This specification describes the general and operational characteristics of a multiplexed, distributed-processing, and multi-function monitoring and control system. Detailed programming will be coordinated with the user at a later date.

The clock system shall be multiplexed with a BCD output converted to synchronous signals in each affected building.

The energy management system shall be multiplexed to transponders with sequential, timed output controls and monitoring capability for each affected building. Additional capacities shall be inherent in the system controls.

The fire alarm system shall be multiplexed to transponders and shall be general alarm to coded signals with each floor of each building identified as a zone. Additional capacities shall be inherent in the system controls.

The system shall include the Central Processing Unit (Simplex Model 2120-8202) with printer, keyboard entry, and digital display; Status Command Center (Simplex Model 2120-7503) with annunciator LED's and manual control switches; microprocessor controlled transponders (Simplex Model 2120-8002) sized as necessary and located throughout the facility; and peripheral devices such as BCD converters, demand limit controls, manual stations, horns, and smoke detectors to provide a complete and operable system.

The existing system is to be removed. Existing conduit and wire will be used where possible. New Conduit and wire will be added as necessary.

I. Description of the Simplex 2120 Multi-function Multiplex System.

The following is intended to describe the minimum functional requirements for a multiplex, integrated, proprietary, monitoring and control system. The equipment, herein specified, is that of the Simplex Time Recorder Co., and constitutes the type and quality of equipment required. System components are the Central Processing Unit (CPU), Status Command Center (SCC), Basic Transponders, Fire Alarm Basic Transponders, Peripheral Detection and Alarm Devices such as smoke detectors and horns, and outputs for specified control functions.

1. The system specified shall consist of a central processing unit (CPU), status command center (SCC), and transponders (TPRs), and shall be designed so that the CPU shall use multiplex communication techniques to receive data from and transmit data to the transponders which shall be located throughout the facility to minimize wiring costs, simplify system design, and allow economical expansion. Multiplex communication techniques shall also be used for all status command center functions.

2. The CPU shall be microprocessor based to increase system reliability, speed response to alarm conditions, and reduce cost. The system shall use distributed processing techniques (intelligent transponders) to allow independent operation of the transponders. All operator

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involvement with the system in an alarm condition shall be at the 
CPU's operator console and Status Command Center (SCC) to simplify 
operation. Additionally, the system can provide status indications 
at remotely located CRT's, printers, or annunciators.

3. The CPU's printer shall be self contained in the same console and 
provide a printed record of all system activity, and shall operate 
on commercial AC voltage or the system's standby batteries to pro-
vide a printed record of system events during commercial power 
outages. The system shall be equipped with custom alphanumeric 
identification labels to speed operator response to alarm conditions. 
The life safety software instructions shall be retained in erasable programmable read-only-memory (EPROM) to prevent unauthorized per-
sonnel from reprogramming vital life safety instructions. The software routines shall be designed to provide an automatic restart after power failures so that the system will become fully operational without manual restart procedures or operator intervention.

4. The CPU shall provide complete supervision of the system so that any 
defects in wiring, loss of power, or transponder failure shall be 
visually amunciated and printed at the CPU with an audible and 
visual signal. The CPU shall detect alarm conditions from all moni-
tored devices connected to the system. It shall provide a printed 
record of such events as well as a visual indication and signal to 
advise the system operator.

5. The transponders shall have the capability to interface with all 
specified peripheral devices, such as waterflow switches, smoke 
detectors, alarm horns for fire alarm and various inputs and outputs 
for energy management, or facility monitoring and control.

6. Fire Alarm Basic Transponders (2120-8002) shall be microprocessor 
based, housed in an all metal cabinet suitable for wall mounting, 
either flush or surface. Basic transponder size shall be a combi-
ation of eight alarm points and four optional control points. Each 
transponder's microprocessor, memory and associated circuitry shall 
have the ability to detect losses of communication with the CPU, 
e.g. resulting from defects in the communications circuit wiring. 
In this event, the microprocessor shall revert to an "off line" mode 
of operation and have the ability to activate any or all of the FABT's 
control points as a result of an alarm condition from the FABT's 
specified monitor points.

7. Sensing circuits from the Basic Transponder to peripheral devices 
shall be supervised to provide an indication of sensing circuit 
fauls. Sensing circuit supervision shall not reduce available sys-
tem monitor points. Sensing circuits shall be capable of reporting 
an alarm, a ground, a short, an open, or a 50% change in detection 
loop current (reference UL 1076). Transponder sensing circuits shall 
be capable of working with normally open (N/O), normally closed (N/C), 
or current limited normally open contacts. As an option, each BT 
may be equipped with voltage monitor capability.
8. Both the BT and FABT shall have the capability of operating from the CPU using 2 wires for digital communication. Both the BT and FABT shall be equipped with an internal 24VDC power supply and battery charger system. This supply may be used to power 4 wire smoke detectors, signals, door holders, and other types of peripherals as required, as well as other BT's and FABT's.

9. As a result of alarm conditions at the CPU, the system shall have the ability to automatically operate specified control points such as initiating fire alarm evacuation signals, or stopping an exhaust fan because the preset limit on the demand meter has been exceeded. The system shall also have the ability to operate its control points on a user programmed schedule.

10. The Status Command Center shall be integrated with the CPU and shall function as both an annunciator for the systems monitor and control points and provide for clearly labelled toggle switches to allow independent and manual operation of the systems control points, with the exception of the Fire Alarm control points, which are fixed through non-programmable control-by-event software.

11. The system shall be listed under the following categories:
   NFPA 72A,B,C,D,E (Fire Alarm),
   C.S.F.M. 7165-026:126
   UL-1076 (security)

12. The CPU and transponders shall use the existing telephone cable and commercially available cable where needed to reduce cost.

13. The system shall be a modular design to allow future expansion with a minimum of hardware and/or software additions. The system shall be equipped with battery standby for system operation during commercial power outages, and the system shall instantly revert to the batteries upon the loss of the 60 Hz supply.

14. When the system is operating on a battery supply, either the CPU or any transponder, a trouble condition shall be generated. When commercial power is restored, the system shall revert back to the 120VAC 60 Hz supply and be fully operational without any operator intervention or manual restart procedures. The CPU shall be equipped with a minimum of four hours of battery standby, and the transponders shall be equipped with a minimum of 24 hours of battery standby. Batteries and battery chargers shall be self contained within the same cabinet as the CPU and/or transponder. The CPU and transponders shall be equipped with battery charging circuits sufficient to recharge fully depleted batteries to within 70% of their maximum capacity within 12 hours.

15. The system shall be equipped with an EIA RS-232-C communications input/output port to allow use of commercially available remote
printers, cathode ray tubes (CRT), and keyboards, to reduce system costs.

16. The CPU shall also be equipped with a binary coded decimal (BCD) time output in order to control the campus clock system. This output will interface with a clock code converter (Simplex 2320-7003) located in each building. Each campus wall clock shall be synchronized to the time of the central processor with clock correction being performed once each minute throughout the day.

II. Operation

1. The system shall detect changes in status of the monitored points within the system and shall indicate any such changes at the CPU. The green all clear LED shall be illuminated when all conditions are normal. The receipt of an alarm condition shall cause the following:

A. Display the alarm condition on the alphanumeric display.

B. Activate any assigned control points through control-by-event.

C. Print or display the assigned English language message and activated control-by-event functions, with time and date, for the monitored point in alarm, on the CPU printer.

D. Sound the alarm signal at the CPU and illuminate the system alarm LED. The alarm signal and LED shall pulse until the appropriate "acknowledge" switch is depressed which shall cause it to be silenced.

E. Operation of the appropriate system "acknowledge" switch shall cause a display of the assigned message for the point in alarm with the suffix "ACK".

F. The system alarm LED shall remain illuminated and the system all clear LED shall extinguish until the alarm condition has been corrected.

G. When the alarm condition has been corrected, the CPU shall display the assigned message for the point in alarm with the suffix "CLR": print and display shall occur as described in paragraphs 4.1.3 and 4.1.4.

H. Deactivate assigned control points through control-by-event provided control point priorities allow.

I. System Summary - prints status of all system points.

J. Trouble Summary - Prints status of any supervisory problem within the system.
K. Time - prints system time.

L. Cancel - Terminates any requested reports.

M. Time Control Summary - prints all assigned times for a respective control point, or prints all control functions for a specific time.

2. Transponders shall be equipped with control point outputs utilizing relays with two amp 120 VAC contacts in the latch (maintain), momentary, or momentary dual contact configuration. This configuration shall be software configured, allowing changes from one central location.

3. Transponder sensing circuits shall utilize two wires from the transponder to the alarm contact. Existing telephone lines shall be used where possible.

4. Fire Alarm Basic Transponders shall be Simplex type 2120-7013 with metal cabinet.

5. Basic Transponders shall be Simplex type 2120-7003 with metal cabinet.

6. The Central Processing unit, CPU, shall be Simplex Model 2120-8202 with alphanumeric display and keyboard, and model 2120-1003, 20 column printer. Both the alphanumeric display and printer shall be fully operational while the system is operating on the standby batteries. The CPU printer shall be thermal head, silent operation, with automatic paper take-up, and shall receive print messages in the 80 column format, but shall print each message on multiple lines. Print rate shall be two lines per second, (40 characters per second). Expanded font shall be available for all alarm conditions, if specified.

7. CPU to transponder wiring shall be supervised for opens in the circuit, shorts across the pair, and grounds. The system shall identify the fault and the affected channel. Supervisory trouble conditions shall cause the CPU to operate in a similar manner as described in Paragraph 1.D, requiring the acknowledge switch to be operated.

8. Should a failure in the communication lines be detected, the transponders shall begin an off-line operation in which an alarm on a locally monitored fire alarm device shall activate all locally controlled horns and controls as programmed at the transponder.

9. Communications between the CPU and transponders shall be in digital form. The message word shall consist of multiple digital bits including address, data, parity, start and stop bits. Data address parity, checksum, overrun, and framing checks must be passed in order for the CPU or transponders to consider any message valid. In the event a transponder fails to respond to a communication from the CPU, 3 more attempts shall be made. Failure of the transponder
to respond to the four attempts will result in an indication of communications failure with a resulting CRT display, audible alarm, and printout.

10. CPU shall include the following pushbuttons, lamps and audible devices:
    - Priority 1 alarm LED and acknowledge button.
    - Priority 2 alarm LED and acknowledge button.
    - Trouble LED and acknowledge button.
    - Sonalert to indicate alarm and trouble conditions.

11. CPU must incorporate circuitry to continuously monitor the communications and data processing cycles of the microprocessor. On CPU failure, an audible and visual signal shall operate to advise attending personnel.

III. Energy Management Requirements

1. The system shall be equipped with a demand load controller, (DLC) Simplex Type Number 2190-9107, which shall predict a demand level based upon the average of the integrated demand and the present instantaneous KW loading. It shall begin load shed action when this predicted demand reaches the demand limit. Restore action shall begin when the predicted demand is less than the demand limit by an adjustment KW value (a restore differential). Output circuits of the DLC shall be interconnected to the nearest basic transponder.

2. The demand limit shall automatically adjust itself in the following manner: The limit shall decrease by 1% of the service KW for every 72 hours that the control has not taken any demand action; and the limit shall increase by 1% of the service KW for every 15 minutes that the control has shed all loads and is still requiring shed action. Levels shall be provided to restrict demand limit increases and decreases.

3. The system shall be capable of controlling eight individual groups of loads. Each load shall be equipped with manual override from the control console.

4. Each load or groups of loads shall be programmed for three adjustable time settings.
   - Minimum shed time - A minimum amount of time a load shall remain off during a shed period.
   - Maximum shed time - A maximum amount of time a load shall remain off during a shed period.
   - Minimum restore time - A minimum amount of time a load must remain on after being shed, before it can be shed again.

5. During normal operation, the control shall provide a visual indication of the demand limit, the predicted demand and the present time of day.
6. System shall alarm under the following conditions: 1) the desired demand limit has been exceeded or 2) a power loss or a control malfunction has occurred.

7. All user entered data shall be retained during power outages of up to one week in length. The 24 hour clock shall continue to update during a power outage. Battery backup shall be provided to retain this information.

8. The CPU shall be equipped with software routines to provide the control-by-event feature, whereby the receipt of an alarm point shall be programmed to operate any or all of the control points within the system.

9. The CPU shall also be equipped with software routines to provide time control allowing a preset program for both on/off and cyclic operations to be set in memory for the operation of electrical loads connected to the transponder control points. Time control shall be totally field programmable utilizing random access memory, RAM, and the system keyboard. The CPU shall include software and hardware to maintain accurate information on time of day, day of week, day or month, month, and year. In addition, it may be programmed with up to 15 holidays for special time control programs. Programmer shall provide a Julian 365 day year and eight (8) day week programmability. Also, the real time programmer shall include leap year capability through the year 1999. Time and date information will be included in all printer and CRT output messages.

IV. Service

1. The system's vendor must employ factory trained technicians and maintain a service organization within 40 miles of the job site. A service technician shall be "on call" 24 hours a day, 365 days a year.

2. This organization must have a minimum of 10 year experience servicing multiplex type alarm systems.

V. Guarantee

1. The system shall be covered by a 2 year warranty commencing with start up and beneficial use of any portion of the system.

2. The vendor shall, in addition to the equipment quotation, provide a quotation for a Preventive Maintenance Agreement (PMA) to take effect at the end of the warranty period.