational parameters,
including those defined in the data base.

EVENT	EXPECTED RESULTS
4. Command the system to execute test sequence and sequence using FID or RTU test set.	4. System executes and displays output in the FID or RTU test set. Verify output against predicted results.
5. Command the system to change the sequence.	5. System requests modification.
6. Enter modification. Command the system to print out new sequence.	6. CCU or COS loads and compiles program with modification. Verify the hard copy listing contains the modifications.
7. Command the system to delete test control sequence.	7. System executes command.
8. Command the system to execute test command cannot be sequence.	8. System indicates executed because the sequence does not exist.
9. Command the system to display the storage space.	9. System displays the storage space allocated for all Verify sufficient storage is

control sequences stored in the contractor's system.	allocated by using the method of storing control sequences to determine storage space required.

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TEST NO: PVT-31A Page 1 of 4 OBJECTIVE: To demonstrate the
TITLE: Alarm Reporting operation of the software which
APPLIES TO: Large/Medium EMCS, UMCS, reports the alarm conditions with
and UCS associated messages.
REFERENCE: Proj. Spec. Paragraph _____

INITIAL CONDITIONS

1. The FID or RTU Test Set and DE is set up to initiate 1,000 alarms, including at least one of each of the following alarm conditions:

. FID or RTU or MUX or ACU not responding.
. FID or RTU or MUX or ACU responding (return to normal).
. FID-CCU or RTU-COS DTM high error rate.
. FID/MUX or RCU/ACU DTM Link high error rate.
. FID-CCU or RTU-COS Real Time Clock error greater than 15 seconds (adjustable).
. FID/MUX or RCU/ACU Door Intrusion Alarm.
. FID/MUX or RCU/ACU OFF-LINE - control panel activated.
. FID/MUX or RCU/ACU ON-LINE - control panel activated.
. FID/MUX or RCU/ACU OUTPUTS DISABLED - control panel activated.
. FID or RTU FAILURE - self diagnostics activated.
. Point not responding to command.
. Point change of state without command.

2. Each type of the DE alarm is assigned an alarm class. Both alarm classes must be represented.

3. At least one alarm in each class must have an associated message 60 characters long.

4. The contractor provides a priority list for each reporting alarm condition when all classes of alarms are initiated simultaneously.

EVENT	EXPECTED RESULTS
1. Log on to the system at a password level that does not allow operator to enact automatic alarm silencing.	1. System acknowledges log on.

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TEST NO: PVT-31A Page 2 of 4 OBJECTIVE: To demonstrate the
TITLE: Alarm Reporting operation of the software which
APPLIES TO: Large/Medium EMCS, UMCS, reports the alarm conditions with
and UMCS associated messages.
REFERENCE: Proj. Spec. Paragraph _____

EVENT	EXPECTED RESULTS
2. Initiate Class 1 and Class 2 alarms. Each class of alarms tested shall include a minimum of one Class two operational alarms and two I/O and 2 alarms with the following functions for selected FID/MUX or RCU/ACU. At random times throughout the test, initiate an alarm that can be easily distinguished (such as varying the pulse rate to cause an alarm on the pulse accumulator). Request Secondary alarm messages for selected alarms.	2. System sounds audible alarm, displays Class 2 alarms on operator's console and prints Class 1 data for each alarm: . Alarm identification. . Alarm class. . Date and time of occurrence. . Device or sensor type. . Limit exceeded (if analog functions). . Engineering units. . Current value or status. . Primary alarm message with a 60 character field. . Secondary messages with a 60 character field for requested alarms.
3. Request secondary messages for each selected alarm. Secondary messages shall be assigned by the operator for printing.	3. System displays and prints secondary messages with a 60 character field for selected alarms.

4. Acknowledge Class 2 alarms.	4. System returns to normal operating mode.
5. Eliminate all alarm conditions.	5. System is in a normal operating mode.
6. Initiate Class 1 alarms.	6. System prints alarm report with the following data for each alarm in order of occurrence: . Alarm identification. . Time of occurrence.

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TEST NO: PVT-31A Page 3 of 4
TITLE: Alarm Reporting
APPLIES TO: Large/Medium EMCS, UMCS, and UCS
REFERENCE: Proj. Spec. Paragraph _____

OBJECTIVE: To demonstrate the operation of the software which reports the alarm conditions with associated messages.

EVENT	EXPECTED RESULTS
6. (continued)	. Device or sensor type. . Limit exceeded (if analog functions). . Engineering units. . Current value or status. . Primary alarm message with a 60 character field.
7. Eliminate conditions causing Class 1 alarms.	7. System prints updated status report and returns to normal operating mode.

8. Initiate Class 2 alarms.	8. System sounds an audible alarm, prints and displays the following data for each alarm in order of occurrence: . Identification of alarm occurrence. . Time of alarm condition. . Device or sensor type. . Limit exceeded (for analog functions). . Engineering units. . Current value or status. . Primary alarm message with a 60 character field.
9. Acknowledge alarm(s).	9. Upon operator acknowledgement, system turns off audible alarm, displays alarm data for the alarms. Visually verify the system display indicates that the alarm(s) have been acknowledged.
10. Eliminate conditions causing Class 2 alarms.	10. System displays updated status report and returns to normal operating mode.

TEST NO: PVT-31A Page 4 of 4 OBJECTIVE: To demonstrate the
TITLE: Alarm Reporting operation of the software which
APPLIES TO: Large/Medium EMCS, UMCS, reports the alarm conditions with
and UCS associated messages.
REFERENCE: Proj. Spec. Paragraph _____

EVENT	EXPECTED RESULTS
11. Command the system to enable that command automatic silencing of a specified present alarm.	11. System will indicate cannot be executed at the operator access level.
12. Log off the system.	12. System acknowledges log off.
13. Log on with a password for an access level that enables the operator to activate automatic alarm silencing and/or initiate automatic acknowledgement of alarms.	13. System acknowledges log on.
14. Command the system to enable executes automatic audible alarm silencing of alarms.	14. System acknowledges and command.
15. Command the system to enable executes automatic acknowledgement of alarms.	15. System acknowledges and command.
16. Initiate alarm conditions.	16. System automatically acknowledges alarms.
17. Acknowledge Class 2 alarms requiring such acknowledgement.	17. Audible alarm ceases.
18. Eliminate Class 2 alarm conditions.	18. System prints return to normal.
19. Request display of primary and storage secondary alarm messages.	19. Verify that sufficient space is allocated on disk to store

alarm message possible messages with characters	a 60 character primary for every DE point with a alarm and 100 secondary a field of 4 lines of 60 each.

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TEST NO: PVT-32A Page 1 of 1
TITLE Static Data Base Update
APPLIES TO: Large/Medium EMCS, UMCS, and UCS
REFERENCE: Proj. Spec. Paragraph _____

OBJECTIVE: To determine the ability of the CCU or COS during normal operation to update the DE parameters and the constraints to the static data base file automatically whenever a change occurs.

TEST EQUIPMENT

1. A certified stopwatch with time intervals of 0.1 seconds.

EVENT	EXPECTED RESULTS
1. Command the system to store new System parameter definitions for selected input and stores data in the analog/digital (A/D) points in the DE. (For example, select analog high and low limit alarms and select start-stop times for digital output points.)	1. System requests data. acknowledges data in memory.
2. Command the system to display new system displays parameters and constraints from static data base after new values are entered.	2. Visually verify static data files with revised parameter and constraints.

PVT-32A

Test No:

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TEST NO: PVT-33A Page 1 of 2 OBJECTIVE: To demonstrate that the
TITLE: FID or RTU Software RTU Programming FID or RTU FID or RTU executes FID or software programs and/or
APPLIES TO: Large/Medium EMCS, UMCS, and UCS programs downloaded from the CCU or COS without CCU or COS intervention.
REFERENCE: Proj. Spec. Paragraph _____

INITIAL CONDITIONS

1. The contractor provides a source program with a known error that performs a visually verifiable operation in the DE. The contractor also provides input data and expected results.

2. The system is performing on-line monitoring and control functions throughout the test.

3. Operator is logged onto system at a level that enables operator to perform FID or RTU software programming.

4. The contractor provides written descriptions of the FID or RTU resident programs to be downloaded with the expected results.

EVENT	EXPECTED RESULTS
1. Develop in the CCU or COS a custom FID or RTU program. (For example, start and stop all HVAC equipment connected to the FID or RTU and associated MUX or ACU at the same time every one-half hour with a time delay between successive starts.)	1. System accepts inputs.
2. Enter source program with name of output. Verify a file via the editor. (This program will be called the test program hereafter.) Command the system to generate hard copy output of program.	2. System generates hard copy listing matches contractor supplied listing, and that system displays error messages on known errors.

3. Correct errors via the editor. Verify program. Command the system to generate hard copy output.	3. System generates output. hard copy printout corresponds to contractor supplied document without errors.	
4. Command the system to save the program on disk test program on designated disk file.	4. System saves test file.	

Test No: PVT-33A
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TEST NO: PVT-33A Page 2 of 2 OBJECTIVE: To demonstrate that the
TITLE: FID or RTU Software RTU Programming FID or RTU FID or RTU executes FID or RTU software programs and/or programs downloaded from the CCU or COS without CCU or COS intervention.
APPLIES TO: Large/Medium EMCS, UMCS, and UCS
REFERENCE: Proj. Spec. Paragraph _____

EVENT	EXPECTED RESULTS
5. Command the system to transfer or RTU RAM software to the designated PROM based software from the CCU or COS programmer or alternately download to the FID or RTU test set or PROMS RAM based software from the CCU are installed in the FID test set. or COS to the test set.	5. System transfers the FID
6. Initiate the debugging software to check program logic. Check output of program against expected results using the test set.	6. System provides necessary information for the operator to follow the execution of the program. Verify program output agrees with expected results.
7. Command the system to list and store the object code generated for the test program and the debugged program.	7. System generates a hard copy listing of the stores program on disk.
8. Command the system to download software to software to selected FID or RTU PROM and command the system to create a new PROM.	8. System downloads software to selected FID or RTU or installed in the selected FID or RTU.
9. Command the system to start RTU	9. Visually verify FID or

execution of software at a selected FID or RTU using the local DE at a designated time.	correctly executes program software with the DE points assigned to the program.
10. Inhibit communication between the or RTU executes CCU or COS and FID or RTU. programs without communication described in descriptions.	10. Visually verify FID custom with CCU or COS as contractor furnished

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TEST NO: PVT-34A Page 1 of 3 OBJECTIVE: To verify the system uses
TITLE: Command Priorities priority levels to prevent
APPLIES TO: Large/Medium EMCS, UMCS, interaction of a command of low
and UCS priority with a command of higher
REFERENCE: Proj. Spec. Paragraph ___ priority.

INITIAL CONDITIONS

1. Prior to the test, the contractor provides a schedule of commands for testing command priorities. In the test, command priorities are assigned to specific applications programs. For example:

   . Command Priority 1 - a routine operation such as scheduled start/stop and operator inputs.
   . Command Priority 2 - a modifying program to the command priority requirement, such as duty cycling.
   . Command Priority 3 - a modifying program to the Command Priority 1 and Command Priority 2 requirements, such as demand limiting.
   . Command Priority 4 - an override by access to a high-level password.

2. Each program priority must cause unique and identifiable change in equipment operation relative to the other program, and DE conditions must be designed so that changes in operation take place as soon as higher priority programs are executed. For example, establish unique but overlapping time periods for equipment start-up and duty cycling where duty cycling occurs after equipment start-up. Also, prescribe a demand limit that will be exceeded by demand during duty cycling period so that equipment cycling under a lower priority command will be interrupted.

3. Establish an equipment operating constraint or environmental constraint that visibly modifies or prevents a desired change in equipment operation. For example, establish a condition that will decrease and increase the duty cycling periods, establish conditions that will cause the duty cycle period to be exceeded during high demand periods.

EVENT	EXPECTED RESULTS

1. Log onto system with an operator password that permits access to all command priorities, except Priority 4.	1. System acknowledges log-on.

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10 June 1994

TEST NO: PVT-34A Page 2 of 3
TITLE: Command Priorities
APPLIES TO: Large/Medium EMCS, UMCS, and UCS
REFERENCE: Proj. Spec. Paragraph

OBJECTIVE: To verify the system uses priority levels to prevent interaction of a command of low priority with a command of higher priority.

EVENT	EXPECTED RESULTS
2. Command the system to execute a command. Priority 1 command (for example, scheduled start/stop) on selected equipment.	2. System executes the command. Visually examine DE status changes.
3. Command the system to execute a command. Priority 2 command that will formally controlled by interrupt the execution of the Priority 1 command (for example, Priority 2 duty cycling).	3. System executes the command. Equipment the Priority 1 command is controlled by the command. Visually verify the change in the operation of the equipment formally controlled by the Priority 1 command (for example, executed duty cycling on equipment currently under scheduled start/stop).
4. Command the system to execute a command. Priority 3 command (for example, controlled by demand limiting).	4. System executes the command. Equipment formally the Priority 2 command is controlled by the Priority 3 command. Visually verify the

of equipment	change in the operation
the Priority 2	formally controlled by
execute a	command. (For example,
on equipment	demand limiting program
cycling mode.)	currently in the duty
5. Command the system to execute a command cannot be Priority 1 command because current command has priority.	5. System indicates executed a higher command
6. Command the system to execute a command cannot be Priority 2 command because current program has priority.	6. System indicates executed a higher command

PVT-34A Test No: 10 June 1994

TEST NO: PVT-34A Page 3 of 3
TITLE: Command Priorities
APPLIES TO: Large/Medium EMCS, UMCS, and UCS
REFERENCE: Proj. Spec. Paragraph _____

OBJECTIVE: To verify the system uses priority levels to prevent interaction of a command of low priority with a command of higher priority.

EVENT	EXPECTED RESULTS
7. Command the system to execute a command cannot be executed at current operator access level. (For example, command the system to keep equipment in operation regardless of demand limit program.)	7. System indicates Priority 4 command.
8. Command the system to decrease in all demand limiting target to a level that will require the implementation of the "Fairness Doctrine" in the demand limiting program.	8. Verify that temperatures areas deviate equally from the established operating setpoints.
9. Log off the system.	9. System acknowledges log-off.
10. Log on the system using an operator password that permits access to all commands.	10. System acknowledges log-on.
11. Command the system to execute a Priority 4 command. (For example, cause equipment to operate even though current peak demand conditions would cause equipment shutdown under the Priority 3 command.)	11. System acknowledges and executes command. Visually verify changes the operation of equipment currently controlled by the Priority 3 command.

Test No: PVT-34A
10 June 1994

TEST NO: PVT-35A Page 1 of 1 OBJECTIVE: To demonstrate software
TITLE: Calculated Point that creates new point values by
APPLIES TO: Large/Medium EMCS, UMCS, performing mathematical operations on
and UCS any values available in the
system REFERENCE: Proj. Spec. Paragraph _____ data base.

INITIAL CONDITIONS

1. Specified DE points, from different communication circuits, are set up to generate known analog, digital and constant values required for the computation of point values. Input values are selected so that calculated values can be predicted.

2. The contractor provides a schedule of data base values of calculated points to be used in the test with the expected results.

EVENT	EXPECTED RESULTS
1. Command the system to display calculated point values based on predetermined data base values and mathematical operations such as same as any square roots and exponents).	1. System displays point identification and values which correspond with predicted values. Display format is the analog print format.
2. Command the system to change specified constants for computation of point values. Enter the new constant(s).	2. System acknowledges input.
3. Command the system to display values for revised calculated point values.	3. System displays new calculated points along with point identification. New values correspond with predicted results

	using the new constant(s).
4. Command the system to stop the DE communication with one of the calculated point shows points used in calculating the calculated point.	4. System generates alarms. DE point and not current data status.
5. Return the system to a normal operating mode.	5. The system returns to a operating mode.

Test No: PVT-35A

10 June 1994

TEST NO: PVT-36A Page 1 of 1 OBJECTIVE: To demonstrate system TITLE: Analog Monitoring capability to monitor all analog
APPLIES TO: Large/Medium EMCS, UMCS, values, including calculated analog and UCS points.
REFERENCE: Proj. Spec. Paragraph _____

INITIAL CONDITIONS

1. The contractor provides a list of analog points including calculated points.

EVENT	EXPECTED RESULTS
1. Command the system to display analog points with points.	1. System acknowledges command and displays the analog points, including calculated points with their descriptors and alphanumeric values.
2. Command the system to change high data input.	2. System acknowledges

limits alarm values for selected analog points.		
3. Initiate a change of value of new value selected analog points at the preselected points without alarm FID/MUX or RCU/ACU within the high and low limits.	3. System displays value of of indication.	
4. Initiate a change of value for selected selected analog points at the FID/MUX or RCU/ACU that will generate alarms, including an alarm for a calculated point.	4. System displays value of points and generates an alarm for each analog point in alarm.	

Test No: PVT-36A
10 June 1994

TEST NO: PVT-37A Page 1 of 2 OBJECTIVE: To demonstrate operation
TITLE: Analog Totalization of software that transmits, displays,
APPLIES TO: Large/Medium EMCS, UMCS, and totalizes analog values over a
and UCS given time period.
REFERENCE: Proj. Spec. Paragraph _____

INITIAL CONDITIONS

1. The contractor provides a list of analog points with known analog values so that totalization over at least three predetermined time periods for each point can be computed as a check against the system totalization for each point.

2. The selected analog points include calculated analog points.

3. The totalization values for each point must be unique for each time period. Time periods for each point must be different.

EVENT	EXPECTED RESULTS
1. Command the system to display and monitor selected designated analog values. points.	1. System acknowledges designated analog displays alphanumeric values. Verify system display against known values.
2. Enter the point identification and analog totalization time period for totalizing each point. For each period and time intervals so that at least three outputs occur in the course of the test. Request system display of totalized values.	2. System executes program at designated time periods point. Select different time for each designated point system displays: . Peak value in current time period. . Total value in current time period.

. Peak value in previous time period.
. Total value in previous time period.

Verify system output against predetermined values.

Test No:

PVT-37A

10 June 1994

TEST NO: PVT-37A Page 2 of 2 OBJECTIVE: To demonstrate operation
TITLE: Analog Totalization of software that transmits, displays,
APPLIES TO: Large/Medium EMCS, UMCS, and totalizes analog values over a
and UCS given time period.
REFERENCE: Proj. Spec. Paragraph _____

EVENT	EXPECTED RESULTS
3. Command the system to change end of command and time period for each totalized point. Request system display of totalized values.	3. System executes and displays: . Peak value in current time period. . Total value in current time period. . Peak value in previous time period. . Total value in previous time period. Verify system display matches expected results.
4. Enter command for system display of analog totals for each time period.	4. Verify system display of analog totals matches expected results.

Test No: PVT-37A
10 June 1994

TEST NO: PVT-38A Page 1 of 1 OBJECTIVE: To demonstrate the
TITLE: Energy Totalization operation of software that totalizes
APPLIES TO: Large/Medium EMCS, UMCS, heating energy consumption for each
and UCS energy source.
REFERENCE: Proj. Spec. Paragraph _____

INITIAL CONDITIONS

1. The contractor provides a list of points with known values so that totalization over at least three distinct predetermining time periods for each point can be computed as a check against the system totalization for each point.

2. Selected points required for totalization are set up to fail during the totalization period.

EVENT	EXPECTED RESULTS
1. Command the system to initiate command, and energy totalization for selected identification and points.	1. System acknowledges requests point time period for totalization for each point.
2. Enter system identification and energy totalization time period for totalization. Select a different time period so that totalization occurs at least 3 times in the course of the test period.	2. System executes program at designated time periods for each system.
3. At the end of the second time period, command the system to display totalization values for each each point.	3. System displays the heat energy (in thousand Btu) consumed during the time period and the values for instantaneous rate in Btu/hr for each point. Verify system output against known values.

4. At a predetermined time during the third time period, command the system to change the end of period time for each totalized point.	4. System acknowledges command and terminates totalization for the third time period.
5. Enter command for energy totalization for the shortened time period.	5. System displays energy totalization data for the third period.

Test No: PVT-38A

10 June 1994

TEST NO: PVT-39A Page 1 of 1 OBJECTIVE: To demonstrate software TITLE: Prediction Software that performs an extrapolation on APPLIES TO: Large/Medium EMCS, UMCS, data into future of analog values and UCS based on past analog values.
REFERENCE: Proj. Spec. Paragraph _____

INITIAL CONDITIONS

1. The contractor provides a curve of known characteristics with at least eight analog values and expected output based on the curve. (At least two sets of input/output data provided. Each input set is spaced over a different time scale.)

2. The Government provides a curve of known characteristics with at least eight analog values and expected output based on the curve. (At least two sets of input/output data provided. Each input set is spaced over a different time scale.)

3. The system is programmed to use the known curve in the prediction program.

EVENT	EXPECTED RESULTS

1. Initiate the prediction program data and time for the curve defined in initial conditions. Command the system to display predicted values.	1. System requests input spacing of values to be extrapolated, and calculates predicted value into future for each point in the curve. Verify system display of predicted value corresponds to expected value.
2. Enter command to vary (increase or decrease) time spacing of values predicted used in the prediction program. Command the system to display the predicted value.	2. System calculates predicted value. Verify system display of value corresponds for each point in the curve to the expected value.
3. Enter Government furnished curve. Command the system to identify the predicted predicted value.	3. System calculates predicted value. Verify system display of value corresponds for each point in the curve to the expected value.

Test No: PVT-39A
10 June 1994

TEST NO: PVT-40A Page 1 of 1 OBJECTIVE: To demonstrate operation
TITLE: Extended Service Program of software that allows one-time
APPLIES TO: Large/Medium EMCS, UMCS, extensions of timed equipment and UCS schedules.
REFERENCE: Proj. Spec. Paragraph _____

INITIAL CONDITIONS

1. All equipment affected by the extended service programs is set up to start up and shut down at specified times.

2. The contractor identifies the input commands for requesting extended service for a given schedule.

3. All selected equipment is initially off.

EVENT	EXPECTED RESULTS
1. Command the system to execute time equipment starts up scheduled programs for all equipment start selected for the extended service program.	1. Visually verify according to the scheduled times.
2. Prior to the scheduled stop time, equipment shuts initiate appropriate inputs to down for schedules without extended request extended service on some but not all of the equipment schedules.	2. Visually verify service request, while equipment under extended service schedules remains in operation.
3. Command the system to modify the identification of extended service program.	3. System requests equipment and schedule.
4. Enter modified extended service input of all programs for selected pieces of equipment. Visually	4. System acknowledges schedules and equipment. verify service change in the operation of equipment as a result of the modified programs.

5. Command the system to display the start/stop schedule extended with the extended service program.	5. System displays start/stop schedule for the equipment which shows that the service was a one time only extended schedule.

Test No:
PVT-40A 10 June 1994

TEST NO: PVT-41A Page 1 of 1 OBJECTIVE: To demonstrate
TITLE: Scheduled Start/Stop Program software to start and stop
- Summer Operation equipment based on time of day
APPLIES TO: Large/Medium EMCS, UMCS, and day of week, including
and UCS holidays.
REFERENCE: Proj. Spec. Paragraph _____

INITIAL CONDITIONS

1. Select points in the DE with status indication to have scheduled for start/stop activity every day of the week and holidays, during the summer. The contractor provides the following information for the units to be tested:

. Summer period - cause cooling equipment operation.
. Equipment schedules - to start and stop equipment during the test period.
. Equipment status - (for example, to be off initially).

2. Select three points having electrical loads that are over 20 hp or 50 kW.

3. The system is programmed to execute the scheduled start/stop program with distinct operator adjustable time delay of loads over 20 hp and 50 kW.

EVENT	EXPECTED RESULTS
1. Compare list of program inputs and supplied program outputs required in the contract documents against the contractor supplied input/output.	1. Contractor inputs/outputs may include all those inputs/outputs in the contract documents. Contractor furnished software that requires input/output points not included in the contract documents must operate with default values.
2. Command the system to execute the start/stop program	2. System executes scheduled start/stop program for all

		with time delay between starts of equipment selected for the test.	equipment over 20 hp and 50 kW.
3.	Start up and stop equipment manually at the unit by overriding the system controls.	3.	Visually verify the system generates an alarm to indicate unauthorized starting or stopping of equipment.

Test No: PVT-41A
10 June 1994

TEST NO: PVT-42A Page 1 of 1 OBJECTIVE: To demonstrate software TITLE: Scheduled Start/Stop Program to start and stop equipment based
- Winter Operation on time of day and day of week,
APPLIES TO: Large/Medium EMCS, UMCS, including holidays.
and UCS
REFERENCE: Proj. Spec. Paragraph _____

INITIAL CONDITIONS

1. Select points in the DE with status indication to have scheduled for start/stop activity every day of the week and holidays, during the winter. The contractor provides the following information for the units to be tested:

   . Winter period - cause heating equipment operation.
   . Equipment schedules - to start and stop equipment during the test period.
   . Equipment status - (for example, to be off initially).

2. Select three points having electrical loads that are over 20 hp or 50 kW.

3. The system is programmed to execute the scheduled start/stop program with distinct operator adjustable time delay of loads over 20 hp and 50 kW.

EVENT	EXPECTED RESULTS
1. Compare list of program inputs and supplied program outputs required in the contract include all documents against the supplied input/output.	1. Contractor inputs/outputs may contractor those inputs/outputs in the contract the contractor supplied documents. Contractor furnished software that requires input/output points not included in the contract documents must operate with default values.

2. Command the system to execute the start/stop program scheduled start/stop program for all equipment selected for the test.	2. System executes with time delay between starts of equipment over 20 hp and 50 kW.
3. Start up and stop equipment manually at the unit by overriding the system controls.	3. Visually verify the system generates an alarm to indicate unauthorized starting or stopping of equipment.

Test No: PVT-42A

10 June 1994

TEST NO: PVT-43A Page 1 of 2 OBJECTIVE: To demonstrate software TITLE: Optimum Start/Stop Program to start and stop equipment on a - Summer Operation sliding schedule based on indoor and
APPLIES TO: Large/Medium EMCS, UMCS, outdoor air conditions. and UCS
REFERENCE: Proj. Spec. Paragraph _____

INITIAL CONDITIONS

1. Select points in the DE with status indication to have scheduled start/stop activity every day of the week and holidays during the summer.

2. The contractor provides equipment schedules that coincide with the test period.

3. The values must be selected so that the software for cooling units is tested.

4. The contractor provides the formulas and explanation for predicting optimum start/stop times.

5. The contractor provides the predicted values for optimum start/stop times based on input data on outside air temperature on building characteristics (occupancy, temperature, and thermal factors) and on equipment operating characteristics with distinct operator adjustable time delay of loads over 20 hp and 50 kW.

EVENT	EXPECTED RESULTS
1. Compare list of program inputs and outputs required in the contract documents against the contractor supplied input/output.	1. Contractor supplied program inputs/outputs may include all inputs/outputs in the contract documents. Contractor furnished software that requires input/output points not included in the contract documents must operate with default values.
2. Command the system to execute the optimum start/stop program. Command the system to display optimum start/stop report.	2. System executes the optimum start/stop program. Visually verify the system displays start and stop times that match the predicted optimum start/stop times.

Test No: PVT-43A
10 June 1994

TEST NO: PVT-43A Page 2 of 2 OBJECTIVE: To demonstrate software TITLE: Optimum Start/Stop Program to start and stop equipment on a
- Summer Operation sliding schedule based on indoor and
APPLIES TO: Large/Medium EMCS, UMCS, outdoor air conditions.
and UCS
REFERENCE: Proj. Spec. Paragraph _____

EVENT	EXPECTED RESULTS
3. Manually attempt to change point alarms and status from start to stop by start or overriding the system controls.	3. System generates indicates unauthorized stop of equipment.
4. Change (decrease) space temperature displays start setpoint (for cooling systems) for results start-up and command the system to display equipment status.	4. Verify the system times that match predicted (earlier start times than previous start times).
5. Request printout of optimum start/stop start/stop report.	5. Verify output of optimum report corresponds with actual results.

PVT-43A

Test No:

10 June 1994

TEST NO: PVT-44A Page 1 of 2 OBJECTIVE: To demonstrate software TITLE: Optimum Start/Stop Program to start and stop equipment on a
- Winter Operation sliding schedule based on indoor and APPLIES TO: Large/Medium EMCS, UMCS, outdoor air conditions.
and UCS
REFERENCE: Proj. Spec. Paragraph _____

INITIAL CONDITIONS

1. Select points in the DE with status indication to have scheduled start/stop activity every day of the week and holidays during the winter schedule.

2. The contractor provides equipment schedules that coincide with the test period.

3. The values must be selected so that the software for heating units is tested.

4. The contractor provides the formulas and explanation for predicting optimum start/stop times.

5. The contractor provides the predicted values for optimum start/stop times based on input data on outside air temperature on building characteristics (occupancy, temperature, and thermal factors) and on equipment operating characteristics with distinct operator adjustable time delay of loads over 20 hp and 50 kW.

EVENT	EXPECTED RESULTS
1. Compare list of program inputs and supplied program outputs required in the contract documents against the contractor supplied input/output.	1. Contractor inputs/outputs may include all those inputs/outputs in the contract documents. Contractor furnished software that requires input/output points not included in the contract documents must operate with default values.
2. Command the system to execute the optimum	2. System executes the

optimum start/stop program. Command the system to display optimum start/stop report.	start/stop program. Visually verify the system displays start and stop times that match the predicted optimum start/stop times.	

Test No: PVT-44A
10 June 1994

TEST NO: PVT-44A Page 2 of 2 OBJECTIVE: To demonstrate software TITLE: Optimum Start/Stop Program to start and stop equipment on a
- Winter Operation sliding schedule based on indoor and APPLIES TO: Large/Medium EMCS, UMCS, outdoor air conditions.
and UCS
REFERENCE: Proj. Spec. Paragraph _____

EVENT	EXPECTED RESULTS
3. Manually attempt to change point status from start to stop by overriding the system controls.	3. System generates alarms and indicates unauthorized start or stop of equipment.
4. Change (increase) space temperature setpoint (for heating systems) for start-up and command the system to display equipment status.	4. Verify the system displays start times that match predicted results (earlier start times than previous start times).
5. Request printout of optimum start/stop report.	5. Verify output of optimum start/stop report corresponds with actual results.

PVT-44A

Test No:

10 June 1994

TEST NO: PVT-45A Page 1 of 2 OBJECTIVE: To demonstrate the
TITLE: Duty Cycling Program - software that causes equipment
Summer Operation shutdown for predetermined periods of
APPLIES TO: Large/Medium EMCS, UMCS, time during building occupied hours
and UCS in accordance with satisfying space
REFERENCE: Proj. Spec. Paragraph ____ conditions.

INITIAL CONDITIONS

1. Select points in the DE with status indication to have scheduled start and stop activity every day of the week and holidays, during the summer schedule.

2. The contractor provides equipment schedules that coincide with the test period.

3. The values must be selected so that the software for cooling units is tested.

4. The contractor provides an explanation of how the system increases or decreases the cycling intervals relative to space temperature conditions. The contractor provides the predicted values for a change in the cycling for interval based on input data on space temperature changes.

EVENT	EXPECTED RESULTS
1. Compare list of program inputs and supplied program outputs required in the contract include all documents against the supplied input/output. Contractor requires must operate	1. Contractor inputs/outputs may contractor those inputs/outputs in the contract documents. furnished software that input/output points not included in the contract documents with default values.

2. Command the system to execute the duty cycling program. Command the duty cycling program. Visually verify the DE system to display equipment status.	2. System executes the program. Visually point status corresponds to the predicted on-off cycle intervals. The system displays the change of status and a start or stop signal for each unit. Check units for time delay between successive starts of equipment.

Test No: PVT-45A
10 June 1994

TEST NO: PVT-45A Page 2 of 2 OBJECTIVE: To demonstrate the
TITLE: Duty Cycling Program - software that causes equipment
Summer Operation shutdown for predetermined periods of
APPLIES TO: Large/Medium EMCS, UMCS, time during building occupied hours
and UCS in accordance with satisfying space
REFERENCE: Proj. Spec. Paragraph ____ conditions.

EVENT	EXPECTED RESULTS
3. Initiate a change in space temperature to cause a visible change in cycling times of selected equipment and in system display of point status. selected equipment. (For example, initiate a higher space temperature, resulting in shorter "off" times for cooling equipment.)	3. Visually verify a change in cycling times of selected equipment and in system display of point status.
4. Enter command to change equipment duty cycle duration.	4. System requests equipment identification and new cycling time.
5. Enter point identification and new cycling interval.	5. System executes command. New cycling interval replaces old cycling interval for selected equipment. Visually verify changes in cycling intervals for selected equipment.

PVT-45A

Test No:

1994

10 June

TEST NO: PVT-46A Page 1 of 2 OBJECTIVE: To demonstrate the
TITLE: Duty Cycling Program - software that causes equipment
Winter Operation shutdown for predetermined periods of
APPLIES TO: Large/Medium EMCS, UMCS, time during building occupied hours
and UCS in accordance with satisfying space
REFERENCE: Proj. Spec. Paragraph _____ conditions.

INITIAL CONDITIONS

1. Select points in the DE with status indication to have scheduled start and stop activity every day of the week and holidays, during the winter schedule.

2. The contractor provides equipment schedules that coincide with the test period.

3. The values must be selected so that the software for heating units is tested.

4. The contractor provides an explanation of how the system increases or decreases the cycling intervals relative to space temperature conditions. The contractor provides the predicted values for a change in the cycling for interval based on input data on space temperature changes.

EVENT	EXPECTED RESULTS
1. Compare list of program inputs and outputs required in the contract supplied program inputs/outputs against the contractor supplied input/output. Contractor requires all documents included in must operate	1. Contractor inputs/outputs may include those inputs/outputs in the contract documents. furnished software that input/output points not the contract documents with default values.

2. Command the system to execute the duty cycling program. Command the system to display equipment status.	2. System executes the duty cycling program. Visually verify the DE point status corresponds to the predicted on-off cycle intervals. The system displays the change of status and a start or stop signal for each unit. Check units for time delay between successive starts of equipment.	

Test No: PVT-46A
10 June 1994

TEST NO: PVT-46A Page 2 of 2 OBJECTIVE: To demonstrate the
TITLE: Duty Cycling Program - software that causes equipment
Winter Operation shutdown for predetermined periods of
APPLIES TO: Large/Medium EMCS, UMCS, time during building occupied hours
and UCS in accordance with satisfying space
REFERENCE: Proj. Spec. Paragraph _____ conditions.

EVENT	EXPECTED RESULTS
3. Initiate a change in space temperature to cause a change in cycling of selected equipment and in change in the duty cycling of selected equipment. (For example, initiate a higher space temperature, resulting in longer "off" times for heating equipment.)	3. Visually verify a change in visible times of system display of point status.
4. Enter command to change equipment duty cycle duration.	4. System requests equipment identification and new cycling time.
5. Enter point identification and new cycling interval.	5. System executes command. New cycling interval replaces old cycling interval for selected equipment. Visually verify changes in cycling intervals for selected equipment.

PVT-46A

1994

Test No:

10 June

TEST NO: PVT-47A Page 1 of 3 OBJECTIVE: To demonstrate the
TITLE: Demand Limiting Program software that sheds electrical loads
APPLIES TO: Large/Medium EMCS, UMCS, for peak demand control using
and UCS prediction techniques to avoid
REFERENCE: Proj. Spec. Paragraph _____ exceeding preestablished peak demand values.

INITIAL CONDITIONS

1. Select points in the DE with status indication for inclusion in the demand limiting program.

2. Equipment schedules coincide with the test period.

3. The contractor provides the necessary information per equipment unit (as required in the contract documents) such that the operation of the unit can be predicted during the test period.

4. Each equipment unit is assigned a priority class. All priority classes must contain at least two units.

5. Selected equipment is assigned constraints that will prevent a desired change in equipment operation.

6. The contractor provides data for determining power demand from fixed demand interval meters with and without end of interval signal, from "sliding window" intervals, and for time of day metering.

7. The test period demand levels are set up to exceed the peak demand target at least two times such that all equipment assigned to demand limiting program will be shut down and started up at least two times during the test period.

8. The system is programmed to generate the electrical peak demand report for each day in the test period.

Test No: PVT-47A
10 June 1994

TEST NO: PVT-47A Page 2 of 3 OBJECTIVE: To demonstrate the
TITLE: Demand Limiting Program software that sheds electrical loads
APPLIES TO: Large/Medium EMCS, UMCS, for peak demand control using
and UCS prediction techniques to avoid
REFERENCE: Proj. Spec. Paragraph _____ exceeding preestablished peak demand values.

EVENT	EXPECTED RESULTS
1. Compare list of program inputs and outputs required in the contract may include all documents supplied input/output. Contractor requires must operate	1. Contractor supplied program inputs/outputs against the contractor those inputs/outputs in the contract documents. furnished software that input/output points not included in the contract documents with default values.
2. Initiate power demand levels which are predicted to exceed peak demand target.	2. System executes demand limit program which sheds electrical loads in order of assigned priority, from lowest to highest priority, until the predicted demand falls below the target. Visually verify system displays change of status signals for equipment that is shutdown.
3. Program demand levels to fall shed	3. System begins to restore

below target limit such that some, but not all loads, are restored. Assign equipment constraints to some equipment in the DE so that the units cannot be shed at the time the constraints assigned in next demand target is exceeded.	equipment. Verify the points representing the highest priority shed are restored before units of lower priority. Verify units with equipment Event 3 are not shed.
4. Decrease target and inhibit the shed on units that are operating as in Result 2.	4. System initiates load "end-of-interval" signal from the system so that demand is computed with the lowest priority still by the "sliding window" method. Verify units with equipment constraints assigned to Event 3 are not shed. System displays change of status for equipment that is restored to the system.

Test No: PVT-47A

10 June 1994

TEST NO: PVT-47A Page 3 of 3 OBJECTIVE: To demonstrate the
TITLE: Demand Limiting Program software that sheds electrical loads
APPLIES TO: Large/Medium EMCS, UMCS, for peak demand control using
and UCS prediction techniques to avoid
REFERENCE: Proj. Spec. Paragraph _____ exceeding preestablished peak demand values.

EVENT	EXPECTED RESULTS
5. Change the target in the demand limiting program for time of day metering. sliding window to time of day metering.	5. System executes demand limiting program operation from
6. Repeat Events 2 through 4 above for each time of day target. Each time of day program has the number of different time of day targets required by the contract requirements.	6. System initiates control on points representing loads as per Results 2 through 4 for each of the different priority levels and priority levels, for each the day target.

Test No: PVT-47A
10 June 1994

TEST NO: PVT-48A Page 1 of 3 OBJECTIVE: To demonstrate the
TITLE: Day-Night Setback Program software that reduces the heating
APPLIES TO: Large/Medium EMCS, UMCS, space temperature setpoint during
and UCS unoccupied hours or raises the
REFERENCE: Proj. Spec. Paragraph _____ cooling space temperature setpoint during unoccupied hours.

INITIAL CONDITIONS

1. Select points in the DE for inclusion in the day-night setback program.

2. The contractor provides specific data for each required input and provides the predicted output with an explanation of how the output is determined.

4. Equipment operation coincides with the test period.

5. Program specified points to represent the value of space temperatures.

EVENT	EXPECTED RESULTS
1. Compare list of program inputs and supplied program outputs required in the contract documents against the contractor supplied input/output.	1. Contractor inputs/outputs may include all those inputs/outputs in the contract documents. Contractor furnished software that requires input/output points not included in the contract documents must operate with default values.
2. Initiate conditions causing heating mode during winter season unoccupied predicted period (heating mode). Command the system to display equipment status and space	2. Verify displayed status of equipment to be in the night setback operation and space temperature match results.

temperatures.	
3. Initiate conditions causing heating status of daytime mode space of operation during winter season occupied time period (heating mode).	3. Verify displayed equipment to be in the equipment operation and temperatures match predicted results (equipment is started and space temperatures increase to setpoint).
Command the system to display equipment status and space temperatures.	

Test No: PVT-48A

10 June 1994

TEST NO: PVT-48A Page 2 of 3 OBJECTIVE: To demonstrate the
TITLE: Day-Night Setback Program software that reduces the heating
APPLIES TO: Large/Medium EMCS, UMCS, space temperature setpoint during
and UCS unoccupied hours or raises the
REFERENCE: Proj. Spec. Paragraph _____ cooling space temperature setpoint during unoccupied hours.

EVENT	EXPECTED RESULTS
4. Command the system to modify equipment day-night setback program.	4. System requests identification and input.
5. Enter equipment identification and new input (for example, modify minimum occupied temperature). Command the system to place equipment with new input in the occupied mode.	5. System acknowledges input and executes program in accordance with modified input. Selected equipment operation follows new program inputs.
6. Initiate conditions causing heating equipment to be in the night setback mode during heating unoccupied period (heating mode). Command the system to display equipment status and space temperatures.	6. Verify displayed status of equipment operation and space temperatures match predicted results.
7. Initiate conditions which will cause night setback for cooling equipment during the summer season unoccupied period (cooling mode).	7. Verify displayed status of equipment matches predicted results (equipment is started and space temperatures are increased to

		unoccupied period setpoints). Command the system to display equipment status and space temperature.
8. Initiate conditions causing cooling equipment is started and space temperatures are occupied period (cooling mode).	8. Visually verify equipment is in daytime mode of operation during summer season decreased to occupied period setpoints. Verify displayed status of equipment matches predicted results. Command the system to display equipment status and space temperature.	

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TEST NO: PVT-48A Page 3 of 3 OBJECTIVE: To demonstrate the
TITLE: Day-Night Setback Program software that reduces the heating
APPLIES TO: Large/Medium EMCS, UMCS, space temperature setpoint during
and UCS unoccupied hours or raises the
REFERENCE: Proj. Spec. Paragraph _____ cooling space temperature setpoint during unoccupied hours.

EVENT	EXPECTED RESULTS
9. Command the system to modify equipment day-night setback program.	9. System requests identification and input.
10. Enter equipment identification input and and new input (for example, modify accordance with occupied temperature). Place selected equipment with new input in the unoccupied mode.	10. System acknowledges executes program in modified input. Verify equipment operation follows new program inputs.
11. Initiate conditions which will cause night setback for cooling equipment during the summer season unoccupied period (cooling mode).	11. Verify displayed status of equipment matches predicted results (equipment is started and space temperature are increased to unoccupied period setpoints).
Command the system to display equipment status and space temperature.	

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Test No:

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TEST NO: PVT-49A Page 1 of 1 OBJECTIVE: To demonstrate software TITLE: Economizer Program that reduces HVAC system cooling
APPLIES TO: Large/Medium EMCS, UMCS, requirements when the outside air
and UCS (OA) dry bulb temperature is less
REFERENCE: Proj. Spec. Paragraph _____ than the required mixed air
temperature of HVAC System.

INITIAL CONDITIONS

1. Select points in the DE for inclusion in the economizer program.

2. The contractor provides an explanation of how OA dampers are affected by OA dry bulb, return air (RA) dry bulb, and the changeover temperature. The contractor also provides at least two different predicted positions of outside air dampers (fully open, under local loop control) based on two different sets of input values on outside air and return air dry bulb temperatures.

EVENT	EXPECTED RESULTS
1. Compare list of program inputs and supplied program outputs required in the contract include all documents against the supplied input/output.	1. Contractor inputs/outputs may contractor those inputs/outputs in the contract documents. Contractor furnished software that requires input/output points not included in the contract documents must operate with default values.
2. Initiate conditions which will cause outside air (OA) dampers to be fully closed or in minimum position	2. System commands OA damper to be in closed or minimum position. Verify system display of status of OA

(for example, when OA dry bulb is greater than the specified changeover temperature).	dampers agrees with predicted results.	
3. Initiate conditions which will cause outside air (OA) dampers to be under local control (for example, when OA dry bulb is less than the specified changeover temperature and return air temperature).	3. System commands outside air dampers to be under local loop control to maintain mixed air temperature status of the OA dampers (open). Visually verify point output on damper position agrees with predicted results.	to
4. Modify changeover temperature setpoint and repeat Events 2 and 3.	4. System commands OA as in Events 2 and 3 at the new changeover temperature.	

Test No: PVT-49A
10 June 1994

TEST NO: PVT-50A Page 1 of 1 OBJECTIVE: To demonstrate software
TITLE: Enthalpy Program that reduces HVAC system cooling
APPLIES TO: Large/Medium EMCS, UMCS, requirements when the enthalpy of the
and UCS outside air (OA) is less than that of REFERENCE: Proj. Spec. Paragraph _____the return air.

INITIAL CONDITIONS

1. Select points in the DE for inclusion in the Enthalpy Program.

2. The contractor provides an explanation of how OA dampers are affected by OA, and also provides at least two different predicted positions of outside air dampers (fully open, under local loop control) based on two different sets of input values on outside air and return air enthalpy conditions.

EVENT	EXPECTED RESULTS
1. Compare list of program inputs and supplied program outputs required in the contract documents against the contractor supplied input/output.	1. Contractor inputs/outputs may include all those inputs/outputs in the contract documents. Contractor furnished software that requires input/output points not included in the contract documents must operate with default values.
2. Initiate conditions which will cause outside air (OA) dampers to be at minimum position (for example, when OA enthalpy exceeds return air enthalpy).	2. System commands OA dampers to be closed. Verify system display of status of OA dampers agrees with predicted results.

3. Initiate conditions which will cause outside air (OA) dampers to be under local loop control. Verify under local loop control (for example, when OA enthalpy is less than return air enthalpy).	3. Outside air dampers are placed under local loop control. Verify system display of status of OA dampers agrees with predicted results.	

Test No: PVT-50A

10 June 1994

TEST NO: PVT-51A Page 1 of 3 OBJECTIVE: To demonstrate the
TITLE: Ventilation - Recirculation Program software that reduces the HVAC system thermal load during warm-up
APPLIES TO: Large/Medium EMCS, UMCS, and UCS or cool-down cycles prior to occupancy of the building and
REFERENCE: Proj. Spec. Paragraph _____ unoccupied periods.

INITIAL CONDITIONS

1. Select points in the DE for inclusion in the ventilation - recirculation program.

2. The system is programmed to execute the ventilation - recirculation program.

3. The contractor provides an explanation of how OA temperature, RA temperature and space temperature affect heating/cooling equipment operation. The contractor also provides a set of conditions which will cause predictable equipment operation based on specified input values used during the test period.

4. Simulated OA dampers and relief dampers are set up to change position during the test periods.

EVENT	EXPECTED RESULTS
1. Compare list of program inputs and supplied program outputs required in the contract include all documents against the contractor supplied input/output.	1. Contractor inputs/outputs may those inputs/outputs in the contract documents. Contractor furnished software that requires input/output points not included in the contract documents must operate with default values.

2. Initiate conditions causing a dampers remain warm-up cycle: . Winter season. . Unoccupied period. . OA temperature is below a predetermined value that would initiate the starting of equipment to meet the space temperature setpoints at the time of occupancy.	2. Visually verify OA closed when HVAC equipment is started. Verify system displays the status of the dampers to be closed and status of fans to be on.

Test No: PVT-51A
10 June 1994

TEST NO: PVT-51A Page 2 of 3 OBJECTIVE: To demonstrate the
TITLE: Ventilation - Recirculation Program software that reduces the HVAC system thermal load during warm-up
APPLIES TO: Large/Medium EMCS, UMCS, and UCS or cool-down cycles prior to occupancy of the building and
REFERENCE: Proj. Spec. Paragraph _____ unoccupied periods.

EVENT	EXPECTED RESULTS
3. Initiate conditions causing and HVAC occupied space temperature to reach desired levels prior to occupancy time. . Cooling season. . Unoccupied period. . OA temperature is below a predetermined value that would initiate the starting of equipment to meet the space temperature setpoints at the time of occupancy.	3. Verify OA air dampers equipment are placed under local loop control. Verify system displays status of dampers to be under local loop control.
4. Initiate conditions causing a cool-down cycle during period prior to occupied period: . Cooling season. . Unoccupied period. . OA temperature is below a predetermined value that would initiate the starting of equipment to meet the space temperature setpoints at the time of occupancy.	4. Verify OA air dampers are closed and HVAC equipment is started. Verify system displays status of OA relief air dampers to be closed and status of fans to be on.

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TEST NO: PVT-51A Page 3 of 3 OBJECTIVE: To demonstrate the
TITLE: Ventilation - Recirculation Program software that reduces the HVAC system thermal load during warm-up
APPLIES TO: Large/Medium EMCS, UMCS, and UCS or cool-down cycles prior to occupancy of the building and
REFERENCE: Proj. Spec. Paragraph _____ unoccupied periods.

EVENT	EXPECTED RESULTS
5. Initiate conditions that will require the OA damper to be placed under local loop control during the period prior to the occupied time. . Winter season. . Unoccupied period. . OA temperature is below a predetermined value that would initiate the starting of equipment to meet the space temperature setpoints at the time of occupancy.	5. Verify OA dampers and HVAC equipment are placed under local loop control. Verify system displays status of dampers to be under local loop control.
6. Initiate conditions that will require the OA damper to be closed during the unoccupied period prior to cool-down or warm-up cycle. . Winter/Cooling season. . Unoccupied period (prior to a cool-down or warm-up cycle).	6. Verify OA dampers are closed and HVAC equipment is off. Verify system displays status of dampers to be closed and status of fans to be off.

Test No: PVT-51A
10 June 1994

TEST NO: PVT-52A Page 1 of 2 OBJECTIVE: To demonstrate the
TITLE: Hot Deck - Cold Deck software that resets the hot deck -
Temperature Reset Program cold deck temperatures in dual duct
APPLIES TO: Large/Medium EMCS, UMCS, and differential between the hot and and UCS cold deck temperature.
REFERENCE: Proj. Spec. Paragraph _____

INITIAL CONDITIONS

1. Select points in the DE for inclusion in the hot deck - cold deck program.

2. The system is programmed to execute the hot deck - cold deck temperature reset program.

3. The contractor provides an explanation of how space temperature and humidity requirements affect hot deck - cold deck temperature reset. The contractor also provides the test input data with expected zone hot and cold deck temperatures.

EVENT	EXPECTED RESULTS
1. Compare list of program inputs and supplied program outputs required in the contract documents against the contractor supplied input/output.	1. Contractor inputs/outputs may include all those inputs/outputs in the contract documents. Contractor furnished software that requires input/output points not included in the contract documents must operate with default values.
2. Initiate an increase in space and cold temperature dry bulb setpoints for each zone so that the hot deck and cold deck temperature reset is verify	2. System executes the hot deck temperature reset program to maintain zone space dry bulb setpoints. Visually

required. Command the system to display hot deck and cold deck discharge temperatures.	hot deck and cold deck temperatures are reset upwards in accordance with expected results.	
3. Initiate a change in space dry bulb hot deck and cold temperature reset is required. Command the system to display hot deck and cold deck temperatures.	3. Visually verify downwards for each zone so that hot and cold deck temperature decrease in accordance with expected results.	deck discharge temperatures

Test No: PVT-52A

10 June 1994

TEST NO: PVT-52A Page 2 of 2 OBJECTIVE: To demonstrate the
TITLE: Hot Deck - Cold Deck software that resets the hot deck -
Temperature Reset Program cold deck temperatures in dual duct
APPLIES TO: Large/Medium EMCS, UMCS, and differential between the hot and and UCS cold deck temperature.
REFERENCE: Proj. Spec. Paragraph _____

EVENT	EXPECTED RESULTS
4. Initiate an increase in space dry bulb temperature and humidity setpoints for the zone with the maximum heating requirements.	4. Visually verify hot deck temperature is reset upwards in accordance with expected results. Visually verify cold deck temperature is not reset.
5. Initiate a decrease in space dry bulb and humidity setpoints for the zone with the maximum cooling requirements.	5. Visually verify cold deck temperature is reset downwards in accordance with expected results. Visually verify hot deck temperature is not reset.

Test No: PVT-52A
10 June 1994

TEST NO: PVT-53A Page 1 of 2 OBJECTIVE: To demonstrate the
TITLE: Reheat (RHT) Coil Reset Program software that selects the zone requiring the least amount of reheat
APPLIES TO: Large/Medium EMCS, UMCS, and UCS and resets the cold deck discharge temperature of the zone with the lowest reheat demand.
REFERENCE: Proj. Spec. Paragraph _____

INITIAL CONDITIONS

1. Select points in the DE for inclusion in the reheat coil reset program.

2. The contractor provides an explanation of how the zone temperature and humidity requirements affect the cold deck discharge temperatures.

3. The contractor provides input data on zone temperatures and humidity requirements with expected cold deck discharge temperatures for the test.

EVENT	EXPECTED RESULTS
1. Compare list of program inputs and program outputs required in the contract include all documents against the contractor supplied input/output.	1. Contractor supplied inputs/outputs may those inputs/outputs in the contract documents. Contractor furnished software that requires input/output points not included in the contract documents must operate with default values.
2. Initiate dry bulb temperature reheat coil setpoints in all zones to be above cold	2. System executes the discharge program to reset

the initial cold deck discharge temperature setpoint so that reheat is required in all zones.	deck discharge temperature upwards until a reheat coil in the zone with lowest space temperature setpoint is fully closed. In other zones with higher reheat requirements, reheat coil valves are partially open.

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TEST NO: PVT-53A Page 2 of 2 OBJECTIVE: To demonstrate the
TITLE: Reheat (RHT) Coil Reset Program software that selects the zone requiring the least amount of reheat
APPLIES TO: Large/Medium EMCS, UMCS, and UCS and resets the cold deck discharge temperature of the zone with
the REFERENCE: Proj. Spec. Paragraph _____ lowest reheat demand.

EVENT	EXPECTED RESULTS
3. Initiate a change in the space cold deck discharge temperature setpoint upwards for the zone with reheat coil that is fully closed, so that the setpoint is higher than all other zones. Command the system to display sequence equipment status.	3. Verify that the cold deck discharge temperature is further increased until the reheat coil valve for the zone with the current lowest space temperature setpoint is fully closed. Visually verify sequence of equipment operation, and verify system display of final status agrees with predicted results.
4. Initiate a change in the space cold deck discharge temperature setpoint downwards to the zone with the reheat coil that is fully closed so that the temperature setpoint is below all other zones. Command the system to display equipment status.	4. Verify that the cold deck discharge temperature is reduced until the cold deck discharge temperature equals the discharge temperature of the zone with the lowest reheat demand. Visually verify sequence of equipment operation, and verify system display

		of final status agrees with predicted results.
5. Repeat Events 2, 3, and 4 with dry cold deck Command the system to display temperature until the equipment status.	5. Visually verify that the cold deck bulb and humidity setpoints. reset program resets the discharge	zone(s) with the highest reheat demand is satisfied. Visually verify that reheat valve for the zone(s) with the lowest reheat demand is fully closed. Verify system display of final status agrees with predicted results.

Test No: PVT-53A
10 June 1994

TEST NO: PVT-54A Page 1 of 2 OBJECTIVE: To demonstrate software TITLE: Steam Boiler Selection that selects the most efficient
Program boiler operating data to satisfy the
APPLIES TO: Large/Medium EMCS, UMCS, heating load.
and UCS
REFERENCE: Proj. Spec. Paragraph _____

INITIAL CONDITIONS

1. Select points in the DE for inclusion in the boiler selection program.

2. The contractor provides an explanation of how the program selects boiler plant operation to meet at least three levels of heating demand (low, average, maximum) representative of the size of boilers installed. The contractor also provides input data for establishing heating demand, such as OA temperature trends, and indicates the sequence and timing of boiler operation to satisfy various demands.

3. Boilers are to be either shut down or at minimum load at the beginning of the test.

4. The system is programmed to execute the steam boiler plant selection program.

EVENT	EXPECTED RESULTS
1. Compare list of program inputs and supplied program outputs required in the contract include all documents against the supplied input/output.	1. Contractor inputs/outputs may contractor those inputs/outputs in the contract documents. Contractor furnished software that requires input/output points not included in the contract documents must operate with default values.
2. Initiate conditions for minimum boiler	2. System executes steam

heating requirements. Command the selection program for minimum system to display boiler status and heating operating efficiency.	requirements using the available boilers. The boilers that most efficiently satisfy minimum heating requirements are enabled or loaded. Visually verify system display of status on boilers and operating efficiency agrees with predicted results.	

Test No: PVT-54A

10 June 1994

TEST NO: PVT-54A Page 2 of 2 OBJECTIVE: To demonstrate software TITLE: Steam Boiler Selection that selects the most efficient Program boiler operating data to satisfy the APPLIES TO: Large/Medium EMCS, UMCS, heating load. and UCS
REFERENCE: Proj. Spec. Paragraph _____

EVENT	EXPECTED RESULTS
3. Input a revised set of analog values that establish a trend towards higher, but not maximum, requirements. Verify steam output status on requiring multiple boiler operation. Command the system to display boiler status and operating efficiency.	3. Boilers that most efficiently satisfy higher heating requirements are enabled and/or loaded. Verify system display of the system display of boilers and operating efficiency corresponds with predicted results.
4. Input revised analog values that show a trend towards maximum steam requirements.	4. Boilers that most efficiently satisfy maximum heating requirements are enabled and/or loaded. Verify system display of status on boilers and operating efficiency corresponds with predicted results.
5. Input analog values that predict of status on lower steam plant output.	5. Verify system display boilers and operating efficiency corresponds with predicted results. System discontinues the operation of boilers not required to meet load.

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10 June 1994

TEST NO: PVT-55A Page 1 of 2
TITLE: Hot Water (HW) Boiler Selection Program
APPLIES TO: Large/Medium EMCS, UMCS, and UCS
REFERENCE: Proj. Spec. Paragraph _____

OBJECTIVE: To demonstrate software that select the most efficient boiler or combination of boilers based on boiler operating data to satisfy the heating load.

INITIAL CONDITIONS

1. Select points in the DE for inclusion in the boiler selection program.

2. The contractor provides an explanation of how the program selects boiler plant operation to meet at least three levels of heating demand (low, average, maximum) representative of the size of boilers installed. The contractor also provides input data for establishing heating demand, such as OA temperature trends, and indicates the sequence and timing of boiler operation to satisfy various demands.

3. Boilers are to be either shut down or at minimum load at the beginning of the test.

4. The system is programmed to execute the HW boiler plant selection program.

EVENT	EXPECTED RESULTS
1. Compare list of program inputs and supplied program outputs required in the contract documents against the contractor supplied input/output.	1. Contractor inputs/outputs may include all those inputs/outputs in the contract documents. Contractor furnished software that requires input/output points not included in the contract documents must operate with default values.

2. Initiate conditions for minimum boiler selection heating requirements. Command the system to display boiler status and operating efficiency.	2. System executes HW program for minimum heating requirements using the available boilers. The boilers that most efficiently satisfy minimum heating requirements are enabled and/or loaded. Visually verify system display of status on boilers and operating efficiency agrees with predicted results.

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TEST NO: PVT-55A Page 2 of 2
TITLE: Hot Water (HW) Boiler Selection Program
APPLIES TO: Large/Medium EMCS, UMCS, and UCS
REFERENCE: Proj. Spec. Paragraph _____

OBJECTIVE: To demonstrate software that select the most efficient boiler or combination of boilers based on boiler operating data to satisfy the heating load.

EVENT	EXPECTED RESULTS
3. Input a revised set of analog values that establish a trend towards higher HW output requirements, requiring multiple status on operation. Command the system to display boiler status and operating efficiency.	3. Boilers that most efficiently satisfy higher heating requirements are enabled and/or loaded. Verify the system display of boilers and operating efficiency corresponds with predicted results.
4. Input revised analog values that show a trend towards maximum HW heating requirements.	4. Boilers that most efficiently satisfy maximum requirements are enabled and/or loaded. Verify system display of status on boilers and operating efficiency corresponds with predicted results.
5. Input analog values that predict of status on lower steam plant output.	5. Verify system display boiler and operating efficiency corresponds with predicted results. System discontinues the operation of

boilers not required to meet load.

Test No: PVT-55A
10 June 1994

TEST NO: PVT-56A Page 1 of 1 OBJECTIVE: To demonstrate the
TITLE: Hot Water (HW) OA Reset software that resets the HW
Program temperature supplied by the boiler or
APPLIES TO: Large/Medium EMCS, UMCS, convertor in accordance with the
and UCS outside air (OA) temperature.
REFERENCE: Proj. Spec. Paragraph _____

INITIAL CONDITIONS

1. Select points in the DE for inclusion in the hot water OA reset program.

2. The contractor provides an explanation of how the outside air temperature affects the HW supply temperature. The contractor also provides input data on outside air temperatures with corresponding expected HW supply temperature.

3. The system is programmed to execute the hot water OA reset program.

EVENT	EXPECTED RESULTS
1. Compare list of program inputs and supplied program outputs required in the contract documents against the contractor supplied input/output.	1. Contractor inputs/outputs may include all those inputs/outputs in the contract documents. Contractor furnished software that requires input/output points not included in the contract documents must operate with default values.
2. Initiate conditions causing water OA reduction and increases in the outside air temperature. Command	2. System executes the hot reset program which calculates HW reset temperature in accordance

	the system to display HW supply temperature for different OA temperature temperatures.	with reset schedule. Verify system temperature and outside air display of HW supply temperature in the corresponding OA temperature agrees with predicted results.
3.	Initiate condition causing minimum and maximum OA conditions.	3. System executes the OA reset program. Verify system display for maximum and minimum HW temperatures match those in the reset schedule.
4.	Change OA reset schedule and correspond repeat Events 2 and 3.	4. Verify that the results to Results 2 and 3.

Test No: PVT-56A

10 June 1994

TEST NO: PVT-57A Page 1 of 3 OBJECTIVE: To demonstrate software TITLE: Chiller Selection Program that selects the most efficient
APPLIES TO: Large/Medium EMCS, UMCS, and UCS chiller or combination of chillers based on chiller operating profile
REFERENCE: Proj. Spec. Paragraph _____ data to satisfy the cooling load using prediction techniques to match chiller capacity with the predicted load.

INITIAL CONDITIONS

1. Select points in the DE that indicate chiller status, chilled water (CHW) pump status and condenser water pump operation for inclusion in the chiller selection program.

2. The contractor provides an explanation of how the program selects chiller plant operation to meet at least three levels of cooling demand (low, average, maximum) representative of the size of chiller controlled. The contractor provides input data for establishing cooling demand, such as OA temperature trends, and indicates the sequence and timing of chiller operation to satisfy various demands, including lag time for chiller response to change in cooling demand.

3. The chiller(s) are set up to be either shut down or at a minimum load at the beginning of the test.

4. The system is programmed to execute the chiller plant selection program.

EVENT	EXPECTED RESULTS
1. Compare list of program inputs and supplied program outputs required in the contract documents against the contractor supplied input/output.	1. Contractor inputs/outputs may include all those inputs/outputs in the contract documents. Contractor furnished software that requires

input/output points not included in the contract documents must operate with default values.

Test No: PVT-57A
10 June 1994

TEST NO: PVT-57A Page 2 of 3 OBJECTIVE: To demonstrate software TITLE: Chiller Selection Program that selects the most efficient
APPLIES TO: Large/Medium EMCS, UMCS, and UCS chiller or combination of chillers based on chiller operating profile
REFERENCE: Proj. Spec. Paragraph _____ data to satisfy the cooling load using prediction techniques to match chiller capacity with the predicted load.

EVENT	EXPECTED RESULTS
2. Initiate conditions causing a demand for minimum cooling requirements. Command the system to display status of chillers, CHW and condenser water pumps.	2. System executes the chiller selection program for minimum cooling requirements of the available chillers. The chillers that most efficiently satisfy minimum cooling requirements are started up. Verify system display of status on chillers and pumps agrees with predicted results. Verify the chiller(s) are started up in accordance with the chiller manufacturer's startup sequence requirements.
3. Input a revised set of analog values that establish a trend towards higher CHW plant output requirements.	3. Chillers that most efficiently satisfy higher cooling requirements are started up and/or loaded to meet the expected load. Verify system display of status on chillers and pumps agrees with predicted results. Verify the chiller(s) are

started up in accordance with the chiller manufacturer's startup sequence requirements.

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TEST NO: PVT-57A Page 3 of 3 OBJECTIVE: To demonstrate software TITLE: Chiller Selection Program that selects the most efficient
APPLIES TO: Large/Medium EMCS, UMCS, and UCS chiller or combination of chillers based on chiller operating profile
REFERENCE: Proj. Spec. Paragraph _____ data to satisfy the cooling load using prediction techniques to match chiller capacity with the predicted load.

EVENT	EXPECTED RESULTS
4. Input analog values that show a trend towards maximum CHW plant cooling output requirements. Command the system to display chiller and associated pump status.	4. Chillers that most efficiently satisfy maximum requirements are started up and/or loaded to meet the expected load. Verify system display of status on chillers and pumps agrees with predicted results. Verify the chiller(s) are started up in accordance with the chiller manufacturer's startup sequence requirements. Verify there is a predetermined time lag between initiation of cooling demand requiring full load operation and initiation of full load operation at the chiller.
5. Input analog values that predict of status on lower CHW plant output. Command the system to display chiller and chiller(s)	5. Verify system display of chillers and pumps agree with predicted results. If

associated pump status.	are shut down, verify shutdown procedure is in accordance with the chiller manufacturer's requirements.
6. Input analog values that predict of status on minimum CHW plant output. Command the system to display chiller and associated pump status.	6. Verify system display chillers and pumps agrees with predicted results. If chiller(s) are shut down, verify shutdown procedure is in accordance with the chiller manufacturer's requirements. System unloads and shuts down chillers not required to meet load.

Test No: PVT-57A
10 June 1994

TEST NO: PVT-58A Page 1 of 1 OBJECTIVE: To demonstrate the
TITLE: Chilled Water (CHW) software that resets the CHW
Temperature Reset Program temperature supplied by a water
APPLIES TO: Large/Medium EMCS, UMCS, chiller in accordance with space
and UCS temperature and humidity
REFERENCE: Proj. Spec. Paragraph _____ requirements.

INITIAL CONDITIONS

1. Select points in the DE that indicate CHW temperatures, dry bulb temperature, and relative humidity (RH) of spaces for inclusion in the reset program.

2. The contractor provides an explanation of how space temperature/humidity requirements affect CHW temperatures. The contractor also provides input data on space temperature and humidity requirements with corresponding expected CHW supply temperatures.

3. The system is programmed to execute the CHW temperature reset program.

EVENT	EXPECTED RESULTS
1. Compare list of program inputs and supplied program outputs required in the contract documents against the contractor supplied input/output.	1. Contractor inputs/outputs may include all those inputs/outputs in the contract documents. Contractor furnished software that requires input/output points not included in the contract documents must operate with default values.
2. Initiate decreases in zone space CHW reset temperatures (or CHW valve supply position) and relative humidity (RH) reset to the minimum setpoints that require the lowest level. Verify the system display	2. System executes the program. The CHW temperature is

CHW supply temperature. Command the system to display CHW supply temperature.	of CHW temperature agrees with predicted results.
3. Initiate increases in zone space temperature is reset upwards to satisfy new space temperature (or CHW valve position). Command the system to display CHW supply temperature.	3. CHW supply relative humidity (RH) and space temperature and relative humidity (RH) setpoints. Verify system display of CHW temperature agrees with predicted results.
4. Initiate an increase in all space temperature is reset to temperature (or CHW valve position) and humidity setpoints that require the maximum CHW supply temperatures. Verify system display of CHW temperature agrees with predicted results. Command the system to display CHW supply temperature.	4. CHW supply its maximum value.

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TEST NO: PVT-59A Page 1 of 1 OBJECTIVE: To demonstrate the
TITLE: Condenser Water Temperature software that resets the operating
Reset Program chiller condenser water temperature
APPLIES TO: Large/Medium EMCS, UMCS, downward when the OA wet bulb
and UCS temperature will produce a lower
REFERENCE: Proj. Spec. Paragraph _____ condenser water temperature.

INITIAL CONDITIONS

1. Select points in the DE that indicate condenser water temperatures and outside air wet bulb temperatures for inclusion in the reset program.

2. The contractor provides an explanation of how changes in OA wet bulb affect condenser water temperatures. The contractor also provides input data on OA wet bulb with corresponding condenser water temperature levels.

3. The system is programmed to execute the condenser water temperature reset program.

EVENT	EXPECTED RESULTS
1. Compare list of program inputs and supplied program outputs required in the contract documents against the contractor supplied input/output.	1. Contractor inputs/outputs may include all those inputs/outputs in the contract documents. Contractor furnished software that requires input/output points not included in the contract documents must operate with default values.
2. Initiate an OA wet bulb temperature that will produce a lower condenser water supply temperature reset	2. System executes the condenser water temperature reset program.

program. water temperature. Command the compares OA wet bulb system to display the condenser water temperature.	The program with condenser water supply temperature. The condenser water controller setpoint is reset downwards to match the temperature of condenser water that the OA wet bulb temperature can produce. Verify system display of condenser water temperature matches predicted results.
3. Initiate OA wet bulb to fall to a value that will produce a minimum temperature below the minimum allowable condenser water temperature.	3. Program resets condenser water controller setpoint to a minimum allowable value and no lower. Verify the system display of condenser water temperature agrees with predicted results.

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10 June 1994

TEST NO: PVT-60A Page 1 of 2OBJECTIVE: To demonstrate software
TITLE: Chiller Demand Limitthat limits the maximum available
Program chiller capacity when commanded by the
APPLIES TO: Large/Medium EMCS, UMCS, demand limiting program. and UCS
REFERENCE: Proj. Spec. Paragraph _____

INITIAL CONDITIONS

1. Select points in the DE that indicate chiller status demand for inclusion in the demand limit program.

2. The system is programmed to execute the chiller demand limit program.

3. The contractor assigns each step of chiller capacity control to a different priority level of the demand limit program (for example, assign lowest priority to first step below full capacity and highest priority to minimum load). The chiller cooling capacity is set at maximum.

4. The contractor provides an explanation of how the chiller demand limit program fixed steps of chiller capacity control are interfaced with the demand limiting program for each assigned priority level.

EVENT	EXPECTED RESULTS
1. Compare list of program inputs and supplied program outputs required in the contract documents against the contractor supplied input/output.	1. Contractor inputs/outputs may include all those inputs/outputs in the contract documents. Contractor furnished software that requires input/output points not included in the contract documents must operate with default values.

2. Initiate conditions causing the cooling capacity system to execute the chiller is reduced to the demand limit program (for example, cause demand to exceed peak demand target).	2. Verify the maximum of preassigned fixed step. Verify system display of status of available chiller capacity agrees with predicted results.

Test No: PVT-60A

10 June 1994

TEST NO: PVT-60A Page 2 of 2 OBJECTIVE: To demonstrate software
TITLE: Chiller Demand Limit that limits the maximum available
Program chiller capacity when commanded by the
APPLIES TO: Large/Medium EMCS, UMCS, demand limiting program.
and UCS
REFERENCE: Proj. Spec. Paragraph _____

EVENT	EXPECTED RESULTS
3. Initiate conditions causing the available maximum highest demand limit priority step of chiller fixed capacity to be activated (for example, continue to increase demand until highest priority step of chiller fixed capacity is shed).	3. Verify that the cooling capacity is reduced for each additional fixed step reduction.
4. Initiate conditions causing chiller maximum cooling capacity fixed capacity to be restored on-line when the demand is reduced.	4. Verify the of the total system is restored. Verify system display of status of available chiller capacity agrees with predicted results.

Test No: PVT-60A
10 June 1994

TEST NO: PVT-61A Page 1 of 1 OBJECTIVE: To demonstrate software
TITLE: Lighting Control Program that turns equipment on and off based
APPLIES TO: Large/Medium EMCS, UMCS, on the time of day and the day of
and UCS week, including holidays.
REFERENCE: Proj. Spec. Paragraph _____

INITIAL CONDITIONS

1. Select points in the DE with status indication for inclusion in the lighting control program.

2. The test period includes time periods that correspond to each unique lighting schedule.

3. Establish an initial status on all systems (for example, off).

4. The system is programmed to execute the lighting control program.

EVENT	EXPECTED RESULTS
1. Compare list of program inputs and supplied program outputs required in the contract documents against the contractor supplied input/output.	1. Contractor inputs/outputs may include all those inputs/outputs in the contract documents. Contractor furnished software that requires input/output points not included in the contract documents must operate with default values.
2. Initiate a time period for lights to be turned on. Command the system to display status of lighting	2. System executes lighting control program. Lighting systems start up in accordance with the equipment

systems.	schedule. Verify system indicates which lighting systems are off.
3. Manually disable selected points to simulate the activity of turning off locally lights locally.	3. System displays alarms for each simulated lighting system turned off.

Test No: PVT-61A

10

June 1994

TEST NO: PVT-62A Page 1 of 1 OBJECTIVE: To demonstrate software TITLE: Remote Boiler Monitoring and Control Program that monitors boiler operation and discontinues boiler operation if any APPLIES TO: Large/Medium EMCS, UMCS, and UCS monitored point exceeds a predetermined value of change status.
REFERENCE: Proj. Spec. Paragraph _____

INITIAL CONDITIONS

1. Select points in the DE for inclusion in the remote boiler monitoring and control program.

2. The contractor provides an explanation of how the program remotely monitors and controls boiler plant operation.

3. Boilers have been manually started and are operational at the beginning of the test.

4. The system is programmed to execute the remote boiler monitoring and control program.

EVENT	EXPECTED RESULTS
1. Compare list of program inputs and supplied program outputs required in the contract documents against the supplied input/output.	1. Contractor inputs/outputs may include all those inputs/outputs in the contract documents. Contractor furnished software that requires input/output points not included in the contract documents must operate with default values.
2. Initiate conditions causing at least one of the inputs to exceed the maximum or minimum allowed value (such as water level) and one of	2. Visually verify system discontinues boiler operation.

	the digital inputs to change status (such as flame failure).	
3.	Delete all analog inputs which caused the system to discontinue boiler operation. Manually restart boiler.	3. Points are deleted from display. System indicates boiler is in operation.
4.	Add a new analog input whose value will cause the system to discontinue boiler operation.	4. System accepts new value. Verify system discontinues boiler operation.

Test No: PVT-62A
10 June 1994

TEST NO: PVT-63A Page 1 of 1 OBJECTIVE: To demonstrate custom TITLE: *Custom Programs program software performs in
APPLIES TO: Large/Medium EMCS, UMCS, accordance with the contract
and UCS requirements.
REFERENCE: Proj. Spec. Paragraph _____

INITIAL CONDITIONS

1. The contractor provides an explanation of each program, provides necessary input data for each program and indicates the expected results.

EVENT	EXPECTED RESULTS
1. Compare list of program inputs and supplied program outputs required in the contract documents against the contractor supplied input/output.	1. Contractor inputs/outputs may include all those inputs/outputs in the contract documents. Contractor furnished software that requires input/output points not included in the contract documents must operate with default values.

2. Command the system to execute each custom program.	output corresponds	2. Verify program with expected results.

*This test is used for programs that are added to the programs listed in the guide specification.

Test No:

PVT-63A

10 June 1994

TEST NO: PVT-64A Page 1 of 2 OBJECTIVE: To demonstrate the
TITLE: FID or RTU Stand-Alone Mode software that performs FID or RTU
APPLIES TO: Large/Medium EMCS, UMCS, functions and FID or RTU resident
and UCS applications programs using data
REFERENCE: Proj. Spec. Paragraph _____ obtained from the DE and based upon the FID or RTU RTC.

INITIAL CONDITIONS

1. The contractor provides a separate FID or RTU (stand-alone only) with a list of applications programs resident to the FID or RTU.

2. The contractor provides the default parameters for weekdays, holidays and weekends to be stored in the FID or RTU. (For example, initiate start-stop times for digital points and temperature setpoints for analog points.)

3. The contractor provides input data and expected output on the applications programs to be tested prior to and after the FID or RTU non-communicating mode. (Expected results from applications programs with and without FID or RTU - control system or communication are different.)

4. The contractor provides expected results on operational data that will be stored in the FID.

5. Selected points in the DE indicate the status of equipment included in the tests.

6. Demonstrate all FID or RTU stand-alone applications programs individually using different DE points for each program.

7. Demonstrate all FID or RTU stand-alone applications programs sharing the same set of DE points. (This will demonstrate the priority assigned to each applications program.)

EVENT	EXPECTED RESULTS

1. Compare the contractor furnished contractor's supplied list of application programs resident in the FID or RTU against the required list on the contract documents.	1. Verify the list matches the list in the contract documents.

Test No: PVT-64A
10 June 1994

TEST NO: PVT-64A Page 2 of 2 OBJECTIVE: To demonstrate the
TITLE: FID or RTU Stand-Alone Mode software that performs FID or RTU
APPLIES TO: Large/Medium EMCS, UMCS, functions and FID or RTU resident and UCS applications programs using data
REFERENCE: Proj. Spec. Paragraph _____ obtained from the DE and based upon the FID or RTU RTC.

EVENT	EXPECTED RESULTS
2. Initiate operation of each of the FID or RTU resident application programs at the operator's console. (Select a period of time for load rolling to demonstrate all FID/RCU communication resident programs as specified.)	2. System requests input parameters appropriate to the application program. Verify equipment operates in accordance with expected results when FID or RTU is in with the central system.
3. Initiate a communication failure between the central system and the selected FIDs or RTUs. Allow stand-alone mode to continue for at least six week days, one holiday and one weekend of a continuous period (simulate the remaining schedule by changing the FID or RTU time-clock time and date). Exercise operation of each FID or RTU resident program listed in Event 2.	3. Application programs resident in the FID or RTU operate in the stand-alone mode. Visually verify equipment operates in accordance with stand-alone application programs.
4. At the end of the eight day period re-initiate communication between	4. Verify equipment operates in accordance with expected results

the FID or RTU and CCU or COS.	when FID or RTU is in communication with the central system.

PVT-64A	Test No:
1994	10 June

TEST NO: PVT-65A Page 1 of 1 OBJECTIVE: To demonstrate the
TITLE: FID or RTU Stand-Alone stand-alone software that implements
Load Rolling Function a load-rolling sequence at each FID
APPLIES TO: Large/Medium EMCS, UMCS, or RTU including associated MUX or
and UCS ACU panels in the FID or RTU
REFERENCE: Proj. Spec. Paragraph _____ non-communication mode with the CCU
or COS out of service.

INITIAL CONDITIONS

1. The contractor provides a sequence of load control for the demand control programs initiated at the CCU or COS and for the stand-alone demand control program to be executed under a communication failure between the FID or RTU and CCU or COS. The sequences of control should be different between the two programs.

2. Select points in the DE to represent status of equipment start/stop in the test.

EVENT	EXPECTED RESULTS
1. Initiate a communication failure between the FID or RTU and CCU or COS.	1. FID or RTU resident load rolling function controls equipment. Visually verify equipment status corresponds to expected results of FID or RTU stand-alone load rolling function with a communication failure between FID or RTU and CCU or COS.

Test No: PVT-65A
10 June 1994

TEST NO: PVT-66A Page 1 of 1 OBJECTIVE: To demonstrate that the
TITLE: Telephone Modem modem is interfaced to the CCU or COS APPLIES TO: Large/Medium EMCS, UMCS, and phone system.
and UCS
REFERENCE: Proj. Spec. Paragraph _____

INITIAL CONDITIONS

1. The system is operating normally.

2. The modem and phone line are not busy.

3. A second monitor and modem connected to the telephone system is available.

EVENT	EXPECTED RESULTS
1. Using a remote monitor and modem (not connected to the system) call the system and log on using an unauthorized password.	1. System does not allow log on.
2. Repeat Event 1, using an authorized on through dial password.	2. System allows log up modem.
3. Issue typical commands suitable for type of monitor and password.	3. System executes commands.
4. Log off system.	4. System logs off monitor.
5. Manual originates call from system to remote terminal.	5. System opens communication with remote terminal.
6. Send a report to remote terminal.	6. Report is displayed on remote terminal.
7. Log off remote terminal.	7. System logs off monitor.

PVT-66A

Test No:

10 June 1994

TEST NO: PVT-67A Page 1 of 1 OBJECTIVE: To demonstrate special tests
TITLE: *Special Tests in accordance with the contract
APPLIES TO: Large/Medium EMCS, UMCS, requirements.
and UCS
REFERENCE: Proj. Spec. Paragraph _____

INITIAL CONDITIONS

1. The contractor provides an explanation of each test, provides necessary input data for each test and indicates the expected results.

EVENT	EXPECTED RESULTS
1. Compare list of data inputs and test outputs required in the contract include all documents against the contractor in the supplied input/output.	1. Contractor supplied inputs/outputs may those inputs/outputs contract document. Contractor furnished data that requires input/output not included in the contract documents must operate with default values.
2. Command the system to execute each corresponds with special test.	2. Verify test output expected results.

* This test is used for tests that are added to the tests listed in the guide specification.

Test No: PVT-67A
10 June 1994

TEST NO: PVT-68A Page 1 of 1

TITLE: Final System Equipment Verification

APPLIES TO: Large/Medium EMCS, UMCS, and UCS

REFERENCE: Proj. Spec. Paragraph _____

OBJECTIVE: To verify that the hardware components of the system provided by the contractor are in accordance with the contract plans and specifications and all approved submittals after all tests are completed.

INITIAL CONDITIONS

1. The contractor provides a list of approved system hardware components, including the name of the component, manufacturer, and model number. This list is based on the contract plans, specifications, change orders (if any) and approved submittals which must be available for reference purposes during the test.

EVENT	EXPECTED RESULTS
1. The model numbers of each hardware equipment provided by the contractor.	1. Model numbers of component should be examined and checked against the model numbers of the equipment on the approved submittals. shall match the model numbers of approved

PVT-68A

Test No:

10 June 1994

5.3 Endurance Test, END-1A. The Endurance Test, END-1A, shall be designed to demonstrate the specified overall system reliability requirement of the completed system. The Endurance Test, END-1A, shall be conducted in four phases as described below. The Endurance Test, END-1A, shall not be started until the Government notifies the Contractor, in writing, that the Performance Verification Tests have been satisfactorily completed, training as specified has been completed, correction of all outstanding deficiencies has been satisfactorily completed, and that the Contractor has permission to start the Endurance Test, END-1A. The Contractor shall provide an operator to man the system eight hours per day during first shift operations, including weekends and holidays, during Phase I and Phase III Endurance testing, in addition to any Government personnel that may be made available. The Government may terminate testing at any time if the system fails to perform as specified. Upon termination of testing by the Government or by the Contractor, the Contractor shall commence an assessment period as described for Phase II and Phase IV. Upon successful completion of the Endurance Test, END-1A, the Contractor shall deliver test reports (see 4.4 and 6.3) to the Government prior to acceptance of the system. The Contractor shall keep a record of the time and cause of each outage that takes place during the test period.

During the Phase I testing, the system shall be operated as specified for 24 hours per day, 7 days per week, for 15 consecutive calendar days, including holidays. The Contractor shall not make repairs during this phase of testing unless authorized by the Government, in writing. If the system experiences no failures during the Phase I test, the Contractor may proceed directly to Phase III testing, after the Contractor receives written permission from the Government.

In Phase II, which occurs after the conclusion of Phase I, the Contractor shall identify all failures, shall determine the causes of all failures, repair all failures, and submit a test failure report (see 5.3.1 and 6.3) to the Government. After submitting the written report, the Contractor shall convene a test review meeting at the job site to present the results and recommendations to the Government. The meeting shall be scheduled no earlier than five business days after receipt of the report by the Government. As a part of this test review meeting, the Contractor shall demonstrate that all failures have been corrected by performing appropriate Performance Verification Tests. Based on the Contractor's report, the test review meeting, and the Contractor's recommendation, the Government shall independently determine the restart point and

may require that the Phase I test be totally or partially rerun. The Contractor shall not commence any required retesting until after receipt of written notification by the Government.

After the conclusion of any retesting which the Government may require, the Phase II assessment shall be repeated as if Phase I had just been completed. If the retest is completed without any failures, the Contractor may proceed directly to Phase III testing, after the Contractor receives written permission from the Government.

During Phase III testing, the system shall be operated as specified for 24 hours per day, 7 days per week, for 15 consecutive calendar days, including holidays. The Contractor shall not make repairs during this phase of testing unless authorized by the Government, in writing.
In Phase IV, which occurs after the conclusion of Phase III, the Contractor shall identify all failures, determine the causes of all failures, repair all failures, and submit a test failure report (see 5.3.1 and 6.3) to the Government. After submitting the written report, the Contractor shall convene a test review meeting at the job site to present the results and recommendations to the Government. The meeting shall not be scheduled earlier than five business days after receipt of the report by the Government. As a part of this test review meeting, the Contractor shall demonstrate that all failures have been corrected by performing appropriate Performance Verification Tests. Based on the Contractor's report, the test review meeting, and the Contractor's recommendation, the Government shall independently determine the restart point and may require that the Phase III test be totally or partially rerun. The Contractor shall not commence any required retesting until after receipt of written notification by the Government. After the conclusion of any retesting which the Government may require, the Phase IV assessment shall be repeated as if Phase III had just been completed.

The Contractor shall not be held responsible for failures resulting from the following:

a. An outage of the main power supply in excess of the capability of any backup power source, provided that the automatic initiation of all backup sources was accomplished and that automatic shutdown and restart of the EMCS performed as specified.

b. Failure of a Government furnished communications link, provided that the FID or RTU automatically and correctly operates in the stand-alone mode as specified, and that

the failure was not due to contractor furnished equipment, installation, or software.

c. Failure of existing Government owned equipment, provided that the failure was not due to contractor furnished equipment, installation, or software.

5.3.1 Failure reports. The Contractor shall provide EMCS Endurance Test Failure Reports (see 6.3). EMCS Test Failure Reports shall explain in detail the nature of each failure, corrective action taken, results of tests performed. If any failures occur during Phase I or Phase III testing, the Contractor shall recommend the point at which the Phase I or Phase III testing, as applicable, should be resumed.

5.3.2 Data requirements for failure reports. EMCS Endurance Test Failure Reports (see 6.3), applies to this requirement. Deliverable data identified on the DD Form 1423 shall be prepared in accordance with instructions specified in the DID.

TEST NO: END-1A Page 1 of 4 OBJECTIVE: To demonstrate system
TITLE: Endurance Test - Phase I normal mode operation 24 hours a day
APPLIES TO: Large/Medium EMCS, UMCS, for 15 consecutive calendar days in
and UCS accordance with contract
REFERENCE: Proj. Spec. Paragraph _____ requirements.

INITIAL CONDITIONS

1. All other performance verification tests have been successfully completed.

2. In addition to Government personnel present at the test, contractor operators are to man the system a minimum of 8 hours per day including weekends, for the duration of the Endurance Test.

_____

EVENT	EXPECTED RESULTS
1. Operate the system in normal mode so that the system performs its assigned tasks in accordance with the contract requirements. Verify the contract requirements for 15 consecutive calendar days, 24 hours a day.	1. Verify the system performs its assigned tasks in accordance with the contract requirements. Verify the contractor makes no repairs on the system unless authorized by the Government, in writing.
2. Place at least one FID or RTU in stand-alone mode for 5 days minimum.	2. Verify FID or RTU performs its assigned tasks in stand-alone mode in accordance with contract requirements.
3. Place balance of FIDs or RTUs in stand-alone mode day.	3. Verify FIDs or RTUs perform their assigned tasks in stand-alone mode for at least one in accordance with contract

	requirements.
4. Record failures and provide records data on Government with any failures as specified.	4. Verify contractor data as specified.

Test No: END-1A
10 June 1994

TEST NO: END-1A Page 2 of 4 OBJECTIVE: To demonstrate system
TITLE: Endurance Test - Phase I normal mode operation 24 hours a day
APPLIES TO: Large/Medium EMCS, UMCS, for 15 consecutive calendar days in
and UCS accordance with contract
REFERENCE: Proj. Spec. Paragraph _____ requirements.

EVENT	EXPECTED RESULTS
5. Identify all failures, determine causes of all failures and repair all failures. Submit a written report to the Government on all failures as specified.	5. Verify contractor repairs all failures and submits written reports on all failures as specified.
6. Meet with the Government to review restart point for results of Phase I testing or determine that demonstrate that all failures have commence Phase been corrected by submitting III testing. Provide written results of appropriate Performance Verification Tests. Based on the results of Phase I, either recommend the point at which Phase I retesting should begin or recommend that the Government should proceed into Phase III testing.	6. Determine the Phase I tests and the Contractor can notification for the Contractor.

END-1A

Test No:

10 June 1994

TEST NO: END-1A Page 3 of 4 OBJECTIVE: To demonstrate system
TITLE: Endurance Test - Phase I normal mode operation 24 hours a day
APPLIES TO: Large/Medium EMCS, UMCS, for 15 consecutive calendar days in
and UCS accordance with contract
REFERENCE: Proj. Spec. Paragraph _____ requirements.

EVENT	EXPECTED RESULTS
7. Operate the system in normal mode so that the system performs its assigned tasks in accordance with the contract requirements for 15 consecutive calendar days, 24 hours a day, including a weekend.	7. Verify the system performs its assigned tasks in accordance with the contract requirements. Verify the contractor makes no repairs on the system unless authorized by the Government, in writing.
8. Place at least one FID or RTU in stand-alone mode for 5 days minimum (different FID or RTU from Phase I, END-1A, Event 3).	8. Verify FID or RTU performs its assigned tasks in stand-alone mode in accordance with contract requirements.
9. Place balance of FIDs or RTUs in stand-alone mode day.	9. Verify FIDs or RTUs perform their assigned tasks in accordance with contract requirements.
10. Record failures and provide records data on Government with any failures as specified.	10. Verify contractor data as specified.

Test No: END-1A
10 June 1994

TEST NO: END-1A Page 4 of 4 OBJECTIVE: To demonstrate system
TITLE: Endurance Test - Phase IV normal mode operation 24 hours a day
APPLIES TO: Large/Medium EMCS, UMCS, for 15 consecutive calendar days in
and UCS accordance with contract
REFERENCE: Proj. Spec. Paragraph _____ requirements.

EVENT	EXPECTED RESULTS
11. Identify all failures, determine repairs all causes of all failures and repair all failures. Submit a written report to the Government on all failures as specified.	11. Verify contractor submits written reports on all failures as specified.
12. Meet with the Government to review results of Phase III Tests and demonstrate that all failures have been corrected by submitting results of appropriate Performance Verification Tests. Based on the results of Phase III, either recommend the point at which Phase III retesting should begin or recommend that the EMCS has successfully completed the Endurance Test.	12. Determine the restart point for Phase III testing or determine that the EMCS has successfully completed the Endurance Test. If Phase III retesting is required, provide written notification for the contractor to recommence testing.

Test

No: END-1A

10 June 1994

5.4 Seasonal Endurance Test, END-2A. The Seasonal Endurance Test, END-2A, as specified shall be designed to demonstrate the specified overall system reliability requirement of the complete system. The Seasonal Endurance Test, END-2A, shall be conducted in four phases as described below. The Seasonal Endurance Test, END-2A, shall not be started until the Government notifies the Contractor, in writing, that the Performance Verification Tests have been satisfactorily completed, training as specified has been completed, correction of all outstanding deficiencies has been satisfactorily completed, and that the Contractor has permission to start the Seasonal Endurance Test, END-2A. The Contractor shall provide an operator to man the system eight hours per day during first shift operations, including weekends and holidays, during Phase I and Phase III Endurance Testing, in addition to any Government personnel that may be made available. The Government may terminate testing at any time if the system fails to perform as specified. Upon termination of testing by the Government or by the Contractor, the Contractor shall commence an assessment period as described for Phase II and Phase IV. Upon successful completion of the Seasonal Endurance Test, END-2A, the Contractor shall deliver test reports (see 4.4 and 6.3) to the Government prior to acceptance of the system. The Contractor shall keep a record of the time and cause of each outage that takes place during the test period.

During the Phase I testing, the system shall be operated as specified for 24 hours per day, for 5 consecutive calendar days, including weekends and holidays. The Contractor shall not make repairs during this phase of testing unless authorized by the Government, in writing. If the system experiences no failures during the Phase I test, the Contractor may proceed directly to Phase III testing after the Contractor receives written permission from the Government.

In Phase II, which occurs after the conclusion of Phase I, the Contractor shall identify all failures, determine the causes of all failures, repair all failures, and submit a test failure report (see 5.3.1 and 6.3) to the Government. After submitting the written report, the Contractor shall convene a test review meeting at the job site to present the results and recommendations to the Government. The meeting shall be scheduled no earlier than five business days after receipt of the report by the Government. As a part of this test review meeting, the Contractor shall demonstrate that all failures have been corrected by performing appropriate Performance Verification Tests. Based on the Contractor's report, the test review meeting, and the Contractor's recommendation, the Government shall independently determine the restart point and

may require that the Phase I test be totally or partially rerun. The Contractor shall not commence any required retesting until after receipt of written notification by the Government.

After the conclusion of any retesting which the Government may require, the Phase II assessment shall be repeated as if Phase I had just been completed. If the retest is completed without any failures, the Contractor may proceed directly to Phase III testing after the Contractor receives written permission from the Government.

During Phase III testing, the system shall be operated as specified for 24 hours per day, for 5 consecutive calendar days, including weekends and holidays. The Contractor shall not make repairs during this phase of testing unless authorized by the Government, in writing.
In Phase IV, which occurs after the conclusion of Phase III, the Contractor shall identify all failures, determine the causes of all failures, repair all failures, and submit a test failure report (see 5.3.1 and 6.3) to the Government. After submitting the written report, the Contractor shall convene a test review meeting at the job site to present the results and recommendations to the Government. The meeting shall not be scheduled earlier than five business days after receipt of the reports by the Government. As a part of this test review meeting, the Contractor shall demonstrate that all failures have been corrected by performing appropriate Performance Verification Tests. Based on the Contractor's recommendation, the Government shall independently determine the restart point and may require that the Phase III test be totally or partially rerun. The Contractor cannot commence any required retesting until after receipt of written notification by the Government. After the conclusion of any retesting which the Government may require, the Phase IV assessment shall be repeated as if Phase III had just been completed.

The Contractor shall not be held responsible for failures resulting from the following:

a. An outage of the main power supply in excess of the capability of any backup power source, provided that the automatic initiation of all backup sources was accomplished and that automatic shutdown and restart of the EMCS performed as specified.

b. Failure of a Government furnished communications link, provided that the FID or RTU automatically and correctly operates in the stand-alone mode as specified, and that

the failure was not due to contractor furnished equipment, installation, or software.

c. Failure of existing Government owned equipment, provided that the failure was not due to contractor furnished equipment, installation, or software.

TEST NO: END-2A Page 1 of 4 OBJECTIVE: To demonstrate system
TITLE: Seasonal Endurance Test normal mode operation 24 hours a day
- Phase I for five consecutive calendar days in
APPLIES TO: Large/Medium EMCS, UMCS, accordance with contract
and UCS requirements.
REFERENCE: Proj. Spec. Paragraph _____

INITIAL CONDITIONS

1. All other performance verification tests have been successfully completed.

2. The Endurance Test END-1A is successfully completed.

3. In addition to Government personnel present at the test, contractor operators are to man the system a minimum of 8 hours per day including weekends, for the duration of the Seasonal Endurance Test.

EVENT	EXPECTED RESULTS
1. Operate the system in normal mode so that the system performs its assigned tasks in accordance with the contract requirements. Verify the contract requirements for 5 consecutive calendar days, 24 hours a day, including a weekend.	1. Verify the system performs its assigned tasks in accordance with the contract requirements. the contractor makes no repairs on the system unless authorized by the Government, in writing.
2. Place at least one FID or RTU in stand-alone mode for 5 days minimum.	2. Verify FID or RTU performs its assigned tasks in stand-alone mode in accordance with contract requirements.

3. Place balance of FIDs or RTUs in perform their stand-alone mode for at least one day.	3. Verify FIDs or RTUs assigned tasks in stand-alone mode in accordance with contract requirements.
4. Record failures and provide data on Government with data as specified.	4. Verify contractor records any failures as specified.

Test No: END-2A
10 June 1994

TEST NO: END-2A Page 2 of 4 OBJECTIVE: To demonstrate system
TITLE: Seasonal Endurance Test normal mode operation 24 hours a day
- Phase I for five consecutive calendar days in
APPLIES TO: Large/Medium EMCS, UMCS, accordance with contract
and UCS requirements.
REFERENCE: Proj. Spec. Paragraph _____

EVENT	EXPECTED RESULTS
5. Identify all failures, determine causes of all failures and repair all failures. Submit a written report to the Government on all failures as specified.	5. Verify contractor repairs all failures and submits written reports on all failures as specified.
6. Meet with the Government to review restart point for results of Phase I testing or determine that demonstrate that all failures have been corrected by submitting written results of appropriate Seasonal Contractor Endurance Tests. Based on the results of Phase I, either recommend the point at which Phase I retesting should begin or recommend that the Government should proceed into Phase III testing.	6. Determine the Phase I tests and the Contractor can commence Phase III testing. Provide notification for the Contractor to recommence testing.

END-2A

Test No:

10 June 1994

TEST NO: END-2A Page 3 of 4 OBJECTIVE: To demonstrate system
TITLE: Seasonal Endurance Test - Phase I normal mode operation 24 hours a day for five consecutive calendar days in
APPLIES TO: Large/Medium EMCS, UMCS, and UCS accordance with contract requirements.
REFERENCE: Proj. Spec. Paragraph _____

EVENT	EXPECTED RESULTS
7. Operate the EMCS in normal mode so that the system performs its assigned tasks in accordance with the contract requirements. Verify the contract requirements for 5 consecutive calendar days, 24 hours a day, including a weekend.	7. Verify the system performs its assigned tasks in accordance with the contract requirements. the contractor makes no repairs on the system unless authorized by the Government, in writing.
8. Place at least one FID or RTU in stand-alone mode for 5 days minimum.	8. Verify FID or RTU performs its assigned tasks in stand-alone mode in accordance with contract requirements.
9. Place balance of FIDs or RTUs in stand-alone mode for at least one day.	9. Verify FIDs or RTUs perform their assigned tasks in stand-alone mode in accordance with contract requirements.
10. Record failures and provide data on Government with data as specified.	10. Verify contractor records any failures as specified.

Test No: END-2A
10 June 1994

TEST NO: END-2A Page 4 of 4 OBJECTIVE: To demonstrate system
TITLE: Seasonal Endurance Test normal mode operation 24 hours a day
- Phase I for five consecutive calendar days in
APPLIES TO: Large/Medium EMCS, UMCS, accordance with contract
and UCS requirements.
REFERENCE: Proj. Spec. Paragraph _____

EVENT	EXPECTED RESULTS
11. Identify all failures, determine repairs all causes of all failures and repair submits written all failures. Submit a written report to the Government on all failures as specified.	11. Verify contractor failures and reports on all failures as specified.
12. Meet with the Government to review results of Phase III Tests and determine that demonstrate that all failures have been corrected by submitting results of appropriate Seasonal required, Endurance Tests. Based on the results of Phase III, either recommend the point at which Phase III retesting should begin or recommend that the EMCS has successfully completed the Seasonal Endurance Test.	12. Determine the restart point for Phase III Testing or the EMCS has successfully completed the Seasonal Endurance Test. If Phase III retesting is provide written notification for the contractor to recommence testing.

END-2A

Test No:

10 June 1994

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. This standard provides generic performance verification and endurance tests for EMCS. These tests are to be used to assure that the physical and performance requirements of guide specifications for EMCS are tested, and that the test results are adequately documented.

6.2 Issue of DODISS. When this standard is used in acquisition, the applicable issue of the DODISS must be cited in the solicitation (see 2.2).

6.3 Data requirements. The following DIDs must be listed, as applicable, on the Contract Data Requirements List (DD Form 1423) when this standard is applied on a contract, in order to obtain the data, except where DoD FAR Supplement 227.405-70 exempts the requirement for a DD Form 1423.

Reference Paragraph	DID Number	DID Title	Suggested Tailoring
4.2 and 4.2.1	DI-ATTS-80363A	EMCS Performance Verification and Endurance Test Plans	----
4.3, 4.3.1, and 5.1	DI-ATTS-80364A	EMCS Performance Verification and Endurance Test Procedures	----
4.4, 4.4.1, 5.3, and 5.4	DI-ATTS-80365A	EMCS Performance Verification and Endurance Test Reports	----
5.3, 5.3.1, 5.3.2, and 5.4	DI-ATTS-80366A	EMCS Endurance Test Failure Reports	----

The above DIDs were those cleared as of the date of this standard. The current issue of DoD 5010.12-L, Acquisition Management Systems and Data Requirements Control List (AMSDL), must be researched to ensure that only current, cleared DIDs are cited on the DD Form 1423.

6.4 Subject term (key word) listing.

Computer regulation unit
Digital data display
Digital electronics unit
Execution validation and durability examination
Unitary unit
Utility computer command unit

6.5 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Custodians:
Army - CE
Navy - YD1
Air Force - 04

Preparing Activity:
Navy - YD1
(Project ATTS-0026)