

Photo by Commonwealth Edison Company, Chicago

carryover is made out of the highest order position of the original accumulator storage field.

Sign

The indicator turns on when a field addressed by an arithmetic instruction does not have plus or minus zoning over the right hand digit.

Bank of America

The following checks are made:

Odd-even redundancy  
Read-write operations  
Longitudinal redundancy on magnetic tape processing.

General Electric Company Hanford Atomic Products  
Operation  
Parity check using 7 bit code with only six bits of real data is used for all internal operations and all input-output. All corrective action can be programmed or machine can be set to stop on error at the programmer's discretion.  
Normally operated with internal error detection set to stop, but with input-output error correction programmed.

Photo by Bank of America, San Francisco

### POWER, SPACE, WEIGHT, AND SITE PREPARATION

Type	Name	Qty.	Manufacturer		Heat B.T.U.	Weight lbs.	(Nearest Inch)		
			Power Kw	Current Amps.			Width	Length	Height
702	Central Processing Unit	1	25.0	87	85,000	5,291	147	139	63
	Main Power Unit	1				2,961	34	61	66
	Console	1				508	35	61	46
712	Card Reader	1	5.0	17	17,000	1,053	43	28	49
756	Card Reader Control Unit	1				1,712	27	57	64
717	Printer	1	9.0	31	30,700	2,244	30	64	47
757	Printer Control Unit	1				1,866	27	57	64
722	Card Punch	1	7.6	26	26,000	1,176	25	53	50
758	Card Punch Control Unit	1				1,866	27	57	64
732	Drum Unit	1	6.9	24	23,600	1,775	27	62	64
	Drum Power Supply	1				1,646	27	40	64
727	Tape Unit	10	13.0	45	44,200	9,110	26	24	66
752	Tape Control Unit	1	8.4	29	28,700	1,636	27	57	64
			<u>74.9</u>	<u>259</u>	<u>255,200</u>	<u>32,844</u>			

Approximately one Ton of air conditioning required for 12,000 B.T.U.

U. S. Navy Aviation Supply Office  
System requires 75 Kw, occupies 19,494 cu ft, 2,052 sq ft, measuring 57 ft by 36 ft by 9 1/2 ft. The system weighs 33,000 lbs. The air conditioning con-

sists of a 40-Ton unit and a 15-Ton unit, occupying 3,168 cu ft of space and 288 sq ft of area, measuring 12 ft by 24 ft by 11 ft.

Bank of America  
 System requires 93 Kw, 208V, 3 phase, 60 cycles/sec, 16,000 cu ft, 2,500 sq ft, measuring 55 ft by 45 ft by 8 ft. Air conditioner requires 68 Kw, 2,552 cu ft, 319 sq ft, measures 29 ft by 11 ft by 8 ft, and has a capacity of 60 Tons. The air conditioning equipment designed to accommodate requirements for comfort conditioning of engineering, mail handling, tabulating, and office personnel and space. Building modifications were required, since neither building was specifically designed for computer operations. False ceilings, plenums and partitions were installed for air supply, negative pressure, and temperature control. Power distribution is provided by underfloor conduit and pull boxes.

General Electric Company Hanford Atomic Products  
 Power service to system is 300 amps, 208 volts, 3 phase for computer and 105 amps, 440 volts, 3 phase for air conditioner. The machine room is 40 ft by 60 ft and the air conditioner requires an area of 20 by 20 ft. The air conditioner capacity is 52 Tons. Power consumption has been stated in terms of service supplied rather than actual machine consumption. The space required is a function of the amount of engineering and observation space and other miscellaneous working areas which are considered necessary or desirable to have in addition to the actual cubic footage of the equipment.

### PRODUCTION RECORD

Manufacturer  
 Number produced Over 13  
 There are no 702 Systems in production, at the present time. A limited number of 702's were produced. The successor to the 702 was the IBM 705.

### COST, PRICE AND RENTAL RATES

Type	Name	Monthly Rental	Base Purchase Price
702	CFU (Model 1)	\$6,900	\$358,800
712	Card Reader	750	36,800
717	Printer	1,400	55,000
720	Printer (Model 1)	1,400	56,900
722	Card Punch	800	43,300
727	Magnetic Tape Unit	500	18,200
730	Printer (Model 2)	3,900	210,500
732	Magnetic Drum Storage	2,300	113,000
735	Printer Control	600	32,500
742	Magnetic Drum Power	500	26,500
743	Power Supply	1,000	52,000
752	Tape Control	550	28,600
756	Card Reader Control	300	18,000
757	Printer Control	650	44,000
758	Card Punch Control	600	36,000
760	Control and Storage	2,500	111,000

There is no predetermined grouping of equipment. Combinations of above are available based on requirements.

The base purchase price is used in computing the discounted purchase price based on the age of the installed machine. A published discount schedule is available from IBM.

Maintenance contract available.

U. S. Navy Aviation Supply Office  
 Prime shift monthly rental rate for system is \$30,200.

Bank of America  
 Rental rate is \$9,900 for basic system and \$15,475 per month for additional equipment.

Commonwealth Edison Company of Chicago

Serial No.	Description	Qty	Unit Rate	Monthly Rental (Primary Shift)
702	Central Processing Unit	1	\$9,900	\$9,900
712	Card Reader	2	770	1,540
756	Card Reader Control Unit	2	300	600
717	Printer	2	1,200	2,400
757	Printer Control Unit	2	600	1,200
722	Card Punch	2	750	1,500
758	Card Punch Control Unit	2	325	650
727	Magnetic Tape Units	17	550	9,350
752	Tape Control Unit	1	550	550
776	Record Storage Unit	2	1,850	3,700
732	Magnetic Drum	1	2,800	2,800
	Total			\$34,190

2nd and 3rd shift rental charged at 50% of above rates.

General Electric Company Hanford Atomic Products  
 Rental rate is \$34,900/month for system, including average extra shift rental. Rental rate for punched card machines, including extra shift but excluding key punches and verifiers is \$2,175 per month.

### PERSONNEL REQUIREMENTS

Manufacturer  
 One 8-Hour Shift    Two 8-Hour Shifts    Three 8-Hour Shifts  
 Engineers            4                    7                    10  
 One console operator and 2 floor operators per shift are required. Programmers vary from 4 to over 30, depending on number of applications on system. Education training, program testing, technical assistance on all phases is available from the manufacturer.

U. S. Navy Aviation Supply Office  
 One 8-Hour Shift    Two 8-Hour Shifts    Three 8-Hour Shifts  
 Engineers            3                    6                    9  
 Operators            9                    12                   15  
 The operators are divided as follows: For first shift, 3 are on main frame, 3 auxiliary and 3 supervisory. For second shift, 3 main frame operators are required and for the third shift three operators are required for the main frame.

Bank of America  
 One 8-Hour Shift    Second 8-Hour Shift    Third 8-Hour Shift  
 Supervisors        1  
 Librarians         1  
 Operators          1                    1                    1  
 Engineers          1                    1  
 In-Output Opera 1                    1

Engineers are provided by IBM. Mail clerks, key punch operators and typists are not included among the typical personnel, since these positions are not intrinsic to the computer operation as such. Personnel covers operation on a 5-day-a-week basis. Operation tends toward open shop.

Currently no training is in progress. Present key personnel have, however, attended IBM and Bank sponsored courses prior to their initial assignments.

Commonwealth Edison Company of Chicago  
 Three 8-hour shifts require 9 engineers and 18 technician-operators.

General Electric Company Hanford Atomic Products  
 Three 8-hour shifts require 5 engineers and 8 technician-operators. The engineers are employed by IBM. Personnel covers operation on a 7-day-a-week basis.

### RELIABILITY, OPERATING EXPERIENCE, AND TIME AVAILABILITY

U. S. Navy Aviation Supply Office

Approximate reliability is 0.85, where reliability is obtained by subtracting the sum of machine error time, the unscheduled maintenance time and the tape trouble time, from the available time and dividing the difference by the available time. The above figure is based on the period from July to September 1956.

Bank of America

Average error-free running period	2 Hours
Good time	12.56 Hours/Day
Attempted to run time	14.13 Hours/Day
Operating ratio (Good/Attempted to run time)	0.89

Above figures based on period 1 Jul 56 to 30 Sep 56  
 Passed Customer Acceptance Test 20 Aug 55

Of the 0.11 lost in the operating ratio above, approximately 0.037 was due to main frame down time, 0.037 was due to tape unit down time, 0.030 to corrective restart time and 0.006 was due to tape remake time.

Bank of America

Average error-free running period	100 Hours
Good time	101 Hours/Week (Average)
Attempted to run time	102 Hours/Week (Average)
Operating ratio (Good/Attempted to run time)	0.99

Above figures based on period 1 Jun 60 to 31 Aug 60  
 Passed Customer Acceptance Test 20 Aug 55  
 Time is not available for rent to outside organizations.

A high degree of experience in both the operating and maintenance personnel has resulted in the virtual elimination of "down" time.

Chrysler Corporation Service Parts Warehouse

Productive time, maximum	0.94
Productive time, minimum	0.78

Based on period 5 Apr 56 to 27 Sep 56  
 Passed Customer Acceptance Test 22 Aug 55

Commonwealth Edison Company of Chicago

Average error-free running period	4-6 hours estimate
Good time	18 Hours
Attempted to run time	20 Hours
Operating ratio (Good/Attempted to run time)	0.90

Above figures based on period 1 Oct 56 to 31 Dec 56  
 Passed Customer Acceptance Test Jul 55

General Electric Company Hanford Atomic Products

Average error-free running period	68 Hours
Good time	1,275 Hours
Attempted to run time	1,301 Hours
Operating ratio (Good/Attempted to run time)	0.98

Above figures based on period 1 Aug 56 to 14 Oct 56  
 Passed Customer Acceptance Test 1 Jul 55

Core storage unit installed July 1956. Preventive maintenance is scheduled 4 hours/day for 4 days per week. Over the weekend 68 hours elapse between scheduled maintenance sessions.

The Prudential Insurance Company of America

It is expected that conversion from electrostatic storage to core storage will further reduce unscheduled maintenance from an overall average of 5.8% experienced between 14 November 1955 and 31 August 1956. Two-shift operation occurred during that period.

### ADDITIONAL FEATURES AND REMARKS

Manufacturer

Inter-tape-card-printer conversion.  
 Rental rates include servicing, educational assistance through a 702 school, special representatives and programming service.

System was replaced by the Type 705.  
 Autocoder system is used.

Component units, which have various functions, are housed in a half-dozen or more separate cabinets, the number of each type depending upon the user's needs. The use of these separable units allows freedom in the design of the data processing system. Essential components include the arithmetical and logical unit, the operator's control console, magnetic tape units, an input card reader, and an output printer and card punch. Often a magnetic drum will also be included in an installation, or several drums might be used.

Bank of America

Outstanding features are the inter-tape card-printer conversion and the expandable memory.

Magnetic tapes receive an internal label under program control as well as a manually produced external label. Tapes are stored in a fire-proof tape vault which has humidity and temperature control. Critical "back-up" tapes are sent daily to off-premise storage locations.

### FUTURE PLANS

Bank of America

Our systems will be replaced by IBM Type 7070 and 1401 Electronic Data Processing machines during the first part of 1961. All applications on the IBM 702 are currently being programmed for these new computing systems. Research is also being done on other applications within the banking field.

Commonwealth Edison Company of Chicago  
 System was replaced by an IBM Type 705 Electronic Data Processing Machine in March 1957.

### INSTALLATIONS

U. S. Navy Aviation Supply Office  
 Philadelphia 11, Pennsylvania

Bank of America  
 500 Howard Street  
 San Francisco, California

Chrysler Corporation  
 Detroit 31, Michigan

Commonwealth Edison Company  
 72 West Adams Street  
 Chicago 90, Illinois

Ford Motor Company  
 Dearborn, Michigan

General Electric Company  
 Hanford Atomic Products Operation  
 Richland, Washington

Monsanto Chemical Company  
 St. Louis, Missouri

Prudential Life Insurance Company of America  
 Newark, New Jersey

## APPLICATIONS

### Manufacturer

Scientific and commercial data processing.

USA Ballistic Missile Agency Redstone

Located at Redstone Arsenal, Alabama. Both systems are used for the solution of scientific problems.

USA White Sands Missile Range Control Office

Located at Building 1526, White Sands Missile Range, New Mexico, the system is used for guided missile simulation and reliability studies.

USA White Sands Missile Range Integrated Range Mission

Located in Building 841, Holloman AFB, New Mexico, the primary use is for computations incident to conversion of range flight test data to engineering formats. Secondary usage is for computations of problems associated with flight simulation and a small amount of general purpose computing for range customers.

USN David Taylor Model Basin

Located at Applied Mathematics Laboratory, Washington, D. C. The system is used for the solution of naval engineering and scientific problems.

USN Ordnance Laboratory, White Oak

Located in the Mathematics Department, Naval Ordnance Laboratory, White Oak, Maryland, system is used for scientific applications: e.g., trajectories, material studies, wind tunnel data reduction, and explosive phenomena.

USAF Eglin Air Force Base

Located in Building 100, Room 108, Eglin AFB, Fla. The system is used for the evaluation of the Semi Automatic Ground Environment System (SAGE), the computation of theoretical ballistic trajectories, for data reduction, e.g., the solution of three station Cinetheodolite problems and evaluation of

Photo by International Business Machines Corporation

data collected on Electronic Counter Measures (ECM) tests, and for civilian payroll computation.

USAF Edwards Air Force Base

Located at Flight Test Center, Edwards Air Force Base, Cal. Approximately 70% of the total operational system time is utilized in support of a complete spectrum of scientific applications associated with the testing of all aircraft, rocket engines, and their systems components. In addition, support is provided to Army, Navy, NASA, and numerous contractor organizations utilizing facilities at the Air Force Flight Test Center (AFFTC). Numerous data reduction applications are being accomplished utilizing the computing system to reduce performance and stability data on aircraft undergoing category tests and missiles undergoing static and reliability tests. In addition, numerous range data; namely, Askania, Akeley, Nike Radar, Mod II Radar, Metric-Camera, and oscillographic data, are processed in support of these tests. Other applications being accomplished are Experimental High Speed Track Data Reduction, Power Spectral Density Studies, Heat Transfer Analysis, Rocket-Orbital Trajectory Analysis, etc. The remainder of the computer utilization time is in support of the management type applications; namely, supply, cost accounting, civilian personnel skills inventory, military personnel records, etc.

USAF Headquarters Strategic Air Command.

Located at Offutt Air Force Base, Nebraska.

Fields of Application: target analysis and mission planning target system maintenance and analysis planned damage assessment, determination of optimum aiming points, future force structure requirement studies, missile trajectory computations, airborne alert flight planning, computation of war order

Photo by International Business Machines Corporation

option sheets, plan evaluation, including war gaming and command post exercises, maintenance of SAC readiness, EWO maintenance and update, base status and aircraft readiness, weapons inventory, weather forecasting, ECO control, flight/force following, lost base evaluation, plan revision, actual damage assessment, restrike planning.

USAF Kirtland Air Force Base

β Located in Building 1017, Hq 4925th Test Group (A), Kirtland AFB, New Mexico, the prime use of the high-speed electronic computer at Kirtland AFB is for scientific applications. Both practical and theoretical data are processed through the computer in order to further USAF progress in the application of all phases of nuclear weapons employment, military implications of various nuclear weapons strategies, and other studies vital to the defense of the United States.

Argonne National Laboratory

The system is used primarily for scientific computing.

Bureau of Flight Standards Federal Aviation Agency

Located in Hangar No. 9, FAA Aeronautical Center, Oklahoma City, Okla., the system is used for flight check and evaluation of air navigational aids.

NASA, Ames Research Center

Located at Moffett Field, Cal., 95% of use time is spent doing theoretical problems relative to aeronautical and space research such as heat transfer problems, boundary layer calculations, launch, reentry, and orbit problems, calculation of flow fields in air and other gases, calculation of lift and drag for theoretical configurations, behavioral study of contemplated designs for missiles and rockets, calculations of gas properties for given pressure and temperature ranges. The remaining 5 percent is spent in data reduction for wind tunnels or in a minor

amount of bookkeeping for the 704 staff.

NASA, Lewis Research Center

Located at the NASA-Lewis Research Center, 21000 Brookpark Road, Cleveland 35, Ohio, the system is used for the solution of problems submitted by mathematicians and scientists in the fields of nuclear research and development, rocket components and systems research and development, satellite and interplanetary orbit calculations, materials research, etc.

National Bureau of Standards

Located in Building 42, Washington, D. C., the applications are scientific, engineering, and business.

National Security Agency

Located at Ft. George G. Meade, Maryland, the system is used for mathematical calculations.

Tennessee Valley Authority

Located at 11 Old Post Office, Chattanooga, Tenn, the system is used for hourly computation of economic generation schedule for TVA power system, electric load flow studies, electric load and revenue forecasting, electric sales statistics, payroll, water storage calculation and evaluation, hydraulic data studies, flood control studies, forest survey, chemical research studies, navigation (including river traffic) studies, and linear programming applications.

Allis-Chalmers Manufacturing Company

Located in Milwaukee, Wisconsin, the system is used for engineering calculations, scientific calculations, experimental data reduction, and simulation.

AVCO Corp Research and Advanced Dev. Div.

Located at 201 Lowell St., Wilmington, Mass, the system is used for the solution of engineering problems by numerical methods; specifically, systems of ordinary and partial differential equations

Photo by Flight Simulation Laboratory, WSMR

(trajectories, aerodynamic flow, heat transfer, stress analysis), variational problems (optimization of trajectories), data processing, etc.

Bell Aerosystems Company

Located at the Wheatfield Facility, Niagara Falls, N.Y., the system is used for rocket engine design, rocket fuel combustion analysis, aircraft and missile performance, missile and satellite trajectory analysis, flutter vibration and aeroelasticity studies, heat transfer computations, data reduction, production control, and inventory control.

Bell Telephone Laboratories

Located at 3D-075, Whippany, N. J., the system is used in the sage military system, missile simulation projects, electronic switching applications, and mathematical research problems.

Bell Telephone Laboratories

Located at Murray Hill, New Jersey, the system is used for scientific and engineering applications, including: computer research, numerical analysis, statistical analysis, logical design, simulation of digital system, analysis of audio and visual signals, and simulation of missile systems.

Bendix Systems Division, The Bendix Corporation

Located at Data Processing and Displays Dept., Bendix Systems Division, Ann Arbor, Mich. Scientific applications include: real time input/output for intergrating human decisions and control functions in simulated control loops; simulation of digital guidance and control systems, simulation of tactical computer functions, reliability prediction and development program control operations.

CEIR Incorporated

Located at 1200 Jefferson Davis Highway, Arlington 2, Va., the system is used for linear programming, file maintenance and information retrieval, trajectory calculations, language translation, business data processing, and other applications.

Convair-Fort Worth Division of General Dynamics

Located at Fort Worth, Texas, the system is used for the solution of engineering problems in the

design and testing of aircraft and missiles, preparation of data for the numerical control of machine tools, and the solution of problems arising in research in nuclear physics and operation of nuclear test facilities.

Cornell Aeronautical Laboratory, Inc.

Located at 4455 Genesee Street, Buffalo 21, N.Y. The system is used for the simulation of military systems, the solution of problems resulting from scientific investigation, and data processing.

Convair-San Diego

Located in Building 54A, Plant I, San Diego, Cal. The system is used for flight simulation, flutter analysis, flight data reduction, numerical milling, missile trajectory calculation, satellite surveillance, wind tunnel data reduction, radome predictions, and interceptor mission calculations.

Douglas Aircraft Company

Located at 3000 Ocean Park Blvd, A-260, Santa Monica, Cal., the system is used for strength analysis, missiles trajectories, aerodynamic stability, aerodynamic performance, dynamic response, thermodynamic analysis, weight control, and propulsion analysis.

Douglas Aircraft Company

Located at A-850, Santa Monica, Cal., the system is used for flight test data reduction, aerodynamic certification studies, and flutter and gust load analysis.

Douglas Aircraft Company

Located at B-250, El Segundo, Santa Monica, Cal. The system is used for strength analysis, trajectories, aerodynamic stability, dynamic response, thermodynamic analysis, weight control, and propulsion analysis.

General Electric Company

Located at Temple, Arizona, the system is used for business and scientific problems including payroll, inventory, traffic assignment and simulation.

Photo by David Taylor Model Basin

General Electric Company Evendale

Located in Building 305, General Electric Company, Evendale 15, Ohio, the system is used in all areas of application in scientific and business fields.

General Electric Company Schenectady

Located at Schenectady, New York. The system is used for product design, product performance, shop simulation, payroll, and general accounting.

General Motors Corporation

Located in the Engineering Research Building, General Motors Technical Center, Warren, Michigan. The system is used for test cell data reduction, engine and transmission design (IC, gas turbine and free piston), numerical tool control, curve plotting, reactor studies, missile guidance systems, vehicle simulating, bearing load computations, aircraft propeller design, and component and system reliability.

Allison Division, General Motors Corporation

Located at Plant No. 8, Indianapolis 6, Indiana. The system is used for mathematical support of R and D activity including orbital and trajectory analyses, thermodynamic calculations, secondary power system designs, simulation, reliability studies and data reduction.

Allison Division, General Motors Corporation

Located at P. O. Box 894, Indianapolis 6, Indiana. The system is used for Material Procurement, including: daily sales release reports, material schedules, commitments, priced inventory; for Production Control, including: daily availability, production schedules, manpower and machine loading; for Accounting, including: cost of production, cost of sales, standard time, manufacturing expense; for Hourly Payroll; for Aircraft Spare Parts, including: parts scheduling, parts status, daily shipments, and invoicing; for Reliability, including: engine and parts history

data and field service reporting; and for engineering calculations.

Grumman Aircraft Engineering Corporation

Located in the Engineering Department, Research Section, Bethpage, New York. The system is used for flutter and vibration analyses, structural investigations, engine performance, trajectory studies, operation research studies, simulation numerically controlled machines, research projects, numerous other problems concerned with the design and manufacture of airframes and missiles.

Gulf Research and Development Company

Located at the Gulf Research Center, P. O. Drawer 2038, Pittsburgh 30, Pennsylvania. The computer primarily serves as a research tool for the various activities of the Gulf and Development Co., viz: automotive engineering, geology, geophysics, process research, product development, petroleum and reservoir engineering, physics, chemical and physical analysis, and administration.

The computer is also used for various activities of the parent Gulf Oil Corporation when the problems are too large for the other computers belonging to the corporation.

International Business Machines, Product Development Laboratory, Poughkeepsie

Located on High Street, Poughkeepsie, New York. The system is used for design automation in back panel wiring routing, and for scientific computation, e.g., circuit analysis, reliability and simulation programs, design automation - logic page updating, printing and checking - see Tech. Note TN 00.01110. 416 and Technical Publication TR 00.0110. 72, engineering records - parts usage and maintenance program, engineering change control for 700/7000 series equipments.



Photo by USN Ordnance Laboratory, White Oak

IBM GPD Development Laboratory, Endicott  
Located at GPD Development Laboratory, Endicott, New York. The system is used for mathematical, statistical, and engineering analysis, research and advanced design, design automation, and timing and Op code simulation of proposed computers.

IBM Service Bureau, San Jose  
Located at IBM Plant, Bldg. 10, Room 308, Monterey and Cottle Roads, San Jose, California. The system is primarily a customer usage facility.

IBM Research Center, Yorktown Heights  
Located at Horktown Heights, New York. General scientific computing and data processing arising in the work of a major industrial research organization.

Lockheed Aircraft Corporation, Marietta  
Located at Marietta, Georgia. The system is used for aerodynamics, thermodynamics, vibration and flutter, elasticity, weight and inertia analysis, nuclear physics, missile trajectory simulation, aircraft performance studies, flight test data reduction, numerical lofting, preparation of control media for numerically controlled milling machines, manpower forecasting, and a variety of other applications.

The Marquardt Corporation  
Located at 16555 Saticoy Street, Van Nuys, Cal. The system is used for general scientific computing in support of company engineering and research efforts, engineering data reduction, management data processing, and computing service to outside organizations. (Government and Private Industry).

The Martin Company, Denver  
Located at Waterton Facility of Martin, Denver, Colorado. The system is used for primary use of the computer system in the design of a missile system and in particular the following engineering applications: performance trajectories, structural analysis, propulsion analysis, guidance and control

analysis. Other areas of application are test data reduction and data processing of large information files.

North American Aviation, Inc.,  
Located at 4300 East Fifth Avenue, Columbus 1, Ohio, the system is used primarily for general engineering and scientific applications. Prepares input to numerically-controlled milling machines, via APT. Data reduction for wind tunnel, flight test, and laboratories. Commercial data processing, material inventory, spares inventory, logistics inventory, tooling statistics, engineering statistics, payroll recapitulation and summaries.

Pratt and Whitney Aircraft  
Located in the Office Area, Second Floor, Florida R and D Center, United, Florida. The systems uses are Scientific and Technical: (data reduction, design, performance, statistical, and other analytical studies necessary for the manufacture, testing, and development of jet and rocket engines) and Commercial: (Shop loading, wage and salary, and payroll applications).

Rand Corporation  
Located at 1700 Main Street, Santa Monica, Cal. The system is used for the solution of orbit and trajectory problems, differential equation systems, war games, logistics simulations, and cost analyses.

Raytheon Company, Bedford  
Located at the Systems Laboratory, Missile Systems Division, Raytheon Company, Bedford, Mass., the system is used for the computation of missile trajectories, design of missile components, analysis of missile systems, and other engineering applications.

Republic Aviation Corporation  
Located at Farmingdale, New York, the system is used for corporate engineering-scientific programming-analysis including space studies (trajectories, re-entry and tracking analysis); scientific research

Photo by USAF Edwards Air Force Base

(plasma propulsion and nuclear reactor analysis); aircraft design (aerodynamics, stress, thermodynamics); flight test data reduction; computer simulation. It is also used for corporate business data processing programming-analysis including payroll, accountability, manufacturing control, applied mathematics including numerical analysis, operations research and physical mathematics, and for programming techniques including scientific and business automation programming systems, i.e., SAP, FORTRAN, SURGE, Numerical Controls.

Sandia Corporation

Located in Building 880, Department 5240, Sandia Corporation, Albuquerque, New Mexico. The system is used for the computation of scientific data.

Socony Mobil Oil Company

Located at 150 East 42nd Street, New York 17, New York. The system is used for optimization of refining, distribution, and production by means of linear programming, refinery process unit design calculations, simulation of refining operations, financial analysis of proposed capital investment, sales forecasting, product cost determination, sales analysis, reservoir studies, prediction of future production, and general mathematical research.

Standard Oil Company of California

Located at 225 Bush Street, San Francisco, Cal. The system is used for technical, scientific and business problem solving for major functional areas of Standard Oil Company of California operations, including economics, finance, distribution, supply, exploration, producing, manufacturing, engineering and research.

Standard Oil Company of Indiana

Located at 2400 New York Avenue, Whiting, Ind. The system is used in linear programming (refinery scheduling, gas blending), product analysis, and

operational problems (oil refining plants, line sizing, automatic controls, pilot plants, steam and water distribution, pipe flexibility, other engineering and chemical problems.)

TEMCO Electronics and Missiles Company

Located in the Engineering Building, Garland, Texas, the system is used for scientific requirements to support engineering and electronics department requirements; accounting and manufacturing data controls; payrolls, work in process, inventory analysis, and manufacturing controls, etc.

United Aircraft Corporation

Located at the Research Laboratories, UAC, East Hartford, Connecticut, the three systems are used to provide digital computations for the design, development, and performance of aircraft products, provide computation for the field of numerical control of machine tools, provide computation services for the AF 433L weather contract, and perform computations for direct outside contracts.

Chance Vought Aircraft, Incorporated

Located in Dallas, Texas, the system is used for astronautics, arrested landing, numerical controlled tools, structure analysis, data reduction, production control, simulation, weight accounting, operational analysis, data processing, reliability, flutter analysis, performance calculation, trajectories, and space and orbit analysis.

Westinghouse Electric Corporation

Located in Baltimore 3, Maryland. The system is used for weapons systems engineering design, simulation and evaluation, computer logic evaluation and design, other computer simulations, linear circuit analysis, inverse Laplace transform, space trajectory computations, satellite predictions, radar antenna design investigations, mathematical techniques,

Photo by Mathematical Services Laboratory, Eglin  
Air Force Base, USAF

Westinghouse East Pittsburgh

Located at 4L39, East Pittsburgh, Pennsylvania. The system is used for performance analysis, electrical apparatus design, and electrical apparatus systems simulation.

California Institute of Technology, Jet  
Propulsion Laboratory

Located at Pasadena, California. The system is used for all problems of scientific type, trajectory simulation including power flight and interplanetary, lunar, near earth satellite trajectories, miscellaneous problems from chemistry, physics, structures, propulsion, etc., including temperature distribution calculations, theoretical performance calculation for chemical propulsion systems, structural design, control systems, nuclear calculations, propulsion test data reduction, and space science data reduction.

Midwestern Universities Research Association

Located at 2203 University Ave., Madison, Wis., the system is used for designing high energy particle accelerators.

Ohio State University

Located in Columbus, Ohio. The system is used for training, engineering computations, research in programming methods, and research in numerical analysis.

Texas Engineering Experiment Station

Located in the Data Processing Center Building, College Station, Texas, the system is used for teaching, research, computing support for research projects, and assistance to industry.

University of California, Los Alamos

Located at Los Alamos, New Mexico, the system is used for general scientific problems dominated by hydrodynamics and neutronics problems, research in numerical analysis, and research in automatic coding and programming languages.

University of California, Berkeley

Located in Campbell Hall, University of California, Berkeley, California, the system is used for research for all campus departments.

University of Michigan

Located at Computing Center, Ann Arbor, Michigan. The system is used for instructional and research use of the computer involving scientific computation from many fields.

NASA Lewis Research Center

Located at the NASA Lewis Center, 21000 Brookpark Road, Cleveland 35, Ohio, the system is used for the reduction of experimental data from wind tunnels, test stands, rocket stands, etc. Engineering and scientific analysis-type problems. Experimental data is recorded on automatic recorders of our own design. The punched paper tapes and/or magnetic tapes are fed into the computer, calibrated, and mathematical operations carried out to produce the quantities specified by the test engineer. Scientific problems of all types are punched into paper tapes by a flexowriter, fed into the computer, and the mathematical operations specified by the programmer are performed.

Photo by USAF SAC Control Center, Offutt AFB

## PROGRAMMING AND NUMERICAL SYSTEM

Manufacturer Binary

Internal number system Binary

Binary digits/word 36

Binary digits/instruction 36

Instructions/word 1

Instructions decoded 91

Arithmetic system Fixed and floating point

Instruction type One address

Number range Fixed  $-(2^{35}-1) < N < (2^{35}-1)$

Floating  $-10^{38} < N < 10^{38}$

Instruction word format

Oper Code	Flag	Tag	Address
S,1	11 12 13	18 20	21 35

Op	Decrement	Tag	Address
S,1	3 17	18 20	21 35

Automatic coding includes Fortran and SAP (Symbolic Assembly Prog).

There are 3 index registers and 3 arithmetic registers, i.e. accumulator, multiplier-quotient, and storage register.

## ARITHMETIC UNIT

Manufacturer

	Fixed Point	Floating Point
Incl Stor Access		Exclud Stor Access
Microsec		Microsec
Add	24	84
Mult	240	24-204
Div	240	36-216

Construction (Arithmetic unit only)

Vacuum tubes and diodes

Arithmetic mode Parallel

Timing Synchronous

Operation Sequential - internal  
Concurrent - input/output equip.

Some computing can be carried on concurrently with I/O operations.

## STORAGE

Manufacturer	No. of Bin Words	No. of Dec. Digits Equiv.	Access Microsec
Magnetic Core	Up to 32,768	327,680	12
Magnetic Drum	Up to 16,384	163,840	12,000
Magnetic Tape	900,000	5,000,000	10,000
No. of units that can be connected 10 Units			
No. of char/linear inch of tape 200 Char/inch			
Channels or tracks on the tape 7 Tracks/tape			
Blank tape separating each record 0.75 Inches			
Tape speed 75 Inches/sec			
Transfer rate 15,000 Char/sec			
Start time 10 Millisec			
Stop time 10 Millisec			
Physical properties of tape			
Width 0.5 Inches			
Length of reel 200-2,400 Feet			
Composition Acetate or Mylar			
Mylar is DuPont's trademark for polyester film.			
If pure binary, rate is 25,000 decimal digits equivalent/sec.			
USA BMA (now NASA)			
Magnetic Drum 8,192 words; Magnetic Core 8,192 words;			
Magnetic Tape.			
USA BMA (now at NASA)			
Magnetic Drum 8,192 words; Magnetic Core 8,192 words;			
Magnetic Tape			

Photo by NASA Lewis Research Center

USA WSMR CO  
Magnetic Core 8,192 words; Magnetic Drum 8,192 words;  
Magnetic Tape  
USA WSMR  
MC 8,192; MD 8,192; MT  
USN David Taylor  
MC 32,768; MD 8,191; MT  
USNOL White Oak  
MC 32,768; MT Stations 8  
USAF Eglin AFB  
MC 32,768; MT  
USAF Edwards AFB  
MC 8,192; MD 8,192; MT  
USAF SAC Offutt  
MC 32,768; MD 8,192; MT  
USAF Kirtland AFB  
MC 32,768; MT  
Argonne  
MC 32,768; MD 8,192; MT  
BFS FAA  
MC 8,192; MT  
NASA Ames  
MC 8,192; MT  
NASA Lewis  
MC 8,192; MD 8,192; MT  
NBS  
MC 32,768; MD 8,192; MT Stations 6  
NSA  
MC 16,384; MT

TVA  
 MC 16,384; MT  
     Allis-Chalmers  
 MC 8,192  
     AVCO  
 MC 32,768; MT  
     Bell Aero  
 MC 8,192; MD 8,192. (Magnetic drum on order).  
     Bell Tel Whippany  
 MC 32,768; MT  
     Bell Tel Murray Hill  
 MC 32,768; MT  
     Bendix Systems  
 MC 8,192; MD 8,192; MT Stations 7  
     CEIR  
 MC 8,192; MD 8,192; MT Stations 8  
     Convair Fort Worth  
 MC 32,768; MD 8,192; MT  
     Cornell Aero  
 MC 8,196; MD 8,196; MT  
     Convair San Diego  
 MC 32,768; MT  
     Douglas A-260  
 MC 32,768; MT 9  
     Douglas A-850  
 MC 32,768; MT 6  
     Douglas B-250  
 MC 32,768; MT 7  
     GE Phoenix  
 MC 8,192; MD 8,192; MT

Photo by Tennessee Valley Authority, Chattanooga

    GE Evendale  
 MC 32,768; MT 10  
     GE Schenectady  
 MC 32,768; MT  
     GMC Warren  
 MC 8,192; MD 8,192; MT  
     GMC Indianapolis  
 MC 8,192; MD 8,192; MT 8  
     GMC Indianapolis  
 MC; MD; MT  
     Grumman  
 MC 8,192; MD 8,192; MT 10  
     Gulf  
 MC 32,768; MD 8,192; MT 8  
     IBM PDL Poughkeepsie  
 MC 32,768; MD 8,192; MT 10  
     IBM GPD DL Endicott  
 MC 32,768; MD 8,192; MT  
     IBM San Jose  
 MC 32,768; MD 8,192; MT  
     IBM RC Yorktown Heights  
 MC 32,768; MT  
     Lockheed Marietta  
 MC 8,192; MD 8,192; MT 10  
     Marquardt  
 MC 8,192; MD 8,192; MT  
     Martin Denver  
 MC 8,192; MD 8,192; MT  
     North American  
 MC 8,192; MD 8,192; MT

Pratt and Whitney  
 MC 32,768; MD 8,192; MT 10  
 Rand  
 MC 32,768; MD 8,192; MT 9  
 Raytheon  
 MC 4,096; MD 8,192; MT 4  
 Republic Aviation  
 MC 32,768; MT  
 Sandia  
 MC 8,192; MD 8,192; MT  
 Socony  
 MC 32,768; MT  
 Standard Oil California  
 MC 32,768; MD 8,192; MT 8  
 Standard Oil Indiana  
 MC 8,192; MD 8,192; MT  
 Temco  
 MC 8,192; MD 8,192; MT  
 United Aircraft (3)  
 MC 32,768; MD 8,192; MT 12  
 Chance Vought  
 MC 8,192; MD 8,192; MT  
 Westinghouse Baltimore  
 MC 32,768; MT 8  
 Westinghouse East Pittsburgh  
 MC 8,192; MD 8,192; MT  
 Cal Tech JPL  
 MC 32,768; MT  
 MURA  
 MC 8,192; MD 8,192; MT 4

Photo by Westinghouse Electric Corporation

Ohio State  
 MC 4,096; MD 8,192; MT  
 TEES  
 MC 4,096; MD 8,192; MT  
 U of Cal Los Alamos  
 MC 2 units 32,768 ea; 1 unit 8,192; MT  
 U of Cal Berkeley  
 MC 32,768; MT  
 U of Mich  
 MC 8,192; MD 8,192; MT 8

## INPUT

Manufacturer	Speed
Media	
Card Reader	150 or 250 cards/min
Magnetic Tape	
Card to Magnetic Tape	250 or 800 cards/min

The card to magnetic tape conversion is an independent operation. The higher conversion rate is using the IBM 1401 System as a conversion unit.

USAF SAC Offutt

Input media are punched cards, magnetic tape, and paper tape.

Allis Chalmers  
 Input medium is punched cards.

Lockheed Marietta  
 Input medium is magnetic tape. All other installations utilize punched cards and magnetic tape as input media.

## OUTPUT

Manufacturer	Media	Speed
	Card Punch	100 cards/min
	Line Printer	150 lines/min
	Cathode Ray Tube Display	8300 data points/sec
	Magnetic Tape	
	Magnetic Tape to Card	100 or 250 cards/min
	Magnetic Tape to Printer	150 or 600 lines/min

Conversion is an independent operation. The higher speeds are obtained using the IBM 1401 Data Processing System off-line for tape-to-printer and tape-to-card conversion.

USNOL White Oak

Output media are punched cards, magnetic tape, printer, and cathode ray tube.

USAF Eglin AFB

Output media are punched cards and magnetic tape.

USAF SAC Offutt

Punched cards, magnetic tape, paper tape, and printer.

Allis-Chalmers

Punched cards and printer.

GE Phoenix

Punched cards and magnetic tape.

GMC Indianapolis

Punched cards and magnetic tape.

Photo by United Aircraft Corporation, East Hartford

Lockheed Marietta

Magnetic tape.

Rand

Punched cards and magnetic tape.

Republic Aviation

Punched cards, magnetic tape, printer and cathode ray tube.

All other installations utilize punched cards, magnetic tape and printer as output media.

## CIRCUIT ELEMENTS OF ENTIRE SYSTEM

Manufacturer

There are 295,000, 590,000, or 1,100,000 magnetic cores, depending on memory size.

## CHECKING FEATURES

Manufacturer

Magnetic Tape - horizontal and vertical parity bit check for each row and column.

Main Frame - overflow in accumulator, divide check.

Line Printer - echo checking.



## POWER, SPACE, WEIGHT, AND SITE PREPARATION

Manufacturer  
 Power, computer 84.6 KVA 0.65-0.70 pf  
 Capacity, air conditioner 40 Tons, approx.  
 Weight, computer 19,466 lbs  
 A physical planning manual is available on request.  
 USA BMA (Now NASA)  
 Power, computer 75 Kw 105.7 KVA 0.71 pf  
 Weight, computer 27,880 lbs  
 Power, air conditioner 256,600 BTU/hr  
 USA BMA (Now at NASA)  
 Power, computer 75 Kw 105.7 KVA 0.72 pf  
 Volume, computer 18,432 cu ft  
 Area, computer 1,152 sq ft  
 Room size, computer 1,600 sq ft  
 Floor loading 24.2 lbs/sq ft  
 1,000 lbs concen max  
 Weight, computer 27,880 lbs  
 Capacity, air conditioner 21.4 Tons  
 256,600 BTU/hr

Raised floor, under floor plenums, concrete block building and separate transformer bank serving main power panels.

USA WSMR CO  
 Power, computer 114.8 Kw 139.5 KVA 0.823 pf  
 Area, computer 15,000 sq ft  
 Area, air conditioner 2,670 sq ft  
 Capacity, air conditioner 35 Tons  
 419,790 BTU/hr  
 Weight, computer 40,330 lbs

Photo by Temco Aircraft Corporation

Cinder block constructed building with tile floor, with 18 inch modified false floor for computer system, containing air conditioning plenum.

USA WSMR  
 Power, computer 58.73 Kw 105.7 KVA 0.56 pf  
 Power, air cond 67.5 Kw 90.0 KVA 0.75 pf  
 Volume, computer 1,039.2 cu ft  
 Volume, air conditioner 3,366 cu ft  
 Area, computer 197.25 sq ft  
 Area, air conditioner 306 sq ft  
 Room size, computer 1,628 sq ft  
 Room size, air conditioner 400 sq ft  
 Floor loading 16.54 lbs/sq ft  
 136.52 lbs concen max

Capacity, air conditioner 144 Tons  
 Weight, computer 26,930 lbs  
 Weight, air conditioner 13,000 lbs  
 False flooring for conduits, motor generator (250 KVA), and cooler (cooling tower 14 ft x 14 ft x 20 ft. plumbing - extensive and complicated). Air conditioning capacity is for total building, a portion of which is used for the computer.

USN David Taylor  
 Power, computer 140.0 KVA  
 Volume, computer 22,000 cu ft  
 Volume, air conditioner 16,500 cu ft  
 Area, computer 2,000 sq ft  
 Area, air conditioner 1,500 sq ft  
 Room size, computer 50 ft x 40 ft  
 Room size, air conditioner 30 ft x 20 ft  
 Floor loading 175 lbs/sq ft

Capacity, air conditioner 50 Tons  
 Weight, computer 35,910 lbs  
 Installation of false floor and plenums.  
 USNOL White Oak  
 Power, computer 94 Kw 138 KVA 0.68 pf  
 Volume, computer 16,000 cu ft  
 Volume, air conditioner 8,000 cu ft  
 Area, computer 2,000 sq ft  
 Area, air conditioner 1,000 sq ft  
 Room size, computer 2,500 sq ft  
 Room size, air conditioner 1,000 sq ft  
 Floor loading 200 lbs/sq ft  
 1,000 lbs concen max  
 Capacity, air conditioner 65 Tons  
 Weight, computer 37,330 lbs  
 False floor and ceiling which form air plenums.  
 USAF Eglin AFB  
 Power, computer & peripheral equipment 154.7 KVA 0.80 pf  
 Power, air cond 8.1 Kw 12 KVA 0.80 pf  
 Volume, com & per equip 19,440 cu ft  
 Volume, air conditioner 10,920 cu ft  
 Area, com & per equip 2,160 sq ft  
 Area, air conditioner 840 sq ft  
 Room size, com & per equip 45.4 ft wide  
 47.5 ft long  
 Room size, air conditioner 28 ft x 30 ft  
 Floor loading 100 lbs/sq ft  
 1,000 lbs concen max  
 Capacity, air conditioner 75 Tons

Photo by Socony Mobil Oil Company, Incorporated

Weight, computer 37,770 lbs  
 Weight, air conditioner 1,800 lbs  
 Raised floor eight inches, put in false ceiling, permanent type, installed duct system, installed 75 ton air handling unit, and installed 75 KVA transformers 800 amp air circuit breaker and distribution panel.  
 USAF Edwards AFB  
 Power, computer 108.0 KVA  
 Power, air conditioner 150 KVA 0.93 pf  
 Volume, computer 1,073.6 cu ft  
 Volume, air conditioner 22,000 cu ft  
 Area, computer 1,683 sq ft  
 Area, air conditioner 884 sq ft  
 Room size, computer 61 ft x 33 ft  
 Room size, air conditioner 17 ft x 37 ft  
 17 ft x 15 ft  
 Floor loading 16.5 lbs/sq ft  
 27,880 lbs concen max  
 Capacity, air conditioner 80 Tons  
 60 Tons available  
 Weight, computer 3,150 lbs  
 Air conditioning, power distribution, gutter and hangers for cabling of system, raised wooden flooring for peripheral equipment.

USAF SAC Offutt		
Power, computer	98 Kw	125 KVA 0.80 pf
Floor loading		250 lbs/sq ft
		1,000 lbs concen max
Capacity, air conditioner		60 Tons
Weight, air conditioner		6,000 lbs

Power specifications for the computer air conditioning system differ under normal or emergency power operation.

During periods of normal operation, the air conditioner is tied in with the large central steam-turbine drive air conditioning system which serves the entire SAC Headquarters building. Direct application is by chilled water coil. Cooling is accomplished by a 23,000 cfm supply air fan requiring 7.5 Kw. The power factor of approximately 0.85 results in a KVA of 8.7.

The same air handling unit, producing the same chilled-water coil capacity is used under emergency power conditions. During such periods, cooling capability is supplied by two 30 ton direct expansion Worthington air conditioning units, driven by 30 hp electric motors. The same 23,000 cfm supply air fan is used. Each compressor requires 22 Kw, 26-27 KVA and has a power factor of approximately 0.85.

This computer installation is positioned in a set of rooms located in the SAC Underground Control Center. The main computer room, together with another room which houses air conditioning and other environmental control equipment are grouped so that between

Photo by Republic Aviation Corporation

them they occupy a rectangular area of 50 x 59 ft. Also considered to be an integral part of the computer facility is the 12.5 x 19 x 8 ft. engineering and maintenance room, occupied by the IBM Customer Engineers.

The main computer room measures 40 x 50 ft. and has an adjoining 19 x 24.25 ft. alcove. The overall height of this room is 18 ft., which includes a sub-flooring space of 2.5 ft. and a false ceiling which in most areas measures 3.5 ft. The entire 18 ft. height was considered in computing the volume of this room.

Square feet	2,460.75
Cubic feet	44,293.5

The air conditioning room, 19 x 25.75 x 18 ft, has no false floor or ceiling.

Square feet	237.5
Cubic feet	1,900

It is assumed to be understood that the above figures, while reflecting adequacy for this particular computer installation, should not be construed as being typical or otherwise used as space determination criteria. Exact space specifications may vary greatly with each computer installation; their exact determination and design being a preliminary step by the potential contractor in contract negotiation.

Component parts of this computer system are interpreted as falling into the following three general categories, and the weights given are the totals for all pieces of equipment categorized within each of

these classifications:

Basic 704	30,720 lbs
Additional 704	13,070 lbs
PCAM	<u>9,764</u> lbs
	53,554 lbs

Design, engineering and construction specifications related to site preparation for this computer installation are considered unique in that the SAC Underground Control Center was in being at the time computer installation site construction was accomplished. This involved finishing out an underground area directly under the then-existing engine generator room of the SAC Control Center. This finishing out project included not only the rooms described above, but additional areas which were designed to serve as a supporting office area and conference room. Work specifications necessary to develop this area into suitable configuration for establishment of a computer system therein was accomplished in accordance with the criteria contained in the Physical Planning Installations Manual 701, 704 and 709 Data Processing Systems, dated 15 December 1957, published by the Sales Engineering Department of the International Business Machines Corporation. This manual contains a significant amount of detailed technical information pertinent to installation of the specified computers in any given area.

Photo by The Martin Company (Currently a 709)

Machine	Basic System Name	Weight in Lbs.
704	Central Processing Unit	3,150
711	Punched Card Reader	560
716	Alphabetic Printer	1,910
721	Punched Card Recorder	670
727 (10)	Magnetic Tape Unit	950 ea
733	Magnetic Drum Unit	1,930
736	Power Frame No. 1	2,400
738	Magnetic Core Storage Unit	4,000
741	Power Frame No. 2	3,250
746	Power Distribution Unit	1,110
753	Tape Control Unit	2,240
		<u>30,720</u>
	Additional Equipment	
714	Card Reader	1,150
720	Printer	1,600
727 (2)	Magnetic Tape Unit	950 ea
747	TDS Power Supply	2,000
759	Card Reader Control Unit	2,160
760	Control & Storage Unit (720)	760
774	Tape Data Delector	2,300
		<u>11,870</u>

The 9307 Tape Punch Reader and its supporting power supply weigh 500 and 700 lbs respectively. These two items are classified as additional equipment. The total weight would come to 13,070 lbs.

Machine	PCAM Components Name	Weight in Lbs
010	Binary Punch	29
026(5)	Printing	222 ea
026(2)	Printing Card Punch	222 ea
047	Tape Controlled Card Punch	307
056(2)	Card Verifier	222 ea
056	Card Verifier	222
063	Card Controlled Tape Punch	314
083	Card Sorter	500
089	Alphabetic Collator	1,027
407	Accounting Machine	3,826
519	Document Originating Machine	1,311
552	Card Interpreter	770
		<u>9,764</u>

Grand Total, all equipment: 53,554 lbs.

USAF Kirtland AFB			
Power, computer	83.12 Kw	103.9 KVA	0.80 pf
Power, air cond	30.0 Kw	39.5 KVA	0.76 pf
Volume, computer		982.4 cu ft	
Volume, air conditioner		850.0 cu ft	
Area, computer		207.6 sq ft	
Area, air conditioner		156.0 sq ft	
Room size, computer		185.0 sq ft	
Room size, air conditioner		282.0 sq ft	
Floor loading		750 lbs/sq ft	
		750 lbs concen max	

Capacity, air conditioner 26 Tons  
 Weight, computer 24,810 lbs

Building was in existence as an instrument shop. Site modification included installation of a raised floor to provide air conditioning plenum, and electrical wiring. False floor was in existence. Building is a block wall. Air conditioning. Pressurization prevents dust from entering.

Photo by Grumman Aircraft Engineering Corporation

BFS FAA	
Power, computer	117.7 KVA
Volume, computer	17,280 cu ft
Area, computer	1,728 sq ft
Room size, computer	72 x 24 x 10 ft
Floor loading	100 lbs/sq ft
	1,000 lbs concen max
Capacity, air conditioner	50 Tons
Weight, computer	28,750 lbs

Air conditioning is supplied from a central air conditioning unit that furnishes cooling for a complete building. Site prepared in a new brick structure. There are false ceilings, free access type floor, concrete block construction for the interior. There are no windows. The free access floor has 3 ft x 3 ft square flooring supported by a raised metal framework. There is complete interchangeability of the square flooring panels.

NASA Ames			
Power, computer	45.6 Kw	100.6 KVA	0.80 pf
Power, air conditioner		45.6 Kw	
Volume, computer		3,330 cu ft	
Volume, air conditioner		264 cu ft	
Area, computer		666 sq ft	
Area, air conditioner		32 sq ft	
Room size, computer		47 x 35 ft	
Floor loading		100 lbs/sq ft	
		1,000 lbs concen max	
Capacity, air conditioner		37.5 Tons	
Weight, computer		23,100 lbs	
Weight, air conditioner		4,000 lbs	

The 704 was placed in a converted shop in a wind tunnel building. No false ceiling was installed but a false floor was built to accommodate cabling and serve as a plenum for under floor coating. One floor air conditioner was installed and three over head units. The power for the computer was taken off

before the building cut-off and has no other loads on it except the computer and the air conditioner.

NASA Lewis

Power, computer	135.1 KVA
Power, air conditioner	37.3 KVA
Volume, computer	22,680 cu ft
Volume, air conditioner	4,000 cu ft
Area, computer	2,268 sq ft
Area, air conditioner	400 sq ft
Room size, computer	54 x 42 ft
Room size, air conditioner	20 x 20 ft
Floor loading	100 lbs/sq ft
Capacity, air conditioner	50 Tons

Raised floor used as plenum chamber and cable space.

Separate power feeder; auxiliary ducts in ceiling.

Partitions. Insulated water lines from basement to 3rd floor. Concrete pad for water chillers. Existing building construction was reinforced concrete.

NBS

Power, computer	131 KVA	0.70 pf
Power, air conditioner	45 KVA	
Volume, computer	16,000 cu ft	
Volume, air conditioner	4,000 cu ft	
Area, computer	1,600 sq ft	
Area, air conditioner	400 sq ft	
Room size, computer	40 x 40 ft	
Room size, air conditioner	20 x 20 ft	
Floor loading	20 lbs/sq ft	
	120 lbs concn max	
Capacity, air conditioner	40 Tons	

Photo by General Motors, Detroit

Weight, computer	32,110 lbs
Weight, air conditioner	5,000 lbs
False floors - Quonset Hut.	

TVA

Power, computer	100 KVA	
Power, air cond	72 Kw(1)	166 KVA(2) 0.90 pf
Volume, computer	1,700 cu ft	
Volume, air conditioner	13,100 cu ft	
Area, computer	258 sq ft	
Area, air conditioner	1,456 sq ft	
Room size, computer	2,450 sq ft	
	11 ft. ceiling	
Room size, air conditioner	1,456 sq ft	
Floor loading	200 lbs/sq ft	
	6,000 lbs concn max	
Capacity, air conditioner	110 Tons (2 55 ton systems)	
Weight, computer	42,210 lbs	
Weight, air conditioner	9,200 lbs (does not include duct, piping, insulation & fittings)	

The system was installed in an old building of structural steel and masonry construction. A portion of the building was remodelled with raised removable floor, dropped fireproof acoustical ceiling, panel and acoustical sides, recessed lighting, separate duplicate air-conditioning systems, new 2,000A 4-wire electrical entrance and distribution system, all meeting or exceeding IBM specifications.

Allis-Chalmers

Power, computer	75 KVA	0.85 pf
Power, air conditioner	25 Kw	
Area, computer	2,000 sq ft	
Area, air conditioner	200 sq ft	
Capacity, air conditioner	25 Tons	
Weight, air conditioner	5,000 lbs	

False ceilings, trenches dug in ground floor.  
AVCO

Volume, computer	25,000 cu ft
Area, computer	2,500 sq ft
Room size, computer	50 x 50 ft

Area was prepared under manufacturer supervision during laboratory construction.

Bell Aero  
New building to meet IBM requirements.

Bell Tel Whippany

Power, computer	160 KVA		
Power, air cond	90 Kw	100 KVA	0.90
Volume, computer	28,000 cu ft		
Volume, air conditioner	5,760 cu ft		
Area, computer	3,500 sq ft		
Area, air conditioner	720 sq ft		
Room size, computer	28 ft x 124 ft		
Room size, air conditioner	20 ft x 36 ft		
Floorloading	275 lbs/sq ft		
	1,000 lbs concen max		
Capacity, air conditioner	100 Tons		
Weight, computer	46,970 lbs		
Weight, air conditioner	41,000 lbs		

Photo by General Motors, Indianapolis

Computer located in basement of new building, concrete, steel, block and stucco. Plenum type floor, free access type raised floor. False ceilings. Power distribution - 120/208 volts. 300 KVA transformer.

Bell Tel Murray Hill

Power, computer	110 KVA
Area, computer	1,000 sq ft
Area, air conditioner	300 sq ft
Room size, computer	2,700 sq ft
Room size, air conditioner	400 sq ft
Capacity, air conditioner	80 Tons
Weight, computer	27,000 lbs
Weight, air conditioner	20,000 lbs

False floating floor. To minimize cool air duct work and facilitate inter machine cable connections. False ceiling.

Bendix Systems

Power, computer	112 Kw	140 KVA	0.80 pf
Power, air cond	48 Kw	60 KVA	0.80 pf
Volume, computer	32,000 cu ft		
Volume, air conditioner	1,000 cu ft		
Area, computer	3,200 sq ft		
Area, air conditioner	100 sq ft		
Room size, computer	3,200 sq ft used		
Capacity, air conditioner	60 Tons		
Weight, computer	31,350 lbs		
Weight, air conditioner	10,000 lbs		

The installation which houses the computing facility was built so that a minimum of changes and/or modifi-

cations would be necessary for any equipment that might be installed. The cabling is laid in concrete troughs under the floor on a 7 ft. grid. These channels are covered with removable flooring. Input power and cable connections to auxiliary equipment are accommodated under the floor.

CEIR

Power, computer	75.0 Kw	106.8 KVA	0.70 pf
Power, air cond	10 Kw	12 KVA	0.85 pf
Volume, computer	9,000 cu ft		
Volume, air conditioner	10,000 cu ft		
Area, computer	900 sq ft		
Area, air conditioner	1,000 sq ft		
Room size, computer	25 ft x 40 ft		
Room size, air conditioner	25 ft x 40 ft		
Floor loading	30 lbs/sq ft		
	125 lbs concen max		
Capacity, air conditioner	120 Tons		
Weight, computer	27,886 lbs		
Weight, air conditioner	27,000 lbs		

Air conditioning handles two computers (704 and 709). Brick and mortar built-up floor over concrete slab with channels 6 inch deep for cables. False ceiling.

Convair Fort Worth

Power, computer	131.1 Kw	164.7 KVA	0.80 pf
Volume, computer	31,140 cu ft		
Area, computer	3,114 sq ft		
Room size, computer	43.5 ft x 29 ft		
	32.5 ft x 57 ft		
Floor loading	14.6 lbs/sq ft		

Photo by General Motors, Warren

Floor loading	1,000 lbs concen max
Weight, computer	45,420 lbs

Equipment was installed in an existing reinforced concrete building. A false floor provides an under-floor plenum for inlet of conditioned air. A false ceiling provides a return air plenum. Wooden partition walls were built to enclose the equipment area. Power distribution is to two points for the 704 and three points for peripheral equipment. The power is supplied as regulated 208V 3 phase from a voltage reduction transformer bank.

Cornell Aero

Power, computer	75.6 Kw	101.3 KVA	0.745 avg. pf
Power, air cond	51 Kw	60 KVA	0.85 pf
Volume, computer	24,000 cu ft		
Volume, air conditioner	3,880 cu ft		
Area, computer	3,000 sq ft		
Area, air conditioner	388 sq ft		
Room size, computer	65 x 49 ft		
Room size, air conditioner	16 x 18 ft & 10 x 10 ft		
Floor loading	200 lbs/sq ft		
	800 lbs concen max		

Capacity, air conditioner	35 Tons
Weight, computer	30,400 lbs
Weight, air conditioner	11,000 lbs

Power, computer - 208v, 3 phase, 2 No. 4/0 AVB per phase, 416 amp.

Power, air conditioner - 440v, 3 phase, 1 No. 2/0 RH per phase, 175 amp.

Raised sectional floor and suspended acoustical ceiling in existing building.



Photo by Bendix Systems Division, Bendix Corporation, Ann Arbor

Convair San Diego

Concrete building, plenum, 100 Ton air conditioning, 220 volt, 3 phase, 600 amp main frame, 100 amp each for both printers, one punch and one reader.

Douglas A-260

Power, computer 125 KVA  
 Area, computer 2,000 sq ft  
 Area, air conditioner 1,300 sq ft  
 Room size, computer 40 x 50 ft  
 Floor loading 16 lbs/sq ft  
 200 lbs concen max

Capacity, air conditioner 50 Tons  
 Weight, computer 23,000 lbs

Sealed area, six inch raised false floor installed over power cables, a/c unit and air filter installed, motor generator set with transformer and controls.

Douglas A-850 (2)

Power, computer 125 KVA  
 Area, computer 2,000 sq ft  
 Area, air conditioner 1,200 sq ft  
 Room size, computer 40 x 50 ft  
 Floor loading 16 lbs/sq ft  
 200 lbs concen max

Capacity, air conditioner 40 Tons  
 Weight, computer 24,000 lbs

Sealed area; a/c ducts installed with 500 RCE/sink for each component, a/c unit and air filter installed, motor generator set with transformer and controls. Requirements are for each system.

GE Phoenix

Power, computer 83.2 Kw 112.2 KVA 0.74 pf  
 Volume, computer 180,000 cu ft  
 Area, computer 2,899 sq ft  
 Floor loading 8.48 lbs/sq ft  
 Weight, computer 24,610 lbs  
 False floor.

GE Evendale

Power, computer 63.54 Kw 114.8 KVA  
 Volume, computer 8,800 cu ft  
 Area, computer 880 sq ft  
 Weight, computer 28,610 lbs

The building was designed expressly for housing large-scale digital computers. It was completed in 1955. The flooring in the machine room area is wood to allow cable holes to be made easily. Crossed braced supporting girders permit cables to be strung through them, thus minimizing cable lengths. False ceilings are used in the floor below machine rooms.

GE Schenectady

Power, computer 126.4 KVA  
 Area, computer 1,775 sq ft  
 Capacity, air conditioner 100 Tons  
 Weight, computer 32,760 lbs  
 False ceilings, trench floor.

GMC Warren

Power, computer 162.6 KVA 0.75 pf  
 Power, air conditioner 50 Kw 0.90 pf  
 Volume, computer 25,088 cu ft  
 Volume, air conditioner 1,200 cu ft  
 Area, computer 2,688 sq ft  
 Area, air conditioner 360 sq ft  
 Room size, computer 32 x 84 ft  
 Room size, air conditioner 12 x 30 ft  
 Floor loading 100 lbs/sq ft  
 1,000 lbs concen max

Capacity, air conditioner 70 Tons  
 Weight, computer 40,140 lbs

All air handling is done above a false ceiling with high heat-load machines individually exhausted. Primary power for the 704 is obtained from a transformer installed particularly for it. The main 704 power is interlocked with the automatically controlled air conditioning system.

GMC Indianapolis

704 System set on concrete floor - use portion of central air conditioning system. Additional a/c ducts installed. Provide power for operation of computer.

GMC Indianapolis

A two foot plenum chamber was constructed to be used for electrical and power supply cables as well as for supplying cooled air into the base of certain units. A vinyl plastic non-static floor was installed over the complete area and either cemented to the concrete floors on grade or to the surface of removable floor panels in the computer room. A honeycomb type of aluminum ceiling was installed at a height of approximately 10 feet over the entire area with lighting, air conditioning and duct work installed above this ceiling. Conditioned air was also supplied from above this ceiling to blend with the air supplied from below the floor.

Grumman

Removable floor panels; air conditioning intakes and release plenums extended thru roof; provided separate 500 KVA transformer for computer only; air

conditioner powered from a separate source; and installed lighting for 30 foot-candles.

Gulf

New wing (2-story) added to existing building to house computer and programming and operating staff. Underfloor plenum and overhead air conditioning return in machine room. Air conditioner serves offices also.

IBM PDL Poughkeepsie

Reinforced concrete building; pedestal panel type raised floor; suspended acoustical ceiling with plenum above; double glazing of exterior windows; and vapor barrier control.

IBM GPD DL Endicott

False floor (removable sections), separate transformer (138 v AC 3 phase), false ceiling (removable sections).

IBM RC Yorktown Heights

Floating false floor and air conditioner required.

Marquardt

Existing computer area in engineering office build-

Photo by Bell Telephone Laboratories

ing was enlarged and modified. Building is one story, of concrete tilt-up construction. Modifications include: trenched floor for cables; dropped, integrated ceiling for return air plenum; 2-step lighting; acoustic tile down to wainscoat.

Martin Denver

False ceiling, under floor ducts, raise floor placed in new office building and original area designed for computer installation. Power distribution system was provided separate from building system.

North American

Raised floors and acoustic ceiling and walls.

Pratt and Whitney

This machine is located in an air conditioned space. The space has a raised wooden floor with asphalt tile flooring. Conditioned air is supplied to the space by means of ductwork and ceiling diffusers with the space above the false ceiling serving as a return air plenum. Basic building construction is reinforced concrete with Hauserman metal inner partitions.

Sandia  
Air chamber in floor for cooling equipment, air plenum above false ceiling for return air. Connecting cables in conduit under floor.

Socony  
A 12 inch raised floor was installed for cable passage and which also acts as a plenum. There were no major building modifications other than the relocation of office space. Power supply to the computer is through a 500 KVA transformer installed in a room adjacent to the Computer Center.

Standard Oil California  
Raised false floor, partitioning, lighting, independent power supply and independent air conditioning.

Standard Oil Indiana  
Additional air conditioning installed in existing false ceiling. Raised wooden floor installed with specific cable channels required.

Temco  
Concrete floor dropped 18 inches below main floor during building construction, for cabling and air-conditioning plenum beneath machines in 48 ft x 48 ft area. 1 1/2 inch plywood panels (2 x 4 feet) with strip vinyl covering installed on 4 ft x 4 ft beams and joists. Air filtered electronically from main building system before entering computing area - humidity and temperature controlled. Electrical power obtained from separate sub-station.

photo by Bell Telephone Laboratories

United Aircraft (3)  
Computer room - cinder block walls, concrete slab with raised wood and tile floor 80 ft x 200 ft to provide wire way. Concrete roof (supporting fan room) with acoustic false ceiling which provides exhaust plenum. Power distribution - six (200 KVA each) 3 phase, 208 volt distribution panels.

Chance Vought  
Raised wood platform with race ways for cabling. Air-conditioning for room only.

Westinghouse Baltimore  
A special 34 x 46 foot computer room was constructed with trenches and channels formed in the concrete floor and a metal pan false ceiling. The trenches and channels are used for concealed electrical cable raceways and distribution of underfloor air conditioning of fixed temperature and humidity to those units generating a high heat load. Environmental control of the total air conditioning is maintained by air diffused throughout the room by means of the plenum chamber formed by the false ceiling and the structural ceiling. Electrical power for the computer and peripheral equipment is supplied by a 10 KVA transformer completely separate from the main building service, through a 400 amp distribution panel.

Cal Tech JPL  
Special room constructed consisting of raised floor 16 inches high on adjustable jacks. Also false ceiling with tight air plenum above. All wiring and cable connections under floor.

Photo by Cornell Aeronautical Laboratory, Incorporated

**MURA**

Installation of vapor-proofed walls and ceiling.  
Installation of false floor (raised) with free access  
for ducts and cables.

**TEES**

The building is a new (1959) building constructed  
just to house the data processing equipment. It has  
all the air conditioning and power necessary to han-  
dle any known computer. The building has 12,000  
square feet of floor space.

U of Cal Berkeley

False ceiling and false floor.

U of Mich

Air conditioning	40 Tons
Floor space Machine room	3,300 sq ft
Office	1,600 sq ft

**PRODUCTION RECORD**

Manufacturer

No delivery schedule in effect; availability basis  
only.

**COST, PRICE AND RENTAL RATES**

		Model	Monthly Charge	Purchase Price
704	CPU w/Flo Pt	1	\$9,700	\$523,800
736	Power Frame No. 1	2	1,100	57,200
741	Power Frame No. 2	2	1,400	72,800
746	Power Distribution Unit	2	1,300	67,600
711	Punched Card Reader	2	800	52,000
716	Printer	1	1,200	78,050
721	Card Punch	1	600	39,000
727	Magnetic Tape Unit	1	550	29,800
753	Tape Control Unit	1	2,500	140,250
733	Magnetic Drum Unit (8,192 words)	1	3,100	167,400
737	Mag Core Stor (4,096)	1	4,000	208,000
738	Mag Core Stor (32,768)	1	20,000	1,040,000
740	CRT Output Recorder	1	2,700	162,000
780	Display Unit	1	150	8,700
714	Card Reader	1	1,500	97,500
759	Card Reader	1	900	54,000
717	Printer	1	1,200	73,950
757	Printer Control Unit	1	600	36,000
722	Card Punch	1	750	44,400
758	Card Punch Control Unit	1	300	18,000
720	Printer (500 lpm)	1	1,400	74,200
760	Printer Cntrl & Storage	1	1,850	111,000

The base purchase price is used in computing the  
discounted purchase price based on the age of the

Photo by University of California LRL

installed machine. A published discount schedule is available from IBM.  
 Monthly rental, typical system: \$44,000 and up  
 Purchase price, typical system: \$1,994,000 and up  
 Maintenance contract available.

USA BMA (now NASA) (2)  
 704, 711, 716, 721, 8-727's, 733, 736, 2-737's, 741, 746, 753 - \$33,270 per month.

USA WSMR CO  
 Basic System  
 704, 711, 716, 721, 727 (13), 733, 737 (2), 736, 741, 746, 753, 759, 760, 714, 720, 010 (4), 026 (4), 056 (2), 082, 407, 514, 557. Total approx. rental \$49,500 per month.

Additional Equipment  
 \$19,700 per month.

USA WSMR  
 Basic System  
 IBM 704, 7-727, 711, 716, 721, 753, 733, 2-737, 736, 741, 746: \$33,380 per month.

Additional Equipment  
 IBM 2-519, 747, 774, 2-407, 759, 714, 727, 077, 089, 552, 082, 056, 2-026, 4-024: \$12,682 per month.

USN David Taylor  
 CPU, 10 tape units, core storage, and drum storage rents at \$50,000/month, one shift rental.

Basic System	Cost	Monthly Rental
IBM 704 EDPM	\$2,071,600	\$45,500

Additional Equipment	Cost	Monthly Rental
IBM Type 717 Tape Printer	\$118,200	\$2,600
IBM Type 714 Card-to-tape Converter	96,650	2,950

USAF Eglin AFB  
 704 Computer and peripheral equipment 2,255.5 hrs on a three shift operation including overtime -\$89,856.52 per month.

USAF Edwards AFB  
 704, 711, 716, 721, 8-727's, 733, 2-737's, 741, 746, and 753 rents at \$33,365/month.  
 714, 2-727's, 747, 759, and 774 rents at \$6,515/mo.  
 USAF SAC Offutt

All series 700 IBM equipment, whether classed as basic or additional, is retained on a rental basis under the terms of contract No. GS-OOS-23293, Machine Service for the US Government, which was negotiated between IBM, the contractor and the Federal Supply Branch of the General Services Administration. Basically this contract permits us to use all series 700 equipment for 176 hours per month (prime shift) at basic rental rates. Extra shift rental is computed at approximately 40% of the basic rate. Currently we are utilizing this equipment on a three shift per day basis. Due to the numerous combinations of computer equipment which may be effected to comprise any one separate computer system or installation, it is largely a matter of personal interpretation as to which components constitute basic or additional terms.

The lists of components, which itemize individual basic rental rates, were compiled in this light.

All PCAM equipment is retained on a rental basis under the terms of contract No. GS-OOS-22633, which bears the same title and is between the same principals cited in the preceding paragraph. Currently, this equipment is retained on a one shift rental basis.

The total monthly rental rate for prime shift utilization of all rental components is \$59,513.

The IBM 9307 Tape (paper) Punch Reader is the only component that has been obtained on other than a rental basis. This item was purchased from the IBM Corporation at a cost of \$39,750.

Maintenance and servicing of all rental equipment is provided by IBM Customer Engineers in accordance with the provisions of the two contracts cited above. Customer Engineers accomplish required preventive maintenance and such unscheduled maintenance as may become necessary, including the furnishing of replacement parts. The cost of such maintenance is included in the rental rate.

Customer Engineers also accomplish required preventive and unscheduled maintenance on the 9307 Tape Punch Reader. This is provided under the terms of a separate IBM maintenance agreement at the current rate of \$165 per month.

Machine	Name	Rental Rate
704	Central Processing Unit	\$9,845
711	Punched Card Reader	800
716	Alphabetic Printer	1,200
721	Punched Card Recorder	600
727(10)	Magnetic Tape Unit	550 ea
733	Magnetic Drum Unit	2,900
736	Power Frame No. 1	1,100
738	Magnetic Core Storage Unit	19,700
741	Power Frame No. 2	1,400
746	Power Distribution Unit	1,300
753	Tape Control Unit	2,350
Total		\$46,695
Additional Equipment		
714	Card Reader	\$1,500
720	Printer	1,400
727(2)	Magnetic Tape Units	550 ea
747	TDS Power Supply	500
759	Card Reader Control Unit	900
760	Control & Storage Unit (720)	2,500
774	Tape Data Selector	2,324
Total		\$10,224

The 9307 Tape Punch Reader and its supporting power supply were purchased at a total cost of \$39,750. These two items are classified as additional equipment.

PCAM Components		
010	Binary Punch	\$10
026(5)	Printing	63 ea
026(2)	Printing Card Punch	60 ea
047	Tape Controlled Card Punch	160
056(2)	Card Verifier	53 ea
056	Card Verifier	50
063	Card Controlled Tape Punch	75
083	Card Sorter	134
089	Alphabetic Collator	220
407	Accounting Machine	995
519	Document Originating Machine	319
552	Card Interpreter	90
Total		\$2,594
Grand total, all rental equipment:		\$59,513

USAF Kirtland AFB	
Basic System	Rental
704	\$9,720
736	1,100
741	1,400
746	1,300
738	19,700
711	800
721	600
716	1,200
Additional Equipment	
753	\$2,440
727	3,300

Argonne  
The 704 configuration which Argonne National Laboratory has is as follows:

32,768 word core; 8,192 word drum; 9 on-line tape units (727); on-line: 711 Card Reader, 721 Output Punch, and 716 On-line Printer; off-line: Card-to-Tape (714 Card Reader), and Tape-to-Printer (717 Printer).

BFS FAA	
Basic System	
704	Central Processing Unit 1
711	Card Reader 1
716	Printer 1
717	Printer 1
721	Card Punch 1
727	Tape Units 8
736	Power Supply 1
737	Core Storage 2
741	Power Supply 1
746	Power Unit 1
753	Tape Control 1
757	Printer Control 1
Total Monthly Rental - \$32,555	
Additional Equipment	
026	Card Punch 2
056	Card Verifier 1
082	Sorter 1
407	Accounting Machine 1
514	Reproducing Punch 1
Total Monthly Rental - \$1,255	

NASA Ames  
Basic System  
704 Main Frame, 8K Magnetic Core, Printer, Reader, Punch, 5 Magnetic Tapes and Tape Control Unit rents at \$28,795/month.  
Additional Equipment  
717, 757, and off-line printer rents at \$2,050/month.  
NASA Lewis  
704, 736, 741, 746, 737 (2), 711, 721, 716, 733, 753, 727 (8) rents at \$32,400/month.  
717, 757, 727, 407, 519, 082, 026 (5), 011 rents at \$3,900/month.

NBS  
Basic System  
704, 711, 716, 721, 727 (6), 733, 753, 738, 736, 741, and 746 rents at \$44,450 1st shift.  
Additional Equipment  
776 Tape Switching Device \$40 per shift, 1/2 word logic \$500 per shift, and 717, 757, 727 Off-line Printer \$2,350 per shift.  
TVA  
704, 711, 716, 727 (8), 753, 737 (4), 736, 741, and 746. Purchase price June 1960, \$1,213,679.33. Price when new, \$1,752,900.  
714, 759, 717, 757, 722, 758, and 727 (2). \$324,150 price when new if purchased. However, this equipment is leased from IBM, at price indicated.  
\$37,650/month rental paid for basic system during rental period.  
\$6,950/month for additional equipment.

Service charge is \$3,099.75/month for equipment listed. This price applies to prime shift. Additional charges are paid for services outside the prime shift.

Allis-Chalmers  
Basic System  
704, 711, 716, 721, 753, 736, 741, 746, 740, and 780 rents at \$27,000/month.

AVCO  
Basic System  
704, 738, 711, 716, 721, 753, 9-727. \$54,000/month total system rental prime shift.

Additional Equipment  
717 System, TDS 407, 519 System, 714 System rental included in above figure.

Bell Aero  
Basic System  
704, 8-727 Tapes, 2-737 Cores, 1-733 Drum, 1-716 Printer, 1-711 Reader, and 1-721 Punch rents at \$33,245/month.

Additional Equipment  
717 Printer, 714 Reader, plus basic EAM card preparation equipment \$6,000/month.

Bell Tel Whippany  
Basic System  
704, 741, 736, 753, 716, 714, 722, 717, 720, 738, 746, 13-727, 711, 721, 759, 758, 757, and 760. Total rental is \$57,000/month.

Additional Equipment  
083, 557, 6-026, 407, 087, 519, 3-056, and 101. Total rental is \$3,000/month.  
176 hours basic rental plus maintenance and service.

Bell Tel Murray Hill  
Basic System  
704, 738, 716, 711, 721, 736, 746, 741, 753, and 9-727's rents at \$43,000/month.

Additional Equipment  
717, 757, 720, 760, 714, 759, 722, 758, and 4-727's rents at \$13,000/month.

Bendix Systems  
Rental rate for Basic System  
\$38,285/month for 704, 736, 741, 746, 737, 711, 716, 721, 753, 727, and 733.

Additional Equipment  
DIGITRON (for display purposes) \$48,000 purchase cost.  
IBM 717, IBM 727 (one additional unit).

CEIR  
Basic System  
704, 721, 733, 736, 711, 727 (8), 737 (2), 741, 716, 753, and 746 cost \$809,300.

Peripheral equipment shared by 704 and 709; 774, 720, and 714 cost \$441,000.

Basic System  
704, 716, 727 (8), 733, 736, 746, 711, 721, 753, 737, and 741 rents at \$33,930.

Peripheral equipment shared by 704 and 709; 774, 720, and 714 rents at \$12,707/month.

Qty	Type	Prime Shift Rental
1	704	\$9,795
1	711	800
1	716	1,200
1	721	600
10	727	5,500
1	733	2,900
1	736	1,100
1	738	19,700
1	741	1,400
1	746	1,300
1	753	2,350
Total		\$46,645

Additional Equipment		Prime Shift Rental
Qty	Type	
1	714	\$1,650
1	722	875
3	727	1,650
1	720	1,900
1	758	800
1	759	975
1	760	2,500
Total		\$10,350
Convair San Diego		

Basic System  
IBM 704 with 32K to 10 tapes rents at \$43,000/month.

Additional Equipment  
2 printers, one punch, and one reader rents at \$10,000/month.

Douglas A-260  
Main frame, 9 magnetic tape units, 1 reader, 1 printer, and 28,672 words additional core memory rents at \$33,000/month.

Douglas A-850  
Main frame, 6 magnetic tape units, 1 reader, 1 punch, and 1 printer and 28,672 words additional core memory rents at \$32,625/month.

Douglas B-250  
Main frame, 7 magnetic tape units, 1 reader, 1 punch, 1 printer and 28,672 words additional memory rents at \$33,175/month.

GMC Warren  
Basic System  
704, 711, 716, 721, 727 (8), 733, 737 (2), 740, 753, 780. Total rent \$36,130/month.

Additional Equipment  
717 (2), 757, 714, 759, 722, 758, 727 (4), Tape Switching. Total rent \$12,365/month.

Qty	Type	Monthly Rental
1	704 CPU Model I	\$9,700
	Device Code 203 CAD	20
	Device Code 76 Back Space File	35
	Device Code 419 Flo Pt Trap	75
1	711 Card Reader Model I	800
1	716 Printer Model I (w/Fortran Symbols)	1,200
1	721 Card Punch (on line)	600
8	727 Tape Unit Model I at 550	4,400
1	733 Magnetic Drum Storage Model I	2,900
1	736 Power Supply Model II	1,100
1	737 Magnetic Core Storage Model I	3,700
1	737 Magnetic Core Storage Model II	3,700
1	741 Power Supply Model II	1,400
1	746 Power Distribution Unit Model II	1,400
1	753 Tape Control Model I	2,350
		\$33,380

GMC Indianapolis		Annual Gross
Qty	Type	
1	704 Central Processing Unit	\$119,724
1	711 Model II Card Reader	9,744
1	716 Model I Printer	14,616
1	721 Model I Card Punch	7,308
8	727 Model I Tape Drives	53,016
1	733 Model I Drum Storage	35,316
1	736 Model II Power Supply	13,392
2	737 Core Storage	90,132
1	741 Model II Power Supply	17,052
1	746 Power Distribution Unit	15,828
1	753 Tape Control	28,620
Grand Total		\$404,748
Monthly Total		\$ 33,727

IBM CORNELL AERONAUTICAL LABORATORY

Description	Machine Type Serial	Mo. Chg.	Pur. Price New Of Equiv. Mach.	Monthly Reduction	Aged to Mar. 1 Mos. Pur. Price	Mo. Depreciation Based 80 Mo. Life	0-36	Maintenance 37-73	73-108
Cntrl Process	704 11026	10325.00	487500.00	4062.483	319375.10	4367.19	1149.75	1149.75	1149.75
Pnch Crd Reader	711 11034	800.00	32000.00	266.665	22953.33	286.67	63.25	79.75	96.50
Crd Reader	714 11136	1500.00	64450.00	537.081	51022.91	637.79	192.00	193.00	246.00
Alph Prntr	716 11028	1200.00	54200.00	451.664	38843.34	485.54	116.00	145.00	176.00
Printer	717 11108	1400.00	55000.00	458.331	43541.66	544.27	210.00	233.00	293.00
Pnch Crd Redr	721 11025	600.00	25000.00	208.332	17916.66	223.96	62.25	78.50	96.50
Mag Tape Unit	727 21536	550.00	18200.00	151.666	13043.33	163.04	119.00	120.00	128.0
Mag Tape Unit	727 21537	550.00	18200.00	151.666	13043.33	163.04	119.00	120.00	128.0
Mag Tape Unit	727 21538	550.00	18200.00	151.666	13043.33	163.04	119.00	120.00	128.0
Mag Tape Unit	727 21539	550.00	18200.00	151.666	13043.33	163.04	119.00	120.00	128.0
Mag Tape Unit	727 22662	550.00	18200.00	151.666	13953.33	174.42	119.00	120.00	128.0
Mag Tape Unit	727 22970	550.00	18200.00	151.666	14408.33	180.10	119.00	120.00	128.0
Mag Tape Unit	727 23321	550.00	18200.00	151.666	14863.33	185.79	119.00	120.00	128.0
Mag Drum Strg	733 11057	2900.00	110000.00	916.663	89833.34	1122.92	248.00	248.00	248.0
Power Frame No. 1	736 11025	1100.00	57200.00	476.664	40993.34	511.67	65.25	65.25	65.2
Mag Core Strg	737 10040	3700.00	192400.00	1603.326	128266.71	1603.33	133.00	133.00	133.0
Mag Core Strg	737 11047	3700.00	192400.00	1603.326	137886.71	1723.58	133.00	133.00	133.0
Crt Recorder	740 11030	2450.00	96000.00	800.00	89600.00	1120.00	215.00	215.00	215.0
Power Frame No. 2	741 11025	1400.00	72800.00	606.664	42173.34	652.17	44.50	44.50	44.5
Power Distr	746 11025	1400.00	72800.00	606.664	42173.34	652.17	28.25	28.25	28.2
Tape Cntrl Unit	753 11025	2350.00	80000.00	666.664	57333.34	716.67	224.00	224.00	224.0
Printer Cntrl	757 10051	650.00	44000.00	366.665	26400.00	330.00	88.75	88.75	88.7
Crd Reader Cntrl	759 10001	900.00	45000.00	374.998	24375.01	304.69	76.75	76.75	76.7
Spel Edpm Unit	776 11016	125.00	7500.00	62.449	6625.00	82.81	-	-	-
CRT Recorder	740 11030	2450.00	96000.00	133.333	14953.36	186.66	54.00	65.50	65.5



Grumman

Basic System

IBM 704, 8K core, 8K drum, 10 tapes, full compl. on and off line equipment rents at \$43,130/month.

Additional Equipment

IBM 650 MDDPM, key punches, verifiers, tabulators, reproducers, sorters, etc. rents at \$8,000/month.

Gulf

Basic System

704, 711, 716, 721, 727 (8), 733, 736 (2), 738, 741 (3), 746 (3), and 753 rents at \$46,000/month.

Additional Equipment

714, 717, 727 (2), 757, and 759 rents at \$6,000/month. An additional \$1,500/month is paid for punched card equipment.

2 IBM customer engineers on premises.

IBM PDL Poughkeepsie

Basic System

704 CPU  
711 Card Reader  
716 Printer  
721 Card Punch  
727 (10) Tape Drives  
733 Magnetic Drum  
736 Power Supply  
738 Core Storage  
740 CRT Recorder  
741 Power Supply  
746 Power Distribution Unit  
753 Tape Control  
780 CRT Display

Total rental is \$50,730/month.

Additional Equipment

720 (2) Printers  
760 (2) Printer Controls  
714 Card Reader  
759 Reader Control  
727 (3) Tape Drives

Equipment is also used with 705II, 705III, and 305 Systems. Total rental is \$13,500/month.

IBM GPD DL Endicott

Basic System

704, 721, 711, 716, 733, 736, 738, 741, 746, 753, 727 (9) rents at \$46,580/month.

Additional Equipment

010, 026 (5), 056 (4), 082, 407, 519, 714, 759, 717, 757, 727 (3) rents at \$9,693/month.

IBM RC Yorktown Heights

Basic System

736, 738, 741, 746 rents at \$33,360/month.

Additional Equipment

711, 714, 717 (2), 716, 721, 722, 727 (13), 733, 757 (2), 758, and 759 rents at \$23,000/month.

Marquardt

Basic System

IBM 704, 711, 716, 721, 727 (8), 733, 736, 737 (2), 741, 746, and 753. Total rental: \$33,270/month.

Additional Equipment

010, 024, 026 (5), 056 (2), 077, 083, 407, 519, 552, 714, 727 (2), 720, 759, and 760. Total rental: \$10,218/month.

Martin Denver

Basic System

704, 711, 716, 721, 727 (10), 733, 736, 737 (2), 741, 746, 753 rents at \$34,500/month first shift.

Additional Equipment

727 (2), 714, 717 (2), 722, 757 (2), 758, 759 rents at \$10,000/month first shift.

North American

Basic System

IBM Types: 704, 711, 716, 721, 727 (9), 733, 736, 737 (2), 741, 746, 753 rents at \$33,420/month.

Additional Equipment

IBM Types: 714, 717 (2), 727 (3), 757 (2), 759 rents at \$8,400/month.

Pratt and Whitney

Basic System		Monthly Rental
Qty	Type	
1	704 Analytical Control Unit	\$9,720/ea
1	711 Card Reader	800/ea
1	716 Printer	1,200/ea
1	717 Printer	1,400/ea
1	721 Card Punch	600/ea
8	727 Tape Units	550/ea
2	733 Magnetic Drum Storage	2,900/ea
1	736 Power Supply	1,100/ea
2	737 Magnetic Core Storage	3,700/ea
1	741 Power Supply	1,400/ea
1	746 Power Distribution Unit	1,400/ea
1	753 Tape Control	2,370/ea
1	757 Printer Control Unit	650/ea
		<u>\$38,240</u>

Additional Equipment

2	727 Magnetic Tape Units	\$ 550/ea
1	738 32K Magnetic Core Storage	19,700/ea
1	714 Card Reader	1,500/ea
1	759 Reader Control	900/ea
1	717 Printer	1,400/ea
1	757 Printer Control Unit	650/ea
		<u>\$25,250</u>

The 738 32K Magnetic Core Storage replaced the two 737 units originally installed, and one 733 Magnetic Drum Storage was cancelled. Also, the rental on the 746 Power Distribution Unit was decreased to \$1,300.

Rand

Basic System

Approximately \$58,000/month for three shift operation.

Additional Equipment

Approximately \$10,000/month for three shift operation.

Raytheon

4K core, 8K drum, 4 tapes rents at \$27,480/month.

Socony

Basic System

Core storage, central processing unit, power & control units, 7 magnetic tape units, on line reader, punch, and printer rents at \$42,020/month.

Additional Equipment

Off line card-tape, tape-card, and tape-printer rents at \$9,900/month.

Standard Oil California

Basic System

Central processing unit (704), 8 magnetic tapes, drum, power supply, core storage (32K), core storage (8K), card reader and recorder rents at approx. \$45,750/month.

Additional Equipment

Card Equipment	\$1,600/mo.
Tape to Printer Converter	4,950/mo.
Card to Tape Converter	2,965/mo.

Standard Oil Indiana

704	Central Processing Unit	
711	Punch Card Reader	
716	Alphabetic Printer	
721	Punch Card Recorder	
727(6)	Magnetic Tape Unit	
733	Magnetic Drum Storage	
736	Power Frame No. 1	
737(2)	Magnetic Core Storage	
741	Power Frame No. 2	
746	Power Distribution Unit	
753	Tape Control Unit w/real time & typewriter	
7271	Signal Converter	
Total cost approximately		\$34,000/month

Temco

Approximate cost of system if purchased, for a 4 year old system is \$939,000. This includes:

- 704 CPU
- 741 Power Frame
- 736 Power Frame
- 746 Power Distribution Unit
- 737-1 Core Unit (4,096 words)
- 737-2 Core Unit (4,096 words)
- 711 Card Reader
- 721 Card Punch
- 716 Printer
- 753 Tape Distribution Unit
- 733 Drum Unit (8,192 words)
- 727 (7) Magnetic Tape Units

The system is rented at \$32,730/month.

Additional equipment cost if purchased, would cost card-to-tape peripheral - \$134,000, which includes 727 Tape Units, 714 Card Reader, and 759 Control Unit. Tape-to-punch, \$89,500, which includes 727 Tape Unit, 722 Card Punch, and 758 Control Unit. Tape-to-printer \$91,000, which includes 727 Tape Unit, 717 Printer, and 757 Control Unit. All these rent for \$7,860/month.

United Aircraft (3)

The basic system, consisting of 704 Central Processor, 711 Card Reader, 716 Printer, 721 Punch, 10 727 Mag Tapes, 733 Mag Drum, 736 Power Frame No. 1, 741 Power Frame No. 2, 746 Power Distributor, 753 Mag Tape Control, and 738 Mag Core Storage rents for \$46,590/month.

Additional Equipment

714-759 Card Reader & Control, (2) 717-757 Printer & Control, 722-758 Card Punch & Control, and (2) 727 Mag Tape Units rents for \$9,050/month.

Chance Vought

Basic System

Card reader, printer, punch, 9-tapes, ALU, 2-core, drum, ICU, and power rents at \$33,990/month.

Additional Equipment

Reader, 2-printers rent for \$8,400/month.

Westinghouse Baltimore

Basic System

Qty	Type	Monthly Rental
1	704 Central Processing	\$9,795
1	711 Punch Card Reader	800
1	714 Card Reader	1,675
1	716 Alphabetic Printer	1,200
2	717 Printer	2,800
1	721 Punch Card Reader	600
11	727 Magnetic Tape Unit	6,050
1	736 Power Frame No. 1701	1,100
1	738 Magnetic Core Storage	19,700
1	741 Power Frame No. 2701	1,400
1	746 Power Distribution	1,300
1	753 Tape Control Unit	2,350
2	757 Printer Control Unit	1,300
1	759 Card Reader Control Unit	975

Additional Equipment

3	026 Printing Card Punch	\$180
1	056 Verifier	50
1	514 Reproducing Punch	103
1	552 Alphabetical Interpreter	90

Basic System

The 704 CPU, 711, 716, 721, 7-727, 736, 738, 741, 746, and 753 cost \$1,907,200 and rents at \$42,400/month.

Additional Equipment

717, 757, 026, 056, 082, 519, 557, and 010 cost \$90,400 and rents at \$3,200/month.

MURA

The IBM 704, 711, 716, 721, 727, 753, 733, 737, 736, 741, and 746 rents at \$31,000/month.

PERSONNEL REQUIREMENTS

Manufacturer

Operator, programming, and technical training is available as well as assistance at all levels.

USA BMA (now NASA) (2)

	One 8-Hour Shift	Two 8-Hour Shifts	Three 8-Hour Shifts
Supervisors	1/2	1/2	1/2
Operators	1	1	1
In-Output Oper	1	1	1

Operators are used on 704's, 705, 709 rotating shifts. Other personnel on 8 hrs. shift. Engineers rotate shifts - 704's - 709.

USA WSMR CO

	Used	One 8-Hour Shift Recommended	Two 8-Hour Shifts Used	Two 8-Hour Shifts Recommended
Supervisors	2	2	1	1
Programmers	8	12	1	2
Operators	8	12	2	6
Technicians	3	3	0	0
In-Output Oper	8	12	2	6
Tape Handlers	8	12	2	6

Methods of training used include on-the-job training and operation plus intermittent programming classes.

USA WSMR

	Used	Two 8-Hour Shifts Recommended
Supervisors	13	14
Analysts	22	25
Programmers	10	12
Clerks	1	1
Librarians	1	1
Operators	42	65
In-Output Oper	3	5

Operation tends toward closed shop.

Methods of training used are supervisory, on-the-job, and Operators Manuals and IBM Schools.

USN David Taylor

	One 8-Hour Shift Used	One 8-Hour Shift Recomm	Three 8-Hour Shifts Used	Three 8-Hour Shifts Recomm
Supervisors			1	3
Analysts	10	10		
Programmers	20	20		
Librarians	0.5	1		
Operators			3	3

Operation tends toward closed shop.

Methods of training used is on-the-job and the manufacturer.

USNOL White Oak

	One 8-Hour Shift Used	One 8-Hour Shift Recomm	Two 8-Hour Shifts Used	Two 8-Hour Shifts Recomm
Supervisors	1	1		
Operators	3	2	1	2

Operation tends toward open shop.

Both basic programming and automatic programming are taught by NOL personnel on a regular basis.

USAF Eglin AFB

	Three 8-Hour Shifts
Supervisors	1
Clerks	4
Operators	10
In-Output Operators	5

Operation tends toward closed shop.

Methods of training used includes IBM schools, local schools, and on-the-job training.

USAF Edwards AFB

	Two 8-Hour Shifts	
	Used	Recommended
Supervisors	2	3
Analysts	4	
Programmers	14	
Clerks	1	3
Operators	4	6
In-Output Operators	2	3

Operation tends toward open shop.

USAF SAC Offutt

	One 8-Hour Shift	Two 8-Hour Shifts	Three 8-Hour Shifts	Rec
	R	R	U	
Supervisors	5	6	6	6
Analysts	*	*	0	*
Programmers	*	*	22*	*
Coders	*	*	*	*
Clerks	5*	7*	7*	7*
Librarians	*	*	*	*
Operators	3	5	7	7
Engineers	3	4	4	5
Technicians	3	3	3	3
In-Output Oper	1	2	4	4
Tape Handlers	*	*	*	*

It is considered unlikely that either the same functional alignment or the exact number of personnel of any one classification as are peculiar to this installation would be appropriate to another computer installation of approximately the same equipment configuration. This is considered to be particularly true of many computer installations which have been designed expressly for military operations, which are usually less routine and more subject to changing concepts, fluctuating requirements and irregular periods of peak activity, than would normally apply to the typical commercial type facility.

Those items marked with an \* indicate incompatibility with our mode of operation or interpretation of job classification. For example: although no analysts are presently assigned to or physically working under the direct jurisdiction of the Chief Programmer, the analyst job-function is, never-the-less reflected in computer output. Many of the programs now in being were created with varying degrees of analyst-type consultation and advisement. In addition, this computer system, while assigned to the Control Division of the Directorate of Operations is actually utilized by many other staff agencies, either in direct or indirect support of the SAC mission. In some cases, the only computer-personnel support available to these agencies is that actually assigned to this office. In numerous cases, however, these agencies have their own force of programmers and/or analysts and use only the processing facilities of the computer system for either PCAM activities, program assemblies, testing, production, etc. In other cases, only the work-statement is furnished to the Chief Programmer, and the entire work-effort is accomplished by personnel assigned to this facility and the finished product then furnished to the requesting agency.

Our mode of operation is such that usually it is difficult to differentiate between the functions of programming and coding; therefore, personnel, both military and civilian, assigned to either of these functions have been listed as programmers.

The function of librarian is performed as an additional duty of personnel assigned primarily to other duties.

Few of the personnel assigned or attached to the computer Machine Section, serve exclusively in any

one of the specialized functions cited above.

Through extensive cross-training, many of these personnel are fully qualified in many fields of machine application and from time to time may be assigned varying duties, all or any of which may fall into the specialized classifications listed above.

The figures given under Clerks includes PCAM key punch operators.

Due to the number of variables involved, we do not feel that we can constructively state more inclusive recommendations for single or two-shift operations.

Operation tends toward closed shop.

Routine on-the-job training procedures are utilized, with each person's training program being geared to his individual job assignment and personal qualifications. Attendance of appropriate military or company (IBM) training or orientation courses is employed as training media whenever practicable.

USAF Kirtland AFB

	One 8-Hour Shift		Two 8-Hour Shifts		Three 8-Hour Shifts
	U	Rec	U	Rec	Rec
Supervisors	3	3	3	4	5
Programmers	17	35	17	70	105
Clerks	1	2	1	3	4
Librarians	1	1	1	2	2
Operators	3	3	3	5	7
Engineers	2	2	2	2	3
Tape Handlers	0	1	0	2	3

Operation tends toward open shop.

Methods of training used include IBM schools and on-the-job training.

BFS FAA

	One 8-Hour Shift		Two 8-Hour Shifts	Three 8-Hour Shifts
	U	Rec	Rec	Rec
Supervisors	3	6	9	12
Analysts	0	2	4	6
Programmers	6	20	40	60
Clerks	1	3	4	5
Librarians	1	2	3	4
Operators	3	3	6	9
Engineers	2	2	2	3
In-Output Op	1	1	2	3
Tape Handlers	1	1	2	3

Operation tends toward closed shop.

For inexperienced programmers - 6 months training, including 704 formal programming school; 3 weeks in machine room; 6 weeks advanced program training; the rest of the time spent in system training and specific programs. For experienced programmers - from 3 to 6 months training.

We have a requirement for pure mathematicians of Master's Degree level. We give our mathematicians and systems analysts approximately one year in programming before they are considered qualified to do the work required of them.

We also attempt to send all of our secretaries, librarians, audit clerks, etc., to a 704 school for familiarization purposes.

We are currently on a one-shift operation.

NASA Ames

Our current programming staff is about 75 percent open shop. Specifically these people are full time programmers administratively attached to branches other than the computing branch. In addition we have a small group of engineers who have been trained most recently in the use of a computer. Because of the large percentage of open-shop personnel, the greatest problem is training people as programming consultants. Within our own staff we suffer from a severe lack of systems programmers.

	One 8-Hour Shift	
	Used	Recommended
Supervisors	2	2
Analysts	4	4
Programmers	15	20
Coders	0	3
Clerks	1	1
Librarians	0	1
Operators	3	3

Operation tends toward closed shop.

Training has been by group classes with individual assistance for a single new employee. This has been supplemented by seminars and general information sessions. Operators have always been given on-job training, the original group being trained in the installation by IBM.

NASA Lewis

	One 8-Hour Shift	
	Used	Recommended
Supervisors	1	1
Analysts	4	6
Programmers	18	26
Coders	30	40
Clerks	0	1/2
Librarians	0	1/2
Operators	3	6

These figures are closed shop personnel. About 150 scientists and engineers also submit problems on an "open-shop" programming basis.

Operation tends toward closed shop.

Methods of training used for supervisors, analysts programmers, - professional degree plus on-job training plus IBM courses. All others - on-the-job training.

NBS

	Three 8-Hour Shifts
Supervisors	4
Analysts	7
Programmers	9
Coders	6
Clerks	4
Librarians	1
Operators	5
In-Output Operators	7

NBS Computer Laboratory personnel only.

Operation tends toward open shop.

Methods of training used includes on-job training and in-hours courses.

NSA

	One 8-Hour Shift
Supervisors	1
Operators	1
Engineers	1
Technicians	1

Methods of training used includes formal classes and on-the-job training.

TVA

	One 8-Hour Shift
Supervisors	1
Librarians	1
Operators	1
Engineers	2
In-Output Operators	2
Tape Handlers	1

TVA maintains an open shop operation with some divisions supplying their own analysts, programmers and coders. The Computing Center maintains a Scientific Applications Section and a Business Applications Section for assistance in analysis, programming, and coding.

TVA's 704 is manned on a 24 hour schedule for the Power Generation Scheduling, which requires about

five minutes of machine time per hour. The work load is such that one person each for the second and third shifts is sufficient to maintain both on-line and off-line operations.

Operation tends toward open shop.

Methods of training used: The following classes are offered periodically:

- Introduction to the 704 (2 days)
- FORTRAN (3 days)
- Detailed 704 Programming (2 weeks)
- Input/Output Conversion Techniques (20 hrs.)
- SURGE (2 days)
- Matrix Algebra
- Linear Programming
- Numerical Analysis

Refresher courses are offered periodically in College Algebra, Trigonometry, Calculus, Differential Equations and Statistics.

Matrix algebra, linear programming, numerical analysis and the refresher courses are offered either during working hours, or as after hours classes. After hours classes may be TVA sponsored, or jointly sponsored by TVA and U. of Chattanooga as college credit courses.

Allis-Chalmers

	One 8-Hour Shift
Supervisors	1
Analysts, Programmers & Coders	14
Clerks	2
Operators	1

Operation tends toward closed shop.

Methods of training used is work with experienced person.

AVCO

	Three 8-Hour Shifts
Supervisors	1
Programmers	18
Clerks	2
Librarians	1
Operators	5
Engineers	3

Operation tends toward closed shop.

Method of training is in-shop training.

Bell Aero

	One 8-Hour Shift	
	Used	Recommended
Supervisors	2	
Analysts	2	4
Programmers	7	10
Coders	2	5
Operators	1	2
In-Output Operators		1

Operation tends toward closed shop.

Methods of training used includes 2 weeks programming school under IBM instructors, 1 week school under our instructors, and 6 months to one year work with an experienced programmer.

Bell Tel Whippany

	One 8-Hour Shift
Supervisors	1
Analysts	open shop
Programmers	open shop
Coders	open shop
Clerks	4
Librarians	1
Operators	3
Engineers	open shop
Technicians	open shop

Five operators are used for two 8-hour shifts.

Operation tends toward open shop.

Methods of training used includes IBM training courses and previous employment experience.

Bell Tel Murray Hill

	Three 8-Hour Shifts	
	Used	Recommended
Supervisors	4	
Analysts-Programmers	20	20
Coders	3	5
Clerks	2	5
Librarians	1	
Operators	8	

Operation tends toward open shop.

Methods of training used are in-house courses in Fortran, Sap.

Ours is a fairly standard 704 installation. The primary distinguishing feature is that we operate virtually completely within the BE-SYS-2 monitor program, which provides automatic job-to-job sequencing from a stacked input tape, incorporation of Fortran, Sap and a 650 simulator as sub-systems, snapshot dumping facilities, and automatic merit rating of human operators.

Bendix Systems

	One 8-Hour Shift		Two 8-Hour Shifts	
	Used	Recomm	Used	Recomm
Supervisors	1	1	1	1
Analysts	8	8	9	9
Programmers	12	12	15	15
Clerks	1.5	1.5	2.5	2.5
Librarians	0.5	0.5	0.5	0.5
Operators	2	2	3	3

Operation tends toward open shop.

Inexperienced programmers attend a two and one half (2 1/2) week class taught by International Business Machines Corporation. No training is given to 704 or 709 Systems experienced programmers.

CEIR

	One 8-Hour Shift		Two 8-Hour Shifts		Three 8-Hour Shifts	
	U	R	U	R	U	R
Supervisors	1	1	2	2	3	3
Programmers	17	17	17	17	17	17
Clerks	1	1	1	1	1	1
Librarians	1	1	1	1	1	1
Operators	1	1	2	2	3	3
In-Output Op	1	1	2	2	3	3

For the purpose of personnel reports, our staff was cut in half, since we have both an IBM 704 and IBM 709. We have a dispatcher, program librarian, magnetic tape librarian, etc., to cover both computers.

Operation tends toward open shop.

Operators are given on-the-job training. Programmers are given a 6-months course, evenly divided between formal classes and on-the-job training.

Convair Fort Worth

	Three 8-Hour Shifts	
	Used	Recommended
Supervisors	1	2
Analysts	10	10
Programmers	23	25
Clerks	0.5	1
Librarians	0.5	1
Operators	3	5
In-Output Operators	3	4

Operation tends toward closed shop.

Inexperienced personnel are given "on-job" training. They are apprenticed to experienced personnel for periods of three to six months as required.

Cornell Aero

	One 8-Hour Shift		
Supervisors	1		
Analysts-Programmers	7		
Operators	3		

Supervisor responsible for training of personnel.

Convair San Diego

	One 8-Hour Shift		Two 8-Hour Shifts		Three 8-Hour Shifts	
	U	R	R	R	R	R
Supervisors	3	3	4	4	5	5
Analysts	3	3	4	4	4	4
Prog. & Cod	20	30	45	45	55	55
Clerks	1	1	1.5	1.5	2	2
Librarians	0	0	0.5	0.5	1	1
Operators	3	3	5	5	7	7

Operation tends toward closed shop.

Methods of training used are small classes.

Douglas A-260 (2)

	One 8-Hour Shift		
Supervisors	1		
Analysts, Prog. Coders	20		
Clerks	1		
Operators	4		

Figures are for each system.

Operation tends toward closed shop.

Method of training is own course followed by on-the-job training.

Douglas B-250

	One 8-Hour Shift		
Supervisors	2		
Analysts, Prog. Coders	25		
Clerks	1		
Operators	4		

Operation tends toward closed shop.

Method of training is own course followed by on-the-job training.

GE Evendale

	First 8-Hour Sft		Additional for Second 8-Hr Sft		Additional for Third 8-Hr Sft	
	Hour	Sft	Hour	Sft	Hour	Sft
Supervisors	10	1			0	0
Analysts	29	0			0	0
Programmers	28	0			0	0
Coders	5	0			0	0
Clerks	7	0			0	0
Librarians	1	0			0	0
Operators	2	1			1	1
Engineers	3	1			on call	on call
In-Output Op	2	2			1	1

90% of programming is done by computations personnel.

About 250 engineers and engineering assistants have been trained in FORTRAN. About 100 accountants and procedures personnel have been trained in SURGE, a data processing language. Plans call for more extensive training of Division personnel in these and new problem oriented languages.

Operation tends toward closed shop.

Two full time training specialists are used plus some part time activity. Basic training consists of FORTRAN, SURGE, and SAP. Rate dependent on individual.

GE Schenectady

	One 8-Hour Shift	
	Used	Recommended
Supervisors	2	2
Analysts	8	8
Programmers	30	32
Clerks	8	8
Librarians	1	1
Operators	3	3
Engineers	2	6

Five operators are used and recommended for two 8-hour shifts.

Operation tends toward open shop.  
 Methods of training used includes formalized training in systems used, plus seminars to keep everyone up to date.

GMC Warren

	One 8-Hour Shift
Supervisors	4
Analysts, Prog. & Coders	35
Clerks	11
Librarians	1

Nine operators are used for two 8-hour shifts.  
 Operation tends toward open shop.  
 Methods of training used includes a 3-day FORTRAN course, taught every six weeks, supplemented by on-the-job training.

GMC Indianapolis

	One 8-Hour Shift		Two 8-Hour Shifts	
	U	Rec	U	Rec
Supervisors	4	3	4	4
Analysts	2	3	2	3
Programmers	7	10	7	10
Coders	0	3	0	3
Clerks	1	1	1	1
Librarians	1	1	1	1
Operators	1	2	2	4
Engineers	1	1	1	1
In-Output Op	0	1	0	2

Operation tends toward closed shop.  
 Methods of training used includes IBM schools and on-the-job training.

GMC Indianapolis

	Two 8-Hour Shifts
Supervisors	4
Analysts	3
Programmers	10
Clerks	1
Operators	4
Technicians	1
In-Output Oper	4
Tape Handlers & Stock Clerks	2

The personnel requirements as outlined above deserve the following explanation:  
 Supervisors (4): 1 - Manager of Data Processing (This includes responsibility for not only 705 operations and programming, but also all of EAM operations); 2 - General Supervisor of EDP; 3 - Supervisor of 705 Operations; 4 - Supervisor of 705 Programming.

Programmers: This total of 10 programmers is not a normal requirement. Straight maintenance and improvement on an established computer should require somewhat less than 10. By the same token, changing from one generation computer to another will, in most cases, call for a substantial increase to the programming staff. Actual programming effort at Allison, under the present circumstances and including temporarily assigned personnel for our conversion period is presently at 18.

Operation tends toward closed shop.  
 Methods of training used includes IBM programming classes held on the premises. All other training has been on-the-job type.

Grumman

	First 8-Hour Shift		Second 8-Hour Shift	
	Used	Recomm	Used	Recomm
Supervisors	6	6	6	7
Anal., Prog, C	10	15	0	1 or 2
Clerks	1			
Operators	2		2	
In-Output Op	1			

In addition to the above personnel we have 9 girls in the support area (keypunching, verifying, opera-

tion of EAM equipment).  
 Operation is open shop.  
 Programming classes in FORTRAN given to open shop engineering programmers. Computing Section personnel available for consultation, guidance, and aid in debugging operations. Operating personnel trained on-the-job.  
 Gulf

	One 8-Hour Shift
Supervisors	3
Analysts	2
Programmers	16
Clerks	5.5
Librarians	0.5
Operators	2
In-Output Operators	1

In the second 8-hour shift, 1 additional operator is required. Two are recommended.

Figures quoted are for "closed shop" personnel. Personnel quoted as programmers are considered to be programmer-analysts. We have trained about 225 open-shop personnel in the FORTRAN system. More than one-third of these have been programming.

We have our own training group which trains our programmers. We use IBM training for first pass on new equipment. Our training group also gives a 20-hour FORTRAN class to about 50 people twice a year.

IBM PDL Foughkeepsie

	One 8-Hour Shift	Three 8-Hour Shifts
Supervisors		6
Analysts	5	
Programmers	10	
Coders	5	
Clerks	18	3
Librarians		1
Operators		18
Engineers	20	
In-Output Oper	25	7
Tape Handlers		3

Figures are for three IBM 700-Series systems. Personnel figures reflect figures for machine operations only. The 3 systems are tightly interlocked so that supervisory, clerical, input/output operators are utilized with the 3 systems.

Programming groups are divided into two general areas - Design Automation and Scientific Computation.

Production coordination is accomplished by utilizing an Engineering Process Control Group. This is a technical-clerical group responsible for coordinating all work between computing groups and engineering in general.

Operation tends toward closed shop.  
 Methods of training used includes customer training programs - IBM Sales, on-the-job training, and departmental programming and operation courses.

IBM GPD DL Endicott

	One 8-Hour Shift
Supervisors	4
Analysts, Programmers, Coders	25
Clerks	1
Librarians	1
Technicians	1

Nine operators and 3 engineers are required for 6 day, 3 shift operation.

Operation tends toward closed shop.  
 Operators are given on-the-job training and programmers attend a programming class conducted by department personnel.

IBM San Jose

Three 8-Hour Shifts

Supervisors	1
Analysts	2
Programmers	3
Clerks	2
Librarians	1
Operators	6

Operation tends toward open shop.  
Marquardt

One 8-Hour Shift

Supervisors	2
Analysts	2
Programmers	10
Coders	1
Clerks	3
Operators	3

An additional operator is required for a second 8-hour shift.

Martin Denver

One 8-Hour Shift

Supervisors	7
Analysts	2
Programmers	35
Clerks	8
Librarians	3
Operators	17

An additional two operators are required for the second 8-hour shift and an additional one for a third 8-hour shift.

Operation tends toward closed shop.

Most classes are presented by the computer organization in connection with on-the-job training; for new equipment - classes conducted by the manufacturer.

North American

One 8-Hour Shift

Supervisors	2
Analysts	7
Programmers	10
Coders	10
Clerks	3
Librarians	1
Operators	2
Engineers	3
Technicians	1
In-Output Operators	2
Tape Handlers	2

Methods of training used includes classes and on-the-job training.

Pratt and Whitney

Three 8-Hour Shifts	
Used	Recommended

Supervisors	3	5
Analysts	21	30
Programmers	4	0
Coders	10	12
Clerks	2	3
Librarians	0	2
Operators	4	6
Engineers	3	4
Technicians	1	1

Operation tends toward closed shop.

Inexperienced personnel are trained by two IBM Applied Science Representatives with supplementary training given by our Systems group. New experienced personnel are indoctrinated by our Systems group. Weekly meetings are held to keep the entire group abreast of all new developments.

Rand

Three 8-Hour Shifts

Supervisors	3
Analysts	5
Programmers	40
Coders	8
Clerks	3
Librarians	1
Operators	5
Engineers	3
Technicians	3
In-Output Oper	2

Operation tends toward closed shop.  
Methods of training includes for complete novices, a standard short course in computing (one man per class) for 3-6 weeks, plus apprenticeship to experienced man.

Raytheon

One 8-Hour Shift

Supervisors	1
Analysts	2
Programmers	10
Clerks	1
Librarians	1
Operators	2
Engineers	1

Operation tends toward closed shop.

Methods of training used are IBM training courses and on-the-job training.

Republic Aviation

One 8-Hour Shift	
Used	Recommended

Supervisors	5	
Analysts	5	
Programmers	35	
Coders	2	
Clerks	5	7
Librarians	0	1
Operators	3	4
Engineers	3	3
In-Output Operators	7	7

Supervisor category does not include manager, Digital Computing & Data Processing Division. Number of analysts shown include only those directly engaged in Applied Mathematics. Programmers shown are all program-analysts for engineering applications, business applications and programming techniques. Coders only during training period. Clerks include secretaries and schedulers. Operators include console, tape and peripheral equipment operators. Customer engineers supplied by IBM. In-Out operators include 6 key punch operators and one tape operator.

For two 8-hour shifts, 5 operators are used, 6 recommended. For three 8-hour shifts, 7 operators are used, 8 recommended. One additional engineer is used for the second and third shifts. Two additional engineers are recommended when going to three 8-hour shift operations.

Operation tends toward closed shop.

Methods of training used are primarily in-plant training classes, supplemented by off-site training classes held by manufacturer; off-site conferences - Share, ACM, AMS, etc.

Sandia

Two 8-Hour Shifts

Supervisors	3
Programmers	29
Operators	8

Operation tends toward closed shop.  
Method of training used is on-the-job.

Socony

	One 8-Hour Shift
Supervisors	3
Programmers	10
Coders	1
Clerks	1
Operators	1
In-Output Operators	1

One additional operator each is used for the second and third shifts. Two are recommended. Two operators should be used for the first shift.

Operation tends toward open shop.

Programmers are trained by IBM Programmers Schools, supplementary programming lectures for new programmers, and training assignments in programming. Operators are trained on-the-job.

Standard Oil California

	One 8-Hour Shift
Supervisors	3
Analysts	7
Programmers	7
Clerks	1
Librarians	1
Operators	3
Technicians	4

Five operators are required for two shift operation. Six operators are required for three shift operation. Eleven programmers are recommended.

Operation tends toward open shop.

Personnel are trained by internal Computer Center staff and by IBM training courses.

Standard Oil Indiana

	One 8-Hour Shift
Supervisors	8
Analysts	10
Programmers	5
Clerks	1

Two operators are used for two 8-hour shifts.

Operation tends toward open shop.

Methods of training used include IBM schools and on-the-job experience.

There are approximately 20 people outside of the computer group who program for and make use of computer facilities.

Temco

	One 8-Hour Shift	
	Used	Recommended
Supervisors	10	
Analysts	16	21
Programmers	15	20
Clerks	2	3
Librarians	0	1
Operators	6	8
Technicians		1

Operation tends toward closed shop.

Methods of training used includes formal classes and on-the-job.

United Aircraft (3)

	One 8-Hour Shift		Two 8-Hour Shifts		Three 8-Hour Shifts	
	U	R	U	R	U	R
Supervisors	11	12	12	13	12	13
Anal, Prog, C	62	79	62	79	62	79
Clerks	17	20	17	20	17	20
Librarians	1	1	1	1	1	1
Operators	5	6	10	11	11	12
In-Output Op	14	17	17	20	17	20

Figure for librarian is also included in Analysts-Programmers-Coders, since librarian duties are part-time. Supervisors do not include management-level personnel. Peripheral equipment operators are included in operators. The figure for Input-Output Operators is for keypunchers, verifiers only. Engi-

neers and technicians are supplied by computer manufacturer.

Operation tends toward open shop.

Analysts are trained by on-the-job training (with supervision), a course in Algebraic Language, and a course in Machine Language. Outside programmers are given an Introduction to Machine Computations Course and a course in Algebraic Language.

Chance Vought

	Three 8-Hour Shifts
Supervisors	3
Analysts	5
Programmers	10
Coders	7
Clerks	1
Operators	14

Operation tends toward closed shop.

Methods of training used are on-the-job and 1% class work.

Westinghouse Baltimore

	One 8-Hour Shift
Supervisors	2
Analysts	6
Programmers	9
Clerks	1
Operators	2
In-Output Operators	1
Secretary	1

Operation tends toward closed shop.

The method of training used is primarily on-the-job, however a few selected personnel (5) have been sent to summer courses in numerical analysis. Additional personnel have been trained in programming by the manufacturer. Other personnel have taken evening education programs and university training at nearby schools.

Westinghouse East Pittsburgh

	One 8-Hour Shift
Supervisors	10
Analysts	25
Programmers	20
Coders	3
Clerks	3
Operators	2
Engineers	15
Technicians	8
In-Output Operators	1
Key Punch	4

Three additional operators are used for the second 8-hour shift and one for the third.

Operation is 1/4 open shop and 3/4 closed shop.

Cal Tech JPL

	One 8-Hour Shift	
	Used	Recommended
Supervisors	4	5
Analysts-Prog-Coders	25	30
Clerks	3	5
Operators	3	3
Key Punch Operators	2	2

One additional operator each is used for the second and third 8-hour shifts. The operators handle all IBM 704 peripheral equipment.

Operation tends toward closed shop.

MJRA

	One 8-Hour Shift
Supervisors	1
Analysts	2
Programmers	6
Operators	4

Operation tends toward open shop.

Seminars are conducted for training purposes.



## Ohio State

One 8-Hour Shift

Supervisors	3
Analysts	5
Programmers	15
Coders	20
Clerks	3
Librarians	1
Operators	2
Engineers	2

Operation tends toward closed shop.

TEES

One 8-Hour Shift

Supervisors	1
Analysts	5
Librarians	1
Operators	1

Programmers, coders and clerks are students and faculty.

Operation tends toward open shop.

Our own educational facilities are used for training. Regularly scheduled college courses in the field of computer and data processing are held.

U of Cal Los Alamos

One 8-Hour Shift

Supervisors	7
Analysts	8
Programmers	17
Coders	7
Clerks	1
Librarians	1

Eight operators are used for three 8-hour shifts.

Operation tends toward open shop.

Programming courses are offered as the need arises.

U of Cal Berkeley

One 8-Hour Shift

Programmers	7
Coders	1
Clerks	1
Librarians	1
Engineers	3

Ten operators are used for three 8-hour shifts.

Operation tends toward open shop.

Methods of training used include classes and on-the-job training.

U of Mich

Engineers	supplied by manufacturer
Academic appointees	4
Clerical & keypunching	3
Operators	3
Part time graduate assistants	10
Full time programmers	1

## RELIABILITY, OPERATING EXPERIENCE, AND TIME AVAILABILITY

USA BMA (now NASA) (2)

Good time	176.3 Hours/Week (Average)
Attempted to run time	180.5 Hours/Week (Average)
Operating ratio (Good/Attempted to run time)	0.977
Above figures based on period	1 Jan 60 to 31 Mar 60
Passed Customer Acceptance Test	20 Jan 58

Time is not available for rent to outside organizations.

Hours are included for 2 704's.

USA WSMR CO

Average error-free running period	40 Hours
Good time	68.5 Hours/Week (Average)
Attempted to run time	70 Hours/Week (Average)
Operating ratio (Good/Attempted to run time)	0.978
Above figures based on period	1 Feb 60 to 1 May 60
Passed Customer Acceptance Test	10 Oct 59

Time is available for rent to outside organizations.

USA WSMR

Good time	52.11 Hours/Week (Average)
Attempted to run time	52.63 Hours/Week (Average)
Operating ratio (Good/Attempted to run time)	0.99
Above figures based on period	1 Mar 60 to 30 Apr 60
Passed Customer Acceptance Test	5 Oct 59

Time is not available for rent to outside organizations.

USN David Taylor

Good time	114 Hours/Week (Average)
Attempted to run time	120 Hours/Week (Average)
Operating ratio	0.96
Above figures based on period	1 Jul 59 to 31 May 60
Passed Customer Acceptance Test	Nov 58

Time is available for rent to qualified outside organizations.

USNOL White Oak

Good time	54 Hours/Week (Average)
Attempted to run time	58 Hours/Week (Average)
Operating ratio	0.93
Above figures based on period	1 Jan 60 to 31 Mar 60
Passed Customer Acceptance Test	2 Feb 59

Time is available for rent to outside organizations.

USAF Eglin AFB

Good time	132.7 Hours/Week (Average)
Attempted to run time	168 Hours/Week (Average)
Operating ratio	0.80
Above figures based on period	1 Jan 60 to 1 Apr 60
Passed Customer Acceptance Test	8 Mar 58

Time is not available for rent to outside organizations.

USAF Edwards AFB

Good time	83 Hours/Week (Average)
Attempted to run time	85.2 Hours/Week (Average)
Operating ratio	40 to 1
Above figures based on period	1 Jan 60 to 30 Apr 60
Passed Customer Acceptance Test	20 Feb 58

Time is not available for rent to outside organizations.

USAF SAC Offutt

Operating ratio	0.85
Above figure based on period	1 Sep 59 to 29 Feb 60
Passed Customer Acceptance Test	May 57

Time is not available for rent to outside organizations.

A figure for average error-free running period would be unrealistic and possibly misleading. For example, two such periods might be 1 hour and 100 hours, respectively: the resulting average of 50 1/2 hours would not be realistic.

USAF Kirtland AFB

Average error-free running period	Month
Good time	298.9 Hours/Week (Average)
Attempted to run time	302.0 Hours/Week (Average)
Operating ratio	0.989
Above figures based on period	1 Nov 59 to 30 Apr 60
Passed Customer Acceptance Test	Aug 57

Time is not available for rent to outside organizations.

BFS FAA

Average error-free running period	21.3 Hours
Good time	30.6 Hours/Week (Average)
Attempted to run time	33.6 Hours/Week (Average)
Operating ratio	0.91
Above figures based on period	1 Jun 60 to 30 Jun 60
Passed Customer Acceptance Test	15 Feb 60

Time is available for rent to qualified outside organizations. Limited time is available on 3rd shift with no priority. This is subject to negotiation of proper contract.

NASA Ames  
 Good time 41 Hours/Week (Average)  
 Attempted to run time 42.5 Hours/Week (Average)  
 Operating ratio 0.964  
 Above figures based on period 1 Jan 60 to 1 Apr 60  
 Passed Customer Acceptance Test 22 Sep 58  
 Time is not available for rent to outside organizations.  
 We have not kept statistics to accurately determine an error-free running period. However, we have been extremely pleased with reliability.

NASA Lewis  
 60, 63.6, 0.941, 1 Dec 59 to 1 May 60, 27 Apr 59, not available.

NBS  
 122, 128, 0.953, 1 Apr 59 to 31 Mar 60, is available to qualified organizations.

NSA  
 38.0, 39.3, 0.968, 1 Jan 60 to 31 Jan 60, not available.

TVA  
 Approximately 40 hours, 55, 56, 0.98, Jan 60 to Jun 60, 4 Jun 58, is available.  
 Upon request, contractual arrangements for use of the machine may be made with outside organizations.

Allis-Chalmers  
 26.8, 27, 0.993, 1 Apr 59 to 1 Apr 60, May 58, time is available.

AVCO  
 110, 120, 0.92, Jan 60 to present, Aug 58, time is available.

Bell Aero  
 37, 40, 0.925, Dec 57 to Jul 60, 1 Dec 57, time is available.

Bell Tel Whippany  
 3 days (2 shifts/day), 75, 90, 0.833, Dec 59 to Apr 60, 23 Dec 59, is not available.

Bell Tel Murray Hill  
 75, 79, 0.95, 4 Jan 60 to 30 Jan 60, Mar 58, is not available.

Bendix Systems  
 50, 49.5, 0.99, 14 Sep 59 to present, 15 Sep 59, time is available.  
 All work performed on cost plus fixed fee basis including machine time, operating labor, and programming analysis labor.

CEIR  
 57, 62.5, 0.91, 1 Jan 59 to 1 Jan 60, Feb 57, time is available.  
 The workload varies from week to week depending on the requirements.

Convair Fort Worth  
 108, 112, 0.964, Sep 56 to Jan 60, 18 Mar 57, is not available.

Cornell Aero  
 35-38, 40, 0.912, 59 to 60, 57, time is available.

Convair San Diego  
 78, 83, 0.94, 1 Jan 60 to 15 May 60, Jan 57, time is available.

Douglas A-260  
 6 Hrs, 110, 115, 0.95, Jul 59 to Jul 60, Jun 57, time is available.

Douglas A-850  
 8 Hrs, 110, 115, 0.95, time is available.

Douglas B-250  
 8 Hrs, 110, 115, 0.95, Jul 59 to Jul 60, May 57, time is available.

GE Evendale  
 98, 100, 0.98, 1 Jan 60 to present, Jan 56, time is available.

GE Schenectady  
 69.8, 73.2, 0.95, 1 Jan 60 to 26 Jun 60, Jun 56, time available to qualified organizations.  
 Have run 3 months on 3 shift operation. At present are running on two shifts. Attempted to run time is good time plus machine error and bad tape time.

GMC Warren  
 1 Hr, 61.3, 68.7, 0.892, Mar 60 to May 60, May 56, available to qualified organizations.

GMC Indianapolis  
 7 Hrs, 54, 58.6, 0.92, 18 Apr 60 to 13 May 60, 15 Nov 59, available to qualified organizations.

GMC Indianapolis  
 81.3, 93.0, 0.874, 21 Jun 60 to 20 Jul 60, 15 Jan 57, available to qualified organizations.  
 Because of our present plans involving the IBM 7090 delivery, rental of 705 or 704 computer time is not now considered. Available time could be used by other Divisions of General Motors Corporation.

Grumman  
 68, 75, 0.91, Jan 60 to May 60, 1 Aug 58, is not available.

Gulf  
 0.95, Mar 59 to Aug 60, time is available.  
 We use the system presently about 130 hours/month ourselves and rent about 100 hours/month to outside users. Peripheral equipment added in October 1959.

IBM PDL Poughkeepsie  
 95.9, 105.3, 0.911, 1 Jan 60 to 27 May 60, Aug 59, is not available.  
 Attempted to run time is based on actual productive work time of computer which does not include maintenance, idle time, power failure, etc. Good time is productive time less setup and machine rerun.

IBM GFD DL Endicott  
 70 Hrs, 118, 122, 0.967, 26 Mar 60 to 20 May 60, Mar 57, is not available.

IBM San Jose  
 90, 91, 0.989, 1 May 60 to 31 Jul 60, 8 Feb 60, time is available.

IBM RC Yorktown Heights  
 Passed Customer Acceptance Test Aug 56  
 Time is not available.

Lockheed Marietta  
 92.21, 102.50, 0.90, 1 Jan 60 to 1 May 60, time is available to qualified organizations.

Marquardt  
 40, 41, 0.98, 1 Jan 60 to 1 Apr 60, Dec 57, time is available.

Martin Denver  
 8 Hrs, 150, 156, 0.96, 1 Jan 60 to 30 May 60, 1 Mar 57, is not available.

North American  
 2 Hrs, 45.6, 46.5, 0.98, Jan 60 to Mar 60, Jan 57, time is available.  
 Attempted to run time does not include scheduled or unscheduled maintenance.

Pratt and Whitney  
 398, 410, 0.97, 1 Jan 59 to 31 Dec 59, 28 Jul 58, is not available.

Rand  
 4 Hrs, 80-85, 105, 0.785, 1 Jan 60 to 1 Jun 60, Mar 56, time is available.

Raytheon  
 Time is available.

Republic Aviation  
 100, 110, 0.90, Jan 60 to Mar 60, Oct 58, is not available.  
 Main operating malfunctions of the 704 center about the tape system.

Sandia  
 Attempted to run time 80 Hours/Week (Average)  
 Operating ratio 0.95  
 Passed Customer Acceptance Test Nov 58  
 Time is not available

Socony  
 70, 76, 0.92, 1 Apr 60 to 30 Apr 60, time is available to qualified organizations.  
 Standard Oil California  
 93.1, 95.1, 0.947, Feb 60 to Apr 60, Jul 57, time is available.  
 Standard Oil Indiana  
 61, 62, 0.984, 1 Jan 60 to 31 Aug 60, 1 Apr 60, time is available.  
 Outside organization use is 8.8% of total use per month.

Temco  
 5 Hrs, 55, 57, 0.964, 1 Jun 60 to 30 Jun 60, 4 Apr 60, time is available.

United Aircraft (3)  
 12 Hrs, 71.12, 77.82, 0.914, 1 Jan 60 to 31 Mar 60, Jun 57, time is available to qualified organizations.  
 Outside time depends upon work load and restricted to second and third shifts. Good time includes calculation, program testing, improvement of techniques and laboratory error. In addition to these, attempted to run time includes machine error, scheduled and unscheduled maintenance.

Chance Vought  
 74, 77, 0.96, Jan 59 to Dec 59, Aug 57, time is available.

Westinghouse Baltimore  
 38.65, 45, 0.859, Jan 60 to Jun 60, Sep 57, time is available to qualified organizations.

Westinghouse East Pittsburgh  
 4 Hrs, 78.3, 79.1, 0.99, 1 Jan 60 to 31 Mar 60.  
 Time is available for rent to qualified outside organizations during the evening if the load is light.

Cal Tech JPL  
 89, 90, 0.96, Jan 60 to May 60, 3 Oct 58, is not available.

MURA  
 52, 60, 0.87, Mar 59 to Apr 60, 7 Nov 56.  
 Time is available to other government sponsored work and other AEC work only.

TEES  
 Passed Customer Acceptance Test 9 Dec 59  
 Time is available for rent to outside organizations.  
 U of Cal Los Alamos  
 1800, 1900, 0.95, 56 to 60, 56, time is available to qualified organizations.  
 Data refers to 3 systems.  
 U of Cal Berkeley  
 155, 160, 0.96, 1 Dec 59 to 30 Apr 60, 1 Nov 59, time is available to qualified organizations.

## ADDITIONAL FEATURES AND REMARKS

### Manufacturer

Outstanding features are high speed, floating point, compatibility with 709 and 7090, and large core memory.

Recommended procedures for magnetic tape storing, shipping, and protection from humidity, temperature, electrical, fire, or other damage:

### Acetate Base Tape:

Storage for frequent usage.

Relative humidity 40 to 60%

Temperature 65 to 80°F.

Should the tape be exposed to atmospheric conditions outside the above limits for more than four hours, the following specifications would apply:

Storage for infrequent usage.

Temperature 40 to 120 F.

The tape must be placed in a dust proof container and hermetically sealed in a plastic bag. Before re-using, the tape must be reconditioned by allowing it to remain in the conditioned atmosphere for a length of time equal to the time it was away. Twenty-four hours reconditioning is necessary if the tape is removed for longer than twenty-four hours.

### 5.02 Mylar Base Tape

Storage for frequent or infrequent usage.

Relative humidity 0 to 80%

Temperature 40 to 120 F.

The tape should be stored in a dust proof container. Should the tape be exposed to atmospheric conditions outside the above limits for more than four hours, it must be reconditioned by allowing it to remain at the given condition for a length of time equal to the time it was away. Twenty-four hours reconditioning is necessary if the tape is removed for longer than twenty-four hours.

The upper limit on humidity is given to prevent the formation of fungus and mold growth. This limit may be exceeded by hermetically sealing the tape in a plastic bag.

### General Precautions:

The tape should not come in contact with magnetic material at any time and should never be subjected to strong magnetic fields. Either of these can cause the loss of information or the introduction of noise.

When shipping magnetic tape, the reel should be placed in a dust proof container and hermetically sealed in a plastic bag. Additional support should be obtained by enclosing in an individual cardboard box.

### USA BMA (now NASA)

Adopted procedures for magnetic tape labelling, storage, shipping, and protection from humidity, temperature and physical, electrical, fire, or other damage include the use of external labels (pressure adhesive) and tape cabinet storage in the computer room.

### USA BMA (now NASA)

Outstanding features include the tape switching device.

### USA WSMR CO

An outstanding feature is that jobs are run under an automonitor system. Also, operator motions are cut to a minimum, saving machine time and reducing the chance for operator errors. The machine is used more efficiently as all input-output is magnetic tape under this system.

Tapes are labeled under one of three categories, scratch tapes which are used for input and output, library tapes, and project tapes. Tapes are kept in plastic, dust free containers when not in use and are stored in metal tape cabinets. The tape cabinets are kept in a room where temperature and humidity are controlled.

### USA WSMR

Unique system advantages are the SHARE Service Routines and Library.

### Tape procedures:

Each tape is labeled with an adhesive marker with identification of its contents. Tapes are stored in a metal cabinet easily accessible. Cabinets are manufactured by Wright Line Inc., Worcester, Mass.

### USN David Taylor

Outstanding feature is modification of a Remington Rand high-speed printer to accept IBM 704 tapes for print out.

### USNOL White Oak

Tapes are stored in metal cabinets in the same controlled area as the computer.

USAF Eglin AFB

This 704 will handle the Sage Computer (FSQ-7) generated tape (32 bit word).

Adjacent to the computer is a vault for housing all tapes not in the data reduction cycle.

USAF Edwards AFB

An outstanding feature is internal accounting clock for timekeeping purposes.

Plastic tape containers are used to protect from humidity, temperature; metal containers are used for shipping. Locally reproduced forms are utilized for labeling.

USAF SAC Offutt

Each magnetic tape has been assigned a serial number in order to facilitate identification and control for processing and stripping purposes. Additional identification is accomplished by attaching paper labels to tape reels and, in some cases, by color coding tape reels or their containers.

The majority of tapes are retained either in the machine room proper or in adjacent areas of the SAC Underground Control Center, all of which are of permanent-type construction, and operated in accordance with normal electrical and fire preventive precautions. Machine room and other storage area temperature and humidity ranges have proven to be adequate for tape storage. All using personnel are instructed in proper tape-handling procedures. Smoking is not permitted in the machine room or other areas containing uncased tapes.

BFS FAA

Outstanding features are graph plotting device installed on the printer to print graphs using plus characters with 30 inch x 30 inch resolution. Three tape drives have ungapped read feature where a tape can be read with a two-word inter-record gap instead of conventional 3/4 inch inter-record gap.

Tape labelling - gum-backed paper label used. Storage - tapes are stored in computer room under controlled humidity and temperature. Shipping - shipped in specially designed cartons. Protection from humidity - shipped sealed in plastic bags. Temperature and physical - tape handling areas have controlled temperature. Physical damage is controlled by tape handling techniques. Electrical, fire, or other damage - plans are to protect master files in a specially constructed safe.

NASA Ames

Nothing is planned for protection against damage. Labelling is done on cards inserted in holder. We have a very small library.

NASA Lewis

Outstanding feature is open shop programming using "Fortran" compiler automatic operating system and the modified General Motors "Monitor" System.

TVA

TVA has a 16,384 word drumless 704 System. Modifications necessary to run programs written by other installations for machines with drums are made by an IBM applied science representative and a TVA systems programmer. An important program in this category is the FORTRAN compiler which is maintained by IBM for the 4,096 word, 8,192 word, or 32,768 word systems.

Tape librarian maintains all tapes, including labelling, assignment to jobs, and recording of tape assignments. Tapes stored in cabinets in the 704 room for humidity and temperature control. Copies of important master tapes maintained in another building as precaution against destruction of tapes held in 704 room. Temperature alarms and CO<sub>2</sub> fire extinguishers spaced around the 704 room.

Bell Tel Whippany

Outstanding features are Sage compatibility, Share standard system, J. B. Lewis Tape Switching Network, and Bell System input-output and monitor system.

For the protection of magnetic tape, standard 704 installation (manual) procedures are followed. The computer area is equipped with fire detection apparatus.

Bendix Systems

Outstanding features are READ DRUM Continuously, REAL TIME Package, and special store instructions for masking instructions.

Unique system advantages are that the above two items are used with the Bendix COED (Computer Operated Electronic Display) System for real-time alphanumeric and graphical presentation.

The IBM 704 at Bendix Systems Division has an unusual input/output device attached. This device, the BSD simulation tool (COED (Computer Operated Electronic Display)), is used as a display and input output data device in obtaining design data and for evaluating systems employing a man/machine interface. The device is comprised of three basic units: the I/O discrete buffer, the drum buffer, and a DIGITRON display unit. The I/O discrete buffer performs input of program control commands by means of switches and a program interrupt feature, and receives outputs in the form of binary signals which are used to signal visual indicators. The drum buffer performs the control necessary to extract data from the IBM drum on a cycle basis for display on a DIGITRON cathode ray tube. The DIGITRON display unit manufactured by Marquardt Corp., decodes binary words and generates positional data, alphanumeric characters (64), and lines between any two specified points. This device in conjunction with the IBM 704 Computer may be used to develop design parameters in complex weapon display systems, air traffic control problems, radar displays, industrial control monitoring, and many other applications.

Magnetic tapes containing information to be saved are labelled with gummed paper labels on which the identifying information is written. Tapes not in use are always kept in plastic containers to prevent damage and to keep the tapes dirt free. These are stored in open tape racks in an air conditioned facility, to provide temperature and humidity control. No special provision is made for fire damage.

CEIR

Tapes are labelled with Labelon Plastic Tape. Tapes are shipped in special metal cases. Tapes are stored in humidity and temperature controlled rooms. Fire extinguishers are placed throughout machine room and tape library.

Convair Fort Worth

Magnetic tapes are labelled with insert cards, placed in plastic cans and stored in metal racks. They are stored in the computer area with continuous temperature and humidity control. The entire area is protected by heat sensors and a sprinkler system.

Convair San Diego

Outstanding features are direct tie with test facility area (2 miles) by direct phone line at magnetic tape speed - tape to tape.

Magnetic tape is kept in the same room as the 704 which is kept under air conditioned control at all times.

GE Evendale

Outstanding features are that machine has on line linkage to test cell to perform automatic test data reduction, machine is equipped with interruptability device permitting instantaneous processing of the data upon demand from the test site, and machine is

controlled by monitor system, so that the only time a human operator does anything to the machine configuration is when the program deviates from "stand-ard". All directions for supplemental action are printed on-line.

Only operators handle tapes. Tapes are stored in plastic containers which are then kept in closed metal cabinets. Tapes are kept in constant temperature, constant humidity room.

#### GE Schenectady

Outstanding feature is the printer - 1,000 lines per minute with record select so that four reports can be intermixed on one tape. Unique system advantage is the speed of off-line printer, mixture of check-out and production runs in automatic system.

System is made up of a 704 with 10 tapes and 738 core. Off-line equipment includes one IBM card to tape reader and one 1,000 line a minute Analex printer.

Tape handling procedures: Tape reels numbered. 3 part tape labels containing reel number and contents- 1 on reel, 1 on case, 3 returned to customer. Tape storage room, humidity and temperature controls, fire protection-majority of tapes stored in separate room, open area in computer room, hand fire extinguishers.

#### GMC Warren

Outstanding feature is multi-job monitor that allows such things as FORTRAN compilation. SAP assembly along with immediate execution. IBM manual tape switching between 704 and peripheral equipment. General Motors programmable time clock is a unique system advantage.

Tapes are stored on numbered reels within metal cabinets located in the computer room.

#### GMC Indianapolis

All reels of magnetic tape contain as the first record a label consisting of the tape serial number, date written, description of data contained, and a purge date for the recorded date. Every program tests all tapes used for proper assignment of input and expired purge dates for output prior to processing. Working tapes are stored in the same temperature and humidity controlled area as the computer. Historical tapes are stored in a fireproof vault located in a plant approximately 1/2 mile from the computer building.

#### Grumman

A monitor (executive) system is being used to run approximately 75% of our current programs on the IBM 704. This system was GM "F" System. By this executive control program, tape is used exclusively for input/output operations and idle time between programs is held to a minimum.

At present a "Real Time Package" is being installed which will enable the computing facility (analog and digital) to actually combine hardware for solution of problems where this configuration shows real advantage.

Nothing unique has been adopted. We attempt to eliminate as much as possible tape difficulties, by conscientiously stripping our tapes at regular intervals and in this way our debugging operations seldom consider worn tapes.

#### Gulf

Special room for magnetic tapes, always air conditioned.

#### IBM PDL Poughkeepsie

All tape is stored in a fire-proof room in closed cabinets. This room being air-conditioned, sprinkled and under the supervision of a tape librarian. At appropriate intervals, master tapes are removed and stored in Vital Record Storage outside Poughkeepsie, New York.

#### IBM GPD DL Endicott

Outstanding features are half word arithmetic, half word logic, copy and add and carry, 12 sense switches, back space file, and tape validity check (717).

Tapes externally labelled, stored in metal tape racks in an air conditioned room with fire detection system.

#### IBM RC Yorktown Heights

Outstanding features are programmable accounting clock, backspace file, floating point trap, buttons used with MAD, and I/O indicator lights.

Tapes are numbered and then assigned. They are stored in fireproof cabinets in the machine room so that they are always at the temperature and humidity of the machine room.

#### Martin Denver

Tapes are identified by reel number and a job label, tape usage log is maintained for periodic trimming of tape. Tape cabinets are used for vertical storage of reels in sealed plastic container. No special caution found necessary for humidity or temperature effects other than normal computer room environment.

#### Pratt and Whitney

Outstanding features are universal tape selector used with the 704. Tape selector enables us to go from one job to the next in a minimum amount of time.

#### Republic Aviation

All tapes are labelled, scheduled retention of previous master files and activity files, duplicate master files, air conditioning, dust and humidity control.

#### Socony

This computer configuration conforms to the minimum requirements as established by the SHARE organization.

All tapes stored in computer room.

#### Standard Oil of California

Unique system advantages are the special instructions on machine: backspace file, floating point trap, copy and add logical. The system has a 32,768 word memory, 8 tape stations and magnetic drums.

Recommended are the IBM procedures in "Magnetic Etiquette" Form 570-0702.

#### Standard Oil Indiana

All tapes numbered, non-eraseable tapes have gummed labels attached. Storage of tapes is in computer room. High and low humidity and temperature control to cut off power. Fireproof building plus extinguishers and fire hoses.

#### United Aircraft (3)

Outstanding features are the universal tape selector, automatic logger system, and MAFT converter.

Unique system advantages are the ability to select tapes from the machine console, records accounting information on punched cards automatically, and system converts from magnetic tape to perforated paper tape with read back checking features.

Magnetic tape records in card form maintained. Tape racks and cabinets used for storage. No special shipping procedures. Tapes stored in metal cabinets in machine room which is air conditioned, humidity controlled, and contains a fire-detection system.

#### Chance Vought

A unique system advantage is the operating control system.

Tape handling procedures include label reel and store by fixed location, closed storage for tapes, and tapes are in air controlled room.

#### Bell Aero

Tapes are kept in plastic cans in steel cabinets. The storage room is kept at the same temperature and humidity as the computer room.

Westinghouse Baltimore

A unique system advantage is AUTOPSY (Automatic Multiple Problem Tape-to-Tape Operating System).

Each tape is identified by a small card. Tapes are kept in storage cabinets in the temperature and humidity controlled computer room. A study is being made to determine what kind of fire proof storage equipment will adequately protect tapes against major disasters.

U of Cal Los Alamos

Individuals have responsibility for tape labelling. Tapes are kept at same temperature and humidity as machines.

## FUTURE PLANS

Manufacturer

The steps upward in capacity of computers from the 704 were to the 709 and 7090.

USA BMA (now NASA)

The 704-1 described has since been returned to IBM and in its place a 7090 System has been installed. A second 7090 System will replace the 709 Computer and the 704-2 will be returned to IBM. The present peripheral equipment, 720, 730 and controls, will be replaced by 1401 Data Handling Systems.

USA WSMR CO

Real time flight analysis run on a 7090 or comparable computer.

USN David Taylor

It is planned to turn this IBM 704 System in for an IBM 7090 System.

USNOL White Oak

Plan to install a Type 1401 Data Processing System. This will replace the present off-line equipment, (tape printer and card-to-tape converter).

USAF Eglin AFB

IBM 7090 Computer as a capacity replacement for the 704. Two channels, 14 Model IV Tape Drives, 32K core.

IBM 1401 Systems as a replacement for the 714, 720A and 774.

USAF Edwards AFB

It is anticipated to acquire a 720-721 System, High Speed Printer and Punch.

It is anticipated to acquire an IBM 7090 System which will consist of the following equipment:  
7100 - 2 units, 7151, 7302, 7606, 7607 - 2 units, 7608, 7618, II 7617 - 2 units, IV 729 - 5 units, 711, 721, 716, 1401-C3, 1402, 1403, and II 729 - 7 units.

USAF SAC Offutt

The computer system described herein was established as an interim facility to support SAC needs pending development of a much more sophisticated and inclusive system specifically designed to support the SAC mission. The prime contractor for this system - designated as 465L, the Strategic Air Command Control System - is the International Electric Corporation, a subsidiary of International Telephone and Telegraph Corporation. The data processing subsystem of 465L, for which IBM is the sub-contractor, will contain multiple AN FSQ-3L Computers, now being developed, which either individually or collectively will have a much greater speed, capacity and scope than does the present system. It will be sometime, however, before the 465L System will have sufficiently developed to replace the 704 Computer System now in use.

USAF Kirtland AFB

Future workloads indicate a need for a faster machine. Future planning is for a transistorized high-speed electronic computer of the IBM 7090 class to replace the present system.

BFS FAA

We now have the Navaid Check and Evaluation System and the Intermediate Altitude Position Fix System.

A proposed system is the Basic Altitude System.

New components to be acquired are off-line tape-to-card, off-line card-to-tape, and a 1401 to replace other off-line units.

NASA Lewis

An IBM 1401 has been ordered. It will take over all off-line tasks and some on-line tasks connected with the 704 operation. Later some input-output service for the 1103 will be picked up. Also some payroll and inventory services.

TVA

Equipment on order consists of IBM 1401 Model C3, 1402, 1403 Model II, and 729 Model II (2). Equipment to be released upon receipt of above are the IBM 714, 717, 722, 759, 757, 758, and 727 (2).

Allis-Chalmers

Propose adding 6 tape units and a drum unit.

Propose installing an IBM 7090 within 2 years, and operating an integrating computing system.

AVCO

This system is being replaced in the next six months by a PHILCO Transac System.

Bell Tel Whippany

Three IBM 1401 Systems to replace off-line equipment.

Bell Tel Murray Hill

Plan to replace 704 by 7090, peripheral equipment by 1401's (3).

Bendix Systems

During the next year, consideration is being given to expansion from an 8,192 word core storage unit to a 32,768 word core storage unit.

CEIR

IBM 7090 to be in operation in Arlington, Virginia.

IBM 7090 to be in operation in New York, New York.

Convair Fort Worth

Proposed new equipment is as follows:

An IBM 1401 System to replace the peripheral equipment.

An IBM 7090 System to replace the 704.

Additional applications are constantly being programmed. The file of currently active programs for the IBM 704 consist of approximately 300 programs.

GE Evendale

Expect to get IBM 7090. Systems plans call for FAP/FORTRAN/SURGE to be basic compilers. Monitor system will handle communication problem.

GMC Warren

Replace the existing 704 and associated peripheral equipment with an IBM 7090 supported by IBM 1401 Systems to handle the input-output processing.

GMC Indianapolis

IBM 7090 System to be installed.

GMC Indianapolis

Present plans call for the cancellation of our 705 and 704 Systems and the acquisition of a 7090 System and three 1401 auxiliary systems. This computer system is to be shared by both the commercial and scientific parts of our organization. Because of the tremendous increase in speed of this computer we plan to convert two shifts of 705 operations and one shift of 704 operation into a combined one shift or less 7090 operation. Any expansion of present applications or the mechanization of new problems will, of course, not occur until we have approached a degree of computer efficiency that will justify additional shift rental costs.

Grumman

With the growth in the computing requirement for our Engineering Department occurring over the past 10 years, we expect to obtain in the near future greater

computing capacity to handle an increasing load. Therefore, newer high speed engineering computers are being evaluated for our needs. It is anticipated that a powerful computer would be complemented with smaller computing devices, which engineers could directly apply to small one-time problems.

Gulf

Proposed are an IBM 1401, an IBM 7090, and a magnetic tape transmission system.

IBM PDL Foughkeepsie

Our present 705 and 704 Systems will be replaced by 7080 and 7090 Systems.

Peripheral equipment will be replaced by 1401 Systems and systems operations will be oriented to tape input/output operation.

IBM GPD DL Endicott

Column binary modification for card to tape (off line) is being ordered for use with the PK MAD Monitor which requires column binary.

A 1401 System to be used as peripheral equipment for the 7090 has been ordered.

IBM San Jose

IBM 1401 System to be installed for peripheral usage, tape to punch, tape to printer, card to tape.

IBM 7090 System is to replace 704 System.

IBM RC Yorktown Heights

Planned replacement by IBM 7090 System.

Marquardt

Plan to put in operation a computer system program whereby FORTRAN programs may be compiled and/or executed and symbolic programs assembled from same input tape.

An IBM 1401 Tape System is scheduled for delivery. It will be used in support of the 704, replacing the present peripheral equipment.

An IBM 7090 System is being ordered.

Martin Denver

IBM 7090 to be installed as a replacement for the IBM 704.

Two IBM 1401's to be installed to replace present off-line equipment.

North American

We hope to increase our computer usage to the point where it would be profitable to get the IBM 7090. If our usage does not increase in a year or so, we will probably consider replacing the relatively-unreliable 704 with a less expensive reliable solid-state computer.

Pratt and Whitney

An IBM 7090 will replace the IBM 704. Two IBM 1401 Systems are on order. The first is to be used as 7090 peripheral equipment, and the second is to be used for commercial applications. FAP-FORTRAN system will be used on the 7090 with modifications to make off-line operation more efficient.

Rand

An IBM 7090 is to be delivered.

Republic Aviation

Column binary will be added to 704 peripheral equipment to allow for program read in on tape.

The 704 System will be replaced by a 7090 System. The 7090 will include a 32,768 core storage, 12 on-line tapes and peripheral tape to printer, tape to card and card to tape.

The 7090 peripheral equipment will be replaced by IBM 1401 Systems - as soon as available, including two 600 lines/min printers.

Sandia

Current trends indicate the need of a larger system.

Socony

An IBM 7090 will be installed and the 704 will be returned.

Standard Oil of California

Propose to replace IBM 704 with IBM 7090 and 1401 series computers. Company's home office machine accounting groups will be consolidated with the Computer Center with acquisition of the 7090-1401 System.

Standard Oil Indiana

To be obtained are the 717 Printer, 714 Card Reader, 727 Tape, 727 Tape, 757 Printer Control, 759 Card Reader Control, and Tape to Card 1401.

United Aircraft

Philco 2000 System will be installed. This system will replace one (and possibly two) IBM 704 Systems. Thereafter a second Philco 2000 System will be installed. At that time all three (3) IBM 704 Systems will have been replaced.

The second system will be the central data processor for System 433L. This system will be modified to permit communication directly with high-speed communications circuits and with various government-furnished external devices.

A high speed printer-plotter, operating from magnetic tape, will be in operation.

A magnetic tape to magnetic tape conversion system is expected to be in operation. This system will enable the Philco 2000 Computer to use data prepared on an IBM 704 Computer.

Westinghouse East Pittsburgh

An IBM 7090 is to be installed.

Cal Tech JPL

IBM will deliver a 7090 Type EDPM with 10 tape units. Subsequently, a 1401 Type EDPM will be installed to handle off-line I/O in addition to some small amount of data processing.

It is planned to provide some form of direct data input to the 7090, but as of this date, no proposals have been officially formulated.

MURA

IBM 1401 System to be delivered.

TEES

The 704 will be replaced with a 32K, 2 channel, 8 tape IBM 709.

U of Cal Los Alamos

STRETCH System is due for arrival in 1961. A new building is being built to house it.

U of Mich

Expansion to a larger scientific computer.

## INSTALLATIONS

U. S. Army Ballistic Missile Agency, Computation Laboratory, Redstone Arsenal, Alabama (now NASA)(2)

U. S. Army White Sands Missile Range, Control Office, Ordnance Mission, White Sands Missile Range, New Mexico

U. S. Army White Sands Missile Range, Integrated Range Mission-DRD, White Sands Missile Range, New Mexico

U. S. Navy David Taylor Model Basin, Applied Mathematics Laboratory, Washington 7, D. C.

U. S. Navy Ordnance Laboratory, White Oak, Silver Spring, Maryland

U. S. Air Force Mathematical Services Laboratory, Computer Operations Branch, APGC (PGVMC), Eglin Air Force Base, Florida

U. S. Air Force Flight Test Center, Data Processing and Computing Branch, Edwards Air Force Base, California

U. S. Air Force, Headquarters, Strategic Air Command, Offutt Air Force Base, Nebraska

U. S. Air Force SWWVD, Headquarters, 4925th Test Group (Atomic), Kirtland Air Force Base, New Mexico

Argonne National Laboratory, Box 299, Lemont, Illinois

Federal Aviation Agency, Bureau of Flight Standards, Aircraft Management Division, P. O. Box 1082, Oklahoma City, Oklahoma

National Aeronautics and Space Administration, Ames Research Center, Moffett Field, California

National Aeronautics and Space Administration, Lewis Research Center, 21000 Brookpark Road, Cleveland 35, Ohio

National Bureau of Standards, Connecticut and Van Ness Street, N. W., Washington, D. C.

National Security Agency, Ft. George G. Meade, Maryland

Tennessee Valley Authority, Computing Center, 116 Old Post Office, Chattanooga, Tennessee

Allis-Chalmers Manufacturing Company, Milwaukee, Wisconsin

AVCO Corporation, Research & Advanced Development Division, 201 Lowell St., Wilmington, Mass.

Bell Aerosystems Company, P. O. Box 1, Buffalo 5, New York

Bell Telephone Laboratories, Whippany Road, Whippany, New Jersey

Bell Telephone Laboratories, Murray Hill, New Jersey

The Bendix Corporation, Bendix Systems Division, 3300 Plymouth Road, Ann Arbor, Michigan

C-E-I-R, Incorporated, 1200 Jefferson Davis Highway, Arlington 2, Virginia

Convair, Fort Worth Division of General Dynamics Corporation, Fort Worth, Texas

Cornell Aeronautical Laboratory, Incorporated, 4455 Genesee Street, Buffalo 21, New York

Convair-San Diego, Plant I, Building 54A, Pacific Highway, San Diego, California

Douglas Aircraft Company, Department G-318, 3000 Ocean Park Blvd., Santa Monica, California

General Electric Company, Black Canyon Highway, Phoenix, Arizona

General Electric Company, Evendale Computations Operation, Building 305, Evendale 15, Ohio

General Electric Company, Computer Systems and Operations, Schenectady, New York

General Motors Corporation, General Motors Technical Center, 12 Mile & Mount Roads, Warren, Michigan

General Motors Corporation, Allison Division, Plant No. 8, Indianapolis 6, Indiana

Grumman Aircraft Engineering Corporation, Engineering Department, Research Section, Bethpage, New York

Gulf Research & Development Company, P. O. Drawer 2038, Pittsburgh 30, Pennsylvania

IBM Corporation, Product Development Laboratory, High Street, Poughkeepsie, New York

GPD Development Laboratory, IBM Dept., 284, Endicott, New York

The Service Bureau Corporation, IBM Plant, Bldg. 10, Monterey & Cottle Roads, San Jose, California

IBM Research Center, P.O. Box 218, Yorktown Heights, New York

Lockheed Aircraft Corporation, Marietta, Georgia

The Marquardt Corporation, 16555 Saticoy Street, Van Nuys, California

Martin Company, Box 179, Denver, Colorado

North American Aviation, Incorporated, 4300 East Fifth Avenue, Columbus 6, Ohio

Pratt & Whitney Aircraft, Florida Research & Development Center, United, Florida

Rand Corporation, 1700 Main Street, Santa Monica, California

Raytheon Company, Missile Systems Division, Applied Math Section, Bedford, Massachusetts

Republic Aviation Corporation, Farmingdale, N. Y.

Sandia Corporation, Department 5240, Box No. 5800, Albuquerque, New Mexico

Socony Mobil Oil Company, Inc., 150 East 42nd St., New York 17, New York

Standard Oil Company of California, Electronic Computing Center, 225 Bush St., San Francisco, Calif.

Standard Oil Company of Indiana, 2400 New York Avenue, Whiting, Indiana

Temco Electronics & Missiles Company, P.O. Box 6191, Dallas, Texas

United Aircraft Corporation, Research Laboratories, 400 Main Street, East Hartford 8, Connecticut (3)

Chance Vought Aircraft, Incorporated, Dallas, Texas

Westinghouse Electric Corporation, Air Arm Division, Box 746, Baltimore 3, Maryland

Westinghouse Electric Corporation, 4L39, East Pittsburgh, Pennsylvania

California Institute of Technology, Jet Propulsion Laboratory, 4800 Oak Grove Drive, Pasadena 3, Calif.

Midwestern Universities Research Association, 2203 University Avenue, Madison 5, Wisconsin

Ohio State University, Columbus, Ohio

Texas Engineering Experiment Station, Data Processing Center, College Station, Texas

University of California, Los Alamos Scientific Laboratory, P.O. Box 1663, Los Alamos, New Mexico

University of California, Computer Center, 201 Campbell Hall, Berkeley, California

University of Michigan, Computing Center, Ann Arbor, Michigan

Washington State University, Pullman, Washington

U. S. Navy Mine Defense Laboratory, Panama City, Florida (Anticipated)

U. S. Navy Underwater Sound Laboratory, New Haven, Connecticut



# IBM 705 I II

IBM 705 Model I and II Electronic Data Processing  
Machine

## MANUFACTURER

International Business Machines Corporation

## APPLICATIONS

### Manufacturer

For commercial applications with some scientific applications - engineering design, manufacturing and inventory control, cost and financial control, billing, actuarial work and sales reporting.

### U. S. Navy Construction Battalion Center

Located at Fort Hueneme, California, the system is used for Navy-wide facilities inventory (Class I and II Real Property), fiscal accounting, payroll and personnel accounting, shop stores inventory accounting, supply demand control point applications, and the BuDocks Functional Component Program.

### U. S. Navy Mare Island Shipyard

Located in the Management Engineering Office at Mare Island, the system is used for funds control, production control, payroll, leave and bond accounting, cost accounting, equipment maintenance control, transportation maintenance control, radiac equipment maintenance scheduling and control, supply inventory control,

Photo by International Business Machines Corporation

trol, shop store inventory control, direct purchase material control, material availability reporting, scientific and engineering problems, and commitment accounting.

### U. S. Army The Adjutant General's Office

Located at BE 838 The Pentagon Building, Washington 25, D. C., the system is used for military personnel accounting, civilian personnel accounting, and organizational accounting.

### U. S. Army Ballistic Missile Agency

Located at the Redstone Arsenal, Alabama, the system is used for commercial applications only viz., national supply management and stock control, program budget control, financial and inventory supply accounting, and engineering documentation.

### U. S. Army Engineer Maintenance Center

Located at 52 Starling Street, Columbus, Ohio, the system is used for inventory control and document processing, financial inventory accounting, requirements forecasting, repair parts budget estimates, mobilization reserve materiel requirements, and annual

tabulations of demands and inventory groupings by dollar value.

USAF Hq OCAMA, Tinker AFB

Located at Tinker AFB, Oklahoma, the two systems are used for requirements computation for consumption type items - system develops wearout rate factors and computes consumption type item spare parts through application of projected AF programs to AF assets in order to provide a means for determining procurement actions and budget estimates, contract termination, disposal action, overhaul, etc.

Air vehicle configuration - system provides a central point the necessary records for all of a specific type, model and series of air vehicle which permits the ready evaluation of each air vehicle's capability to perform specific missions and enables the logistic managers to project depot and contractual maintenance requirements; schedule air vehicles into modification and maintenance facilities; establish and evaluate future modernization maintenance funding requirements; and effect more economical procurement of kits and support parts. Provides rapid feedback of consolidated data to operating commands.

Weapons system stock control and distribution - similar to the commodity class property accounting application expanded to automatic distribution functions which include direct processing of debit, credit and file maintenance actions without manual action determination. Other than this the basic difference is the fact that master item records are established for items

Photo by U. S. Army Photo Agency, TAGO

related to the weapon, rather than for specific commodity classes.

Propulsion Unit logistics system - system encompasses data for use in transportation management, material deficiency reporting and accounting, centralized inventory and distribution control, actuarial development, configuration accounting, consolidated requirements, etc. for AF engines.

U. S. Air Force Aviation Supply Office

Located at the Aviation Supply Office, Philadelphia, Pa., the system is used for inventory control.

U. S. Air Force Headquarters Air Defense Command

Located in Building S-3, Ent AFB, Colorado Springs, Colorado, the system is used for:

Military Personnel Accounting System

Application: Maintains the master military personnel file by editing, zero balancing, furnishes intra-command gain and loss information from changes submitted by sub-commands. Information maintained includes skill identification, grade, location, retainability or status, and similar data requirements necessary for the effective management of military personnel resources. Errors discovered through editing are coded and returned to the applicable sub-command. File maintenance is performed on a daily basis. Accomplishing these applications on EDPM increases accuracy, speed, and reduces workload at sub-command level.

Uses: Furnishes this and higher headquarters with

Photo by U. S. Army Engineer Maintenance Center

the most current personal data for all military personnel assigned. Information stored also furnishes data for the preparation and submission of 26 RCS reports.

#### Centralized Manpower Authorization System

Application: Maintains the unit manning documents containing detail unit authorizations for 17 projected quarters by processing into the master field changes from each unit and editing change cards for accuracy.

Uses: Information contained in the master file furnishes data for the preparation and submission of 9 RCS reports to higher headquarters. Various types of management reports are also prepared from this system. Information furnished is used for indicating authorizations for manning purposes and analysis; future planning and programming actions; authorized military strength by unit; manning assistance. For this system authorization documents are prepared and forwarded to subordinate units.

#### Unit Authorization List System

Application: Maintains an accurate and timely unit authorization list from changes processed into the master file.

Uses: Provides data at all echelons of command reflecting the status of UAL equipment for each organization assigned. Preparation of unit and materiel readiness authorization lists, analysis of organizational equipment, cost utilization as well as related management studies and reports.

#### Motor Vehicle Reporting System

Application: Maintains accurate and timely information on all vehicles assigned this command. Approximately 300 changes per week are applied to the master file.

Uses: Provides data to this and higher headquarters reflecting the status and condition of motor vehicles assigned this command. This system controls worldwide Air Force assets of all registered vehicles as defined in current AF regulations. All registered vehicles which are carried on any type of property record are accounted for by all active and reserve Air Force organizations. This system provides management with status, mileage, scheduled, and unscheduled maintenance. Labor and materiel repair costs are provided to obtain labor utilization, job performance, and job standards. From this data budget estimates are provided for management purposes.

#### Medical Stock Status Reporting System

Application: Maintains medical stock status for each base in this command. Approximately 120,000 detail records are created from this reporting system.

Uses: Provides a source for retail medical item requirement data, promote the maintenance of optimum base inventory levels, assist in the disposition and lateral distribution of long supply items.

#### Inventory of Existing Facilities System

Application: Maintains accurate and timely data for all existing real property facilities under control of this command. 29,000 records are contained

in the master file with approximately 10,000 changes per quarter processed.

Uses: Provides data indicating all types of facilities, what they are, and approximate value of each. Civilian Personnel Services Cost Analysis System

Application: Maintains information providing for an analysis of basic and total obligations, quarterly and accumulative for Object Class 01, with a breakdown by lump sum payments, deductions and other variables. Information covers all categories of employees reflecting overall and basic salaries, man years consumed and percentage breakdown of variables to basic obligations. Master summary file amounts to 6,000 records with approximately 5,000 changes applied quarterly.

Uses: Furnish experience data to Hq USAF and this headquarters for the preparation of initial and revised financial plans and budget estimates. Provides information pertaining to skills, grade, salary, location, category and other similar data necessary for the effective management of civilian personnel resources. Prepares recurring or special reports relating to civilian personnel management.

Leased Communications Systems

Application: Maintains information furnishing detailed descriptions of services being ordered, i.e., interexchange channels, local channels and equipments with associated recurring non-recurring, minimum service and contingent termination changes.

Uses: Information stored is used in the preparation of contracts, budgets, establishment of accounts payable, posting of accounting reports and preparation of special reports as desired by this or higher headquarters.

Radar Evaluation Reporting System

Application: Master file contains information re-

Photo by U. S. Navy Civil Engineering Laboratory

flecting down-time of radar sites determined by their length of time, frequency and type of cause. 4,000 records are maintained with approximately 1200 changes per month processed.

Uses: Reflects equipment reliability and maintainability data, predictions of current month's unknown radar tracks.

Raid Recognition System

Application: By using the previous 6 months of unknown tracking information, data maintained reflects expected unknowns (by weight factor) for each 2 hour period of a day. Master file contains one record (273 characters in length) reflecting 6 months distribution of unknown tracks. Approximately 750 changes per month are summarized.

Uses: Assists in raid recognition.

Command Vehicle Management and Control System

Application: By utilizing the UAL master file, motor vehicle master file, and family grouping file, a report is created reflecting, by family grouping, the ADC command status of the motor vehicle fleet. Master file contains 10,000 records.

Uses: Provides the Vehicle Branch, D/Materiel, this Hq and AMC with Vehicle Management and Control Data.

USAF San Bernardino Air Materiel Area, AMC Located at SBAMA, Norton AFB, California, the system is used for:

Advanced Weapons Support (IOCII)

This application consists of a functionally integrated logistic data processing system embodying methodologies and procedures which facilitate the operation of a logistical "pressure" system as contrasted to the traditional logistical demand system. This system includes such procedural concepts as central accountable records of all stock available to the weapons system, both wholesale and retail automatic

resupply of material, central computation of net weapons systems requirements, etc. It includes inventory control, due-in assets, inventory accounting monetary, stock level computation, voucher computation, transportation scheduling, configuration accounting, program preparation and file maintenance of all records in the various segments of the system.

#### Requirements Computation

This system is designed to compute consumption type items spare parts requirements through the application of projected Air Force programs to Air Force assets. Replacement and wear-out factors are computed from consumption experience. This project encompasses all phases of the Air Force world-wide supply requirements system. In addition, it produces products which are analytical of supply effectiveness.

#### Due-in Assets

This project covers management and control of the Due-in Assets Procurement Records functions. It encompasses items due in through Procurement from contractors.

#### Product Improvement Program (PIP)

This program is a series of runs designed to accumulate the number of failures by work unit code (work unit code identifies a functional unit, not a specific part number.) When the number of failures exceeds tolerable limits, a report is prepared. At the end of the month any records which are below tolerable limits are also included in the report. An additional monthly product is a special report on the 10 systems with the highest number of failures and the 5 highest sub-systems within each system.

USAF Hq MAAMA Olmsted Air Force Base, Penna.

Located in Building 33, Bay A, the system is used for:  
Requirements Computation for Consumption Type Items  
All phases of the AF world-wide supply requirements

Photo by U. S. Navy Mare Island Naval Shipyard

system are encompassed in this application. Procurement actions, budget estimates, contract terminations, disposal action, overhaul, etc., are some of the programs that are determined. AF assets related to AF programs are computed thru development of wear-out rate factors. Management is provided the tools to establish standards and to measure the supply accomplishments.

#### Due-In Assets

This application encompasses records that are maintained to control materiel assets due in from contractual sources, intra-AF Depot transactions, acquisition from other federal departments and agencies, and contract termination inventories. Data are provided in the by-products to reflect quantity status of items in pre-contract and post-contract stages, delivery schedules, current status of deliveries, intransit balances (i.e., depot, Hi-Valu, GSSF depot/base), dollar value of both deliveries made and undelivered balances, and item data related to budget projects.

#### Requirements Computation for Replacement Type Items

The purpose of this application is to design, develop and implement a data flow and data processing system by which various types of replacement type item data products may be periodically computed on an AF world-wide basis. Data by-products from this system are projection of gross and net item requirements, procurement and budget estimate item and/or dollar summaries of the above mentioned requirements, contract termination and retention disposal level data, consolidated asset and item information data summary products, item-dollar inventory segmentation, and requirements support effectiveness data. This system is designed to promptly react to the elements which effect AF item requirements i.e., program

changes, authorization changes, support policy changes, funding limitations, in order to be compatible with the latest data handling and processing technological improvements.

National Security Agency

Located at Ft. George G. Meade, Maryland, the system is used for data processing.

Amer. Tel. & Tel. Co., Long Lines Dept.

Located at Mt. Kisco, N. Y., the system is used for circuit provision, traffic load studies, accounting for operating and construction activities, message analyses (by mid 1960), pricing and billing private line customers (by late 1960), and plant trouble results - message circuits.

American Telephone & Telegraph Co., Treasury Dept.

Located at 50 Varick Street, New York, N. Y., the system is used for the processing of all records coincident with AT&T shareowners, such as maintaining the stock book, preparation of dividend payments, proxies, mailings, etc., shareowner statistics, reconciliation of dividend's and tallying of proxies, preparation of Federal and State Information Returns, and handling financing such as bond and stock issues.

Consolidated Edison Co. of N. Y., Inc.

Located at 4 Irving Place, New York 3, N. Y., the system is used for customer accounting, payroll, inventory control, stores accounting, preferred stock dividend accounting, and minor engineering studies.

Photo by U. S. Air Force Mobile Air Materiel Area

Convair - A Division of General Dynamics Corp. Located in the Industrial Accounting Department, Electronic Data Processing Section, at Fort Worth, Tex., the system is used for payroll and personnel, detail labor proration and parts cost, engineering parts list, planning parts list, fabrication work-in-process, production ordering and inventory control, spares inventory control, spares delivery surveillance. It will also be used for material inventory control, fabrication budget and status control, fabrication forecasts, fabrication machine utilization and quality control, engineering and planning configuration control, cost ledger, tool control, and summary production status.

Esso Standard, Div. of Humble Oil & Refining Co. Located at the Refinery Main Office, Baton Rouge, La., the system is used for payroll, manpower scheduling, personnel statistics, sales scheduling, sales invoicing, sales statistics, storehouse stock control, purchase ordering, accounts payable, fixed asset accounting, financial accounting, financial reporting, cost accounting and reporting, crude oil and product inventories, refinery unit operating reports, equipment history records, technical and scientific computing, refinery simulation, and economic studies.

In addition to the 705 we lease an IBM 650 Basic Card Computer, which is used entirely on technical and scientific computing. This work is being transferred to the 705, and we plan to release the 650 this year.

We also have two Royal-McBee LGP 30 Computers, which are used exclusively for calculation of optimum blending of gasolines and other fuel products.

Farmers Insurance Group

Located at 4680 Wilshire Blvd., Los Angeles, Calif., the system is used for premiums-in-force file maint., premium billing, commission statements to agent, sales analysis, payroll, loss reserves, statistical analysis, and accounting data.

The Firestone Tire & Rubber Company

Located in Akron, Ohio, the system is used for sales analysis, payroll, inventory control, retail accounting, scientific computing, multiple correlations and simultaneous equations.

Ford Motor Company, Computer Services Dept.,  
Manufacturing Services

Located in Room 1109, Rouge Office Building, Dearborn, Michigan, the system is used for 6,500 hourly payroll weekly, 30,000 salary payroll semi-monthly, 250,000 stockholders record accounting, general stores non-productive inventory control, Ford Motor Credit Company, salary stock investment program, and pre-production control, including bill of material, parts specification files, and engineering progress changes.

Ford Division of Ford Motor Company

Located at Ford Division General Office, Rotunda & Southfield, Dearborn, Michigan, the system is used for inventory control of service parts for 24 parts depots, production schedule, parts requirements and preparation of purchase orders to suppliers.

Photo by U. S. Air Force Aviation Supply Office

Hughes Aircraft Company, Industrial Dynamics  
Located at Building 105, 5405 West 102nd Street, Los Angeles, California, the system is used for payroll and personnel reporting, company labor distribution, company material distribution, accounts payable distribution, purchase order distribution, material standard cost master, cost of sales reporting, company and government property accounting, expense and budget variance ledgers, analysis of engineering change costs, management engineering project status reporting, engineering costs detail ledger, cost plus fixed fees accounting and ledgers, fabrication work in progress ledgers, line flow work in progress ledgers, maintenance of manufactured parts list, maintenance of assembly parts list, provisioning maintenance parts list, and manufactured inventory control.

Hughes Aircraft Company, Industrial Dynamics  
Located at IBM Service Bureau Corporation, 2706 Wilshire Blvd., Los Angeles, California, the system is used for the same applications as listed above.

International Harvester Company

Located at 1301 West 22nd Street, Broadview, Illinois, the system is used for processing weekly payrolls for 6 manufacturing plants, daily invoicing and stock status for 12 service parts depots, materials spreads for 7 manufacturing plants, cost and inventory accounting work for 7 manufacturing plants, engineering and technical problems.

Photo by U. S. Department of Health, Education and Welfare

Illinois Central Railroad Company

Located at 6327 South Dorchester Ave., Chicago 37, Ill., the system is used for all phases of railroad accounting work, including disbursement accounting, freight accounting, car accounting, and passenger and station accounting.

McDonnell Aircraft Corporation

Located on the 1st level of Administration Building (Main Plant), St. Louis, Missouri, the system is used for payroll and labor distribution, inventory and material accounting, accounts payable, financial forecasting, material requirements, parts list, work order release, manufacturing scheduling, parts control, shop load, spare parts processing, vacation schedules, rate reviews, personnel record keeping, and maintenance engineering and support.

Minnesota Mining and Manufacturing Company

Located at the Main Office, 900 Bush Avenue, St. Paul 6, Minnesota, the system is used for payroll, sales statistics, inventory control, billing, property accounting, distribution of expense, production, and applied mathematics.

Sandia Corporation, Electronic Data Processing  
Dept. 3450

Located at the Sandia Corporation, Sandia Base, Albuquerque, New Mexico, the system is used for payroll (pay 7,000 employees. Prepare all necessary reports), stores control (12,000 item inventory. Prepares all stockkeeping records. Determines replenishment requirements from usage activities and prepares

purchase orders), quality assurance (analyzes product inspection reports and prepares various analytical reports), program planning (this is essentially a production scheduling job), and production control (includes production inventory control, material requirements analyses, and production shop scheduling). The Data Center does generalized statistical analyses routines, e.g. X Bar R process control charts, histograms, normal and cumulative, simple regression, multiple regression, and curve fitting.

The Standard Oil Company (Ohio)

Located at 717 Republic Building, Cleveland 15, Ohio, the system is used for invoice audit, sales accounting, sales statistics, wholesale accounts receivable, merchandise control, refinery stores accounting, refinery simulation, pipeline simulation, linear programming, and regression analysis.

Texaco Incorporated

Located in the Texaco Bldg., Houston, Texas, the system is used for accounting, technical and research applications. The accounting applications are integrated crude oil, integrated gas and gasoline, wholesale marketing, payroll, supply, and distribution. The technical and research applications are producing geophysical, petroleum engineering, civil engineering, refinery simulation, crude evaluations, plant process studies, pipe stress analysis, and determination of maximum allowable operating pressures. Calculations related to crude stills, fractionation, absorption and stripping are also performed.



Photo by U. S. Department of Health, Education and Welfare

United States Steel Corporation  
Tennessee Coal & Iron Division

Located in the General Office, Tennessee Coal & Iron Division, Fairfield, Alabama, the system is used for wage payrolls, calculation of incentive production performances for wage payroll, standard cost accounting system, stores inventory and accounting, and engineering and scientific problems.

Western Electric Co., Inc. Hawthorne Works

Located at Hawthorne Station, Chicago, Illinois, the system is used for payrolls, production and inventory control systems, cable running lists, merchandise stock inventory control, accounting, preparation of equipment engineering specifications, quality control reports, sales analyses, and miscellaneous reports.

Western Electric Co., Inc., Computer Methods

Located at 100 Central Avenue, Kearny, N. J., the system is used for the hourly rated payroll (payroll computation and compilation, deduction accumulations, and remittances. Federal and state payroll tax computation, recording and reporting), monthly rated payroll, wage incentive reports, labor distribution, preparation of engineered equipment job specifications, distribution of engineering time charges, and standard cost bulletin preparation.

## PROGRAMMING AND NUMERICAL SYSTEM

Internal number system Binary Coded Alphanumeric  
Binary coded alphanumeric char/word

The 705 is not a fixed word length system. It is possible to have both variable field and variable record lengths. There are no words, each character of a record being individually addressable.

Binary coded alphanumeric char/instruction 5

Instructions decoded 35

Arithmetic system Fixed point

Floating point is programmable.

Instruction type One address

Number range plus or minus 256 decimal digits

Instruction word format

X	X	X	X	X
Operation	Address			

Automatic built-in subroutines include store for print and transmit.

Automatic coding

Fortran (Automatic Formula Translation).

This is a program which allows expression of scientific problems in terms of mathematical formulae, with the formulae completely acceptable to the system. There is flexibility in the program allowing for expansion of the language and provision for inclusion of a library of programs previously written.

### Autocoder

This program offers advantages of symbolic (step-by-step) coding and high level (multiple step) coding. Autocoder has macro-instructions by which means it is possible to generate many steps from one program instruction written in words close to english language.

### Print I

This is an interpretive system which simulates floating decimal arithmetic circuitry as well as provide an internal library of mathematical functions.

Registers and B-boxes include a one 256 character accumulator, fourteen 16 character auxiliary storage units, and one 32 character auxiliary storage unit.

Photo by Convair Fort Worth

### Construction (Arithmetic unit only)

Vacuum tubes	1,700
Transistors	0
Diodes	4,600
Magnetic cores	3,500

Figures are approximate.

Arithmetic mode	Serial
Timing	Synchronous Internal
	Asynchronous I/O Area
Operation	Sequential Internal
	Concurrent I/O Area

Simultaneous reading and writing of magnetic tape units is possible.

## ARITHMETIC UNIT

	Incl Stor Access
	Microsec
Add	17 per digit
Multiply time =	$17 [N_p (N_c + 4) + 2]$ microseconds
	$N_p$ = No. of digits in multiplier
	$N_c$ = No. of digits in multiplicand storage
Divide time =	$17 [11 + N_d + (N_d - N_r)(7.5 N_r + 15)]$ microsec.
	$N_d$ = No. of digits in dividend
	$N_r$ = No. of digits in divisor

## STORAGE

Manufacturer	No. of Char	Access
Media		Microsec
Magnetic Core	Model 1 20,000	17
	Model 2 40,000	
Magnetic Drum	60,000	8,000
	The drum is arranged in 300 bands of 200 char/band.	
Magnetic Tape		10,000
	No. of units that can be connected	10 Units
	No. of char/linear inch of tape	200 Char/inch
	Channels or tracks on the tape	7 Tracks/tape
	Blank tape separating each record	0.75 Inches
	Tape speed	75 Inches/sec
	Transfer rate	15,000 Char/sec

Start time 10 Millisec  
 Stop time 10 Millisec  
 Average time for experienced operator to change reel Less than 60 Seconds  
 Physical properties of tape  
   Width 0.5 Inches  
   Length of reel up to 2,400 Feet  
   Composition Acetate or mylar  
 Mylar is DuPont's trademark for its polyester film.  
   Naval Construction Bn Ctr  
 Magnetic Core memory 20,000 characters; Magnetic Tape  
 An additional 512 positions of auxiliary storage are available. These serve as accumulators as well as storage positions.  
   Mare Island Naval Shipyard  
 Magnetic Core 40,000 characters; Magnetic Tape  
   USA TAGO  
 MC 40,000; MT  
   USA ABMA  
 MC 40,000; MT  
   USA EMC  
 MC 40,000; MT  
   USAF Tinker AFB  
 MC 40,000; Magnetic Drum 60,000 char  
   USAF ASO  
 MC 40,000; MD 60,000; MT  
   USAF ADC  
 MC 40,000; MT  
   USAF SB AMA  
 MC 40,000; MD 120,000; MT

Photo by Convair Fort Worth

USAF Olmsted AFB  
 MC 40,000; MD 60,000; MT  
   NSA  
 MC 20,000; MT  
   AT and T, LLD  
 MC 40,000; MD 60,000; MT  
   AT and T, TD  
 MC 40,000; MT  
   Boeing Wichita  
 Each of two systems has MC 40,000; MD 60,000; and  
 MT 13 stations.  
   Con Edison  
 MC 40,000  
   Convair Fort Worth  
 MC 40,000; MT  
   Esso Standard  
 MC 40,000; MD 60,000; MT  
   Farmers IG  
 MC 40,000; MT  
   Firestone  
 MC 40,000; MT  
   Ford Motor Man Ser  
 MC 40,000; MT  
   Ford Div  
 MC 40,000; MT  
   Hughes  
 MC 20,000; MT  
   Hughes  
 MC 20,000; MT

IIH

There is one core storage unit of 40,000 positions and 10 magnetic tape stations with each of two 705 computers.

Illinois Central		
MC 40,000; MT	McDonnell Aircraft	
Media	No. of Char	Access Microsec
Core Storage	40,000	34 + 17 for each char
Magnetic Drum	60,000	8,000 + 40 for each char
Magnetic Tape		10,000 + 67 for each char
3M		
MC 40,000; MT	Sandia Corp.	
MC 40,000; MT	SOHIO	
MC 40,000; MT	Texaco	
MC 40,000; MT	USS TC and I	
MC 40,000; MT	WE Hawthorne	
Media	No. of Char	Access Microsec
Magnetic Core	40,000	17
Magnetic Drum	60,000	8,000
16 727 Magnetic Tape Units		10,000
The tape units are also used for input and output.		
WE Comp Methods		
MC 40,000; MD 60,000; 10 MT		

Photo by Convair Fort Worth

INPUT OUTPUT

Manufacturer	
Media	Speed
Magnetic Tape	15,000 char/sec
Card Reader	250 cards/min
Operator's Console	Manual
Magnetic Drum	25,000 char/sec
Card Punch	100 cards/min
Printer	150; 500; 1,000 lines/min
Console Typewriter	600 char/min
Three different models of printers available.	
In addition to the above components, an IBM 1401 Data Processing System may be used for peripheral operations. The speeds of the 1401 components are: Card Reading - 800 cards/min, Card Punching - 250 cards/min, and Printer - 600 lines/min. The tapes from the 705 are completely compatible with the 1401 System.	
Naval Construction Bn Ctr	
Media	Speed
Type 714 Card Reader	250 cards/min (on-off line)
Type 727 Magnetic Tape	15,000 char/sec Uses 2,400 ft
Unit	reels of 1/2 inch plastic tape
Type 722 Card Punch	100 cards/min (on-off line)
Type 717 Printer	150 lines/min (on-off line)
Type 774 Tape Data	150 lines/min (on-off line)
Selector	100 cards/min

Mare Island Naval Shipyard

Media	Speed
Card Reader	250 cards/min
Magnetic Tape	15,000 digit/sec
Punch	100 cards/min
Printer	500 lines/min

Cards and printer are normally used off line.  
USA TAGO

Cards	250 cards/min
Magnetic Tape	15,000 char/sec
Keyboard	Manual
Printed Report	150 lines/min

USA ABMA

Cards, Tape, Printer 150 lines/min  
USA EMC

Cards, Tape, Printer 150 lines/min  
USAF Tinker AFB

Magnetic Tape 22 stations; Cards; Line Printers 150 and 500 lines/min. Hi speed printer and punch are not available on line.  
USAF ASO

Cards; Type 727 Tape Drives (6 1/2 minutes/reel at 15,000 char/sec; Type 720A Printer 500 lines/min; Type 407 Accounting Machine 150 lines/min; Type 519 Doc. Orig. Machine output at 100 cards/min. Types 407 and 519 are used with IBM 774 (Tape Data Selector).  
USAF ADC

Tape, Cards and Printer 500 lines/min  
USAF SB AMA

Tape; Cards; Printer 500 lines/min; Typewriter; Console.

Photo by Hughes Aircraft Company

USAF Olmsted AFB

Tape; Cards; Printer 500 lines/min; Typewriter  
NSA

Type 727 MF; Type 717 On Line Printer 150 lines/min  
AT and T, LLD

Type 727 Tape Units; Type 714 Card Reader, 60 cards/min on line; 250 cards/min off-line; Type 720A Printer max speed 500 lines/min (not used on line); Type 519 Tape Units 100 cards/min used with TDS off-line; Type 407 Printer used with TDS, max 150 lines/min; Typewriter 10 char/sec.  
AT and T, TD

Tape, Cards, Type 717 Printer 150 lines/min  
Boeing Wichita

Each of two systems has 13 Type 727 Tape and 1 Type 714 Card Reader on-line and 1 off-line; and a total of two 720A Printers off-line, one 720 Printer off-line, and two 722 Card Punches off-line.  
Con Edison

Model 720 Printers	500 lines/min
Model 720A Printers	500 lines/min
Model 722 Card Punch	100 cards/min
Model 714 Card Reader	250 cards/min

Convair Fort Worth

Cards; Tape and Printers (600 and 150 lines/min); and Tape Data Selector. Most input/output to and from the computer stored on magnetic tape. On-line card reader used periodically for small programs or input. All printing and punching performed off-line.

Esso Standard  
Cards; Tape; Printer 150 and 500 lines/min  
Farmers IG  
Tape; Cards; Printer 150 lines/min; Typewriter  
Firestone  
Tape; Cards; 1-Printer 150 lines/min; 2 Printers 500 lines/min.  
Ford Motor Man Ser  
Tape; Cards; Printer 500 lines/min  
Ford Div  
Cards; Tape; Printer 500 lines/min  
Hughes (Both Systems)  
Card-to-tape; Tape-to-printer; Tape-to-card. These operations are all performed "off line" and never used for direct input-output.  
IH  
Card Readers (2), Tape Units (20), Printers (3) (500 lines/min). Tapes are 10 to each computer and are either used as input or as output units. Cards.  
Illinois Central  
Tape; Cards; Printer 500 lines/min  
McDonnell Aircraft  
Tape, Cards, Typewriter; Printer 500 lines/min  
3M  
Card Reader 250 cards/min More speed needed  
Tape 15,000 char/sec New tape units faster w/the higher density.  
Printer 500 lines/min Never used as direct output  
Punch 100 cards/min Seldom used as direct output

Photo by Hughes Aircraft Company

Typewriter 10 char/sec Used mainly for check points totals, etc., as to slow speed, it holds up computer process time.

Sandia Corp  
Tape; Cards; Printer 150 lines/min not normally used, typewriter.

SOHIO  
Cards 240 cards/min 1 card reader; on-off line  
Magnetic Tape 15,000 char/sec 10 drives on line  
Cards 100 cards/min off line  
Magnetic Tape 15,000 char/sec 10 on line; 3 off  
Low-speed 150 lines/min on-off line  
Printer  
High-speed 1,000 lines/min off line  
Printer  
Texaco  
Cards; Tape; Printer 150 lines/min; Typewriter (on-line)  
USS TC and I  
Magnetic Tape  
WE Hawthorne  
16 Type 727 Tapes, 2 Type 714 Card Readers, Type 722 Card Punch, 1 Type 717 Printer 150 lines/min, 1 Typewriter  
WE Comp Methods  
One card reader normally operated "Off Line" and one "On Line". Both are arranged for "On Line" operation where required. (Not at same time). There are 10 Type 727 Tape Units + 10 M/S Start-Stop/Record; 2 Type 714 Card Readers; 1 Type 717 Printer 150 lines/min.

2 Type 720A Printers 500 lines/min; 1 Type 722 Card Punch. Printers and punch normally operated "Off Line". All are arranged for "On Line" operation where required. (But not two 720A printers at same time).

### CHECKING FEATURES

#### Manufacturer

Instruction validity, character coding of instruction on transfer of data, transmission of data from all input units to memory, all output data from memory to the drum tape unit, card punch storage, printer storage, and typewriter. Also, there is an overflow check, and a sign check.

### POWER, SPACE, WEIGHT, AND SITE PREPARATION

#### Manufacturer

Power, computer 69.57 Kw  
 Room size, computer 2,000 - 3,000 sq ft  
 Weight, computer 32,844

Physical planning manual is available.

#### Naval Construction Bn Ctr

Power, computer 103 Kw 121.0 KVA 0.92 pf  
 Power, air cond 55 Kw 68.0 KVA 0.80 pf  
 Volume, computer 2,260 cu ft  
 Volume, air condition 4,200 cu ft  
 Area, computer 421 sq ft  
 Area, air condition 600 sq ft

Photo by McDonnell Aircraft Corporation

Room size, computer 40 ft x 80 ft  
 Room size, air conditioner 20 ft x 45 ft  
 Floor loading 200 lbs/sq ft  
 750 lbs concen max  
 Capacity, air conditioner 120 Tons  
 Weight, computer 40,530 lbs

A new building to house the entire data processing facility was constructed since the existing building could not have been economically modified. A reinforced concrete structure of 20,000 sq ft was built to house the computer and related functions.

#### Mare Island Naval Shipyard

Power, computer 102 Kw 0.9 pf  
 Power, air conditioner 39 Kw 0.9 pf  
 Volume, computer 1,430 cu ft  
 Volume, air conditioner 2,600 cu ft  
 Area, computer 270 sq ft  
 Area, air conditioner 360 sq ft  
 Room size, computer 2,600 sq ft  
 Room size, air conditioner 600 sq ft  
 Floor loading 250 lbs/sq ft  
 600 lbs concen max

Capacity, air conditioner 3 of 15 Ton units  
 Weight, computer 34,120 lbs  
 Weight, air conditioner 20,000 lbs

Ceiling: Incombustible ceiling board on suspended aluminum grid, completely demountable. Plenum: Supply in suspended ceiling; return under raised floor system. Building type: Steel reinforced concrete.  
 Building Modifications: Remove existing nonload bearing curtain wall partitions and construct new for air

conditioned EDPM room. Power: New separate transformer and service system for computer. New lighting and power system from existing building service. Computer transformer capacity is 150 KVA. The air conditioner transformer capacity is 300 KVA. Power is from general building service.

USA TAGO

Power, computer	119.7 KVA
Volume, computer	2,335 cu ft
Area, computer	3,575 sq ft
Area, air conditioner	95.6 sq ft
Room size, computer	55 ft x 65 ft approx.
Room size, air conditioner	25 ft x 13 ft x 12 ft
Floor loading	100 lbs/sq ft
Capacity, air conditioner	40 Tons
Weight, computer	42,290 lbs

False ceiling 8 1/2 feet above floor. Raised floors.  
Power is 208 volt, 3 phase, 4 wire, 60 cycles/sec.

USA ABMA

Power, computer	119 Kw	85.5 KVA	0.71 pf
Volume, computer		19,072 cu ft	
Area, computer		1,192 sq ft	
Room size, computer		2,500 sq ft	
Floor loading		25.7 lbs/sq ft	
Capacity, air conditioner		1,000 lbs concen max	
		475 Tons	

Building was built for Computation Laboratory. Concrete slab construction. The computer room has plenum floor construction with porous false ceiling for return air. Power distribution in building has its own

Photo by Sandia Corporation

power sub-station for isolation of the system with continuous 3 phase power distribution centers within the building. Air conditioner supports total building of 60,000 sq ft.

USA EMC

Power, computer	87.6 Kw	135.0 KVA
Power, air condi	225 Kw	225 KVA
Volume, computer		2,412.5 cu ft
Volume, air conditioner		504 cu ft
Area, computer		451.7 sq ft
Area, air conditioner		126 sq ft
Room size, computer		3,000 sq ft
Room size, air conditioner		3,000 sq ft
Floor loading		100 lbs/sq ft
		1,000 lbs concen max
Capacity, air conditioner		150 Tons
Weight, computer		44,770 lbs
Weight, air conditioner		14,640 lbs

The EMC building is of steel and concrete construction. One portion of the third floor of the building was modified for use as the computer room. The major modifications included installation of the following: air conditioning compressors, false ceiling to carry conditioned air, raised flooring to cover computer cables, observation room for visitors, and alternate underground sources of electric power with automatic switch over.

A 208 volt, 3 phase, 4 wire, 60 cycle/sec system is used. The air conditioner is fed 430 volt, 400 amp continuous current.



USAF ASO

Power, computer	126.8 KVA
Power, air conditioner	135 KVA
Volume, computer	25,760 cu ft
Volume, air conditioner	4,200 cu ft
Area, computer	2,800 sq ft
Area, air conditioner	300 sq ft
Room size, computer	40 ft x 70 ft
Room size, air conditioner	120 ft x 70 ft (space) 60 ft x 70 ft (machine)
Capacity, air conditioner	33.8 Tons (air handling) 32.2 Tons (units)
Weight, computer	50,490 lbs

Building was originally a warehouse. Required installation: raised "free access" flooring, overhead air-conditioning duct, false ceiling utilized as return air plenum, 600 amp. power panel and distribute power to required units, humidity and temperature controls, CO<sub>2</sub> system, electronic filter, add and lower lighting, room partitions, convenience outlets every 10 feet, water pumps, cooling tower, refrigerating units, air handling units.

USAF ADC

Volume, computer	17,650 cu ft
Volume, air conditioner	7,200 cu ft
Area, computer	1,960 sq ft
Area, air conditioner	600 sq ft
Room size, computer	2,200 sq ft
Room size, air conditioner	600 sq ft

Photo by Sandia Corporation

Floor loading	100 lbs/sq ft
	1,000 lbs concn max
Capacity, air conditioner	44 Tons
Weight, computer	34,000 lbs
Weight, air conditioner	15,000 lbs

Built new building with false ceiling, plenum chamber (false floor), cement block, no modification. Power distribution (separate transformer) is 400 amp, 3 phase.

USAF SB AMA

Power, computer 1	88.8 Kw	158.4 KVA	
Power, computer 2	83.8 Kw	149.2 KVA	
Power, air cond	360 Kw	450 KVA	0.80 pf
Volume, computer 1		3,179 cu ft	
Volume, computer 2		3,031 cu ft	
Volume, air conditioner		721.4 cu ft	
Area, computer 1		500 sq ft	
Area, computer 2		475 sq ft	
Area, air conditioner		144.4 sq ft	
Room size, computer 1		3,780 sq ft	
Room size, computer 2		3,780 sq ft	
Room size, air conditioner		1,600 sq ft	
Floor loading		200 lbs/sq ft	
		1,000 lbs concn max	
Capacity, air conditioner		315 TR	
Weight, computer 1		52,680 lbs	
Weight, computer 2		48,880 lbs	
Weight, air conditioner		59,250 lbs	

Weight, cubage, and space requirements for air con-

ditioner are for chilled water equipment only. Air handling units, cooling towers, etc., are on roof of building. Site preparation included modification of approximately 25,850 sq ft of a permanent type warehouse. The modification consisted of installation of suspended acoustical ceiling, 15 inch raised floor (raised floor and suspended ceiling in 705 area only), partitions, 1500 KVA transformer station, main switch gear, distribution panels, insulating transformers, lighting, 315 TR chilled water system, air handling units on roof, and necessary duct work. Floor space, electrical power, and air conditioning tonnage not used by 705s is used by COMLOGNET and other electronic equipment.

AT and T, LLD

Power, computer	150 KVA	
Power, air conditioner	200 Kw 235 KVA	0.85 pf
Volume, air conditioner	16,000 cu ft	
Area, air conditioner	600 sq ft	
Room size, computer	4,000 sq ft	
Room size, air conditioner	1,400 sq ft	
Floor loading	100 lbs/sq ft	
	1,000 lbs concen max	
Capacity, air conditioner	170 Tons	
Weight, computer	48,000 lbs	
Weight, air conditioner	18,000 lbs	

Built new building with false floor, false ceiling, air conditioning and commercial power fed through separate transformers from 2 substations. Air conditioner is used for whole building.

Photo by Sandia Corporation

AT and T, TD

Power, computer	201.8 Kw	212.5 KVA	0.949 pf
Power, air cond	151.6 Kw	198.4 KVA	0.777 pf
Volume, computer		70,831 cu ft	
Volume, air handling		6,240 cu ft	
Volume, refrig. mach.		3,240 cu ft	
Volume, cooling tower		3,000 cu ft	
Area, computer		6,589 sq ft	
Area, air handling		416 sq ft	2 floors
Area, refrig. mach.		324 sq ft	Basement
Area, cooling tower		240 sq ft	Roof
Room size, computer		49 ft x 133 ft	
Room size, air handling		13 ft x 32 ft	
Room size, refrig. mach.		18 ft x 18 ft	
Room size, cooling tower		20 ft x 12 ft	
Floor loading		160 lbs/sq ft	
		4,860 lbs concen max	
Capacity, air conditioner		75 Tons	
Weight, computer		121,000 lbs	
Weight, air handling		16,000 lbs	
Weight, refrig. mach.		10,500 lbs	
Weight, cooling tower		10,300 lbs	
Weight, air conditioner		36,800 lbs, total	

Boeing Wichita

Power, computer		293.0 KVA	
Power, air cond	215 Kw	239 KVA	0.90 pf
Volume, computer		47,916 cu ft	
Volume, air conditioner		16,000 cu ft	
Area, computer		5,324 sq ft	
Area, air conditioner		800 sq ft	

Room size, computer 121 ft x 44 ft x 9 ft  
 Room size, air conditioner 50 ft x 16 ft x 20 ft  
 Floor loading 2,400 lbs/sq ft  
 1,800 lbs concen max  
 Capacity, air conditioner 120 Tons  
 Weight, computer 96,050 lbs  
 Weight, air conditioner 28,450 lbs

All the above figures are for the two systems combined. The system is installed in a reinforced concrete building. A false ceiling covers the installation of supply ductwork, lights, and serves as a return air plenum. A raised floor was installed to provide for under floor cables and conduit. A separate transformer bank is used to supply each system.

Con Edison  
 Volume, computer 60,000 cu ft  
 Area, computer 8,000 sq ft  
 Floor loading 125 lbs/sq ft

Installed air conditioning, false ceilings, improved lighting, additional power supply and troughs in floor for wiring between components. Air conditioner is for most of building.

Convair Fort Worth  
 Power, computer 105 Kw 126 KVA 0.8 pf  
 Power, air condit 100 Kw 100 KVA 1.0 pf  
 Volume, computer 39,680 cu ft  
 Volume, air conditioner 2,900 cu ft

Photo by Standard Oil Company, Cleveland

Area, computer 3,968 sq ft  
 Area, air conditioner 290 sq ft  
 Room size, computer 62 ft x 64 ft  
 Room size, air conditioner 29 ft x 10 ft  
 Floor loading 100 lbs/sq ft max  
 1,000 lbs concen max

Capacity, air conditioner Three 25-Ton compressors  
 Weight, computer 52,770 lbs  
 Weight, air conditioner 26,000 lbs

Installed in existing building. Raised floor (16") with open plenum construction underneath. Utilized existing hanging ceilings approximately 10 ft high. New overhead lighting installed. Power sub-station installed - two transformers for air and computer:  
 1 transformer 150 KVA, 4160 volt/440, 3 phase, 60 cycle  
 1 transformer 150 KVA, 4160 volt/208, 3 phase, 60 cycle

Since computer is installed on a wooden mezz one special precaution was taken to isolate computer floor from mezz flooring to eliminate vibration. Thus, the frame work for computer floor is tied directly to beams rising from main plant floor.

Farmers IG  
 Power, computer 208 KVA  
 Power, air conditioner 220 KVA

Photo by Western Electric Company, Inc., Hawthorne Works

Firestone  
 Power, computer 125 Kw 147 KVA 0.85 pf  
 Power, air cond 65 Kw 70 KVA 0.80 pf  
 Volume, computer 24,300 cu ft  
 Volume, air conditioner 12,000 cu ft  
 Area, computer 2,430 sq ft  
 Area, air conditioner 1,200 sq ft  
 Floor loading 125 lbs/sq ft  
 250 lbs concen max  
 Capacity, air conditioner 50 Tons (alternate unit installed)  
 Weight, computer 43,150 lbs  
 Weight, air conditioner 12,500 lbs  
 False floor, plenum chamber-ceiling, power distribution panel, air conditioning control panel, and air conditioning machinery room.  
 Ford Motor Man Ser  
 Power, computer 130.7 KVA  
 Power, air cond 29.8 Kw 35 KVA 0.85 pf  
 Volume, computer 36,800 cu ft  
 Volume, air conditoner 1,000 cu ft  
 Area, computer 3,680 sq ft  
 Area, air conditioner 100 sq ft  
 Floor loading Ground floor solid concrete  
 Capacity, air conditioner 38 Tons  
 Weight, computer 52,360 lbs  
 Weight, air conditioner 4,000 lbs  
 The Rouge Office Building was in the design stage at the time the computer was ordered. The only changes made were as follows: trenches were installed

in the floor for cables, additional overhead air conditioners and humidifiers were installed, and since the installation of the 702 Computer a line filter has been installed to handle the peaks and valleys in the voltage to the machine.

Ford Div  
 Power, computer 150 KVA  
 Volume, computer 6,279 cu ft  
 Volume, air conditioner 9,255 cu ft  
 Area, computer 2,046 sq ft  
 Area, air conditioner 617 sq ft  
 Room size, computer 34.8 x 59 ft  
 Room size, air conditioner 17.75 x 34.75 ft  
 Floor loading Unlimited  
 Capacity 50 Tons (plus 10-Ton in adj. area)  
 Weight, computer 34,000 lbs  
 3 foot false ceiling, 12 inch air plenum with outlets below ventral processing unit and power supply, concrete block building, and false floor of reinforced aluminum and vinyl tile.  
 Hughes  
 Power, computer 201 Kw 201 KVA Unity Synchronous Motor Generator  
 Power, air cond 57 Kw 71 KVA approx. 0.80 pf  
 Induction motor driven  
 Volume, computer 30,365 cu ft  
 Volume, air conditioner 4,620 cu ft  
 Area, computer 2,977 sq ft  
 Area, air conditioner 420 sq ft

Room size, computer 60 ft x 43 ft  
20 ft x 22 ft

Room size, air conditioner 15 ft x 28 ft

Floor loading 100 lbs/sq ft  
1,000 lbs concn max  
(per caster)

Capacity, air conditioner 56.8 Tons

Weight, computer 46,620 lbs

Weight, air conditioner 1,500 lbs

Building type: 3B-tilt-up concrete block wall with wood truss roof. Site preparation: Demolition of existing partitions; installation of raised floor, insulated with alum; "Dryfol" and mounted on 1/8 in. rubber; construction of separate but attached air conditioning, generator, and tape storage rooms; install two duct, two air conditioning systems; install 120/208 volt-3 phase-4 wire-600 amp. power panel for IBM equipment, using existing 400 amp. panel for lighting, etc.; and install acoustical tile on existing ceiling.

Hughes

Power, computer 225 Kw 225 KVA Unity

Area served by separate transformer

Volume, computer 23,386 cu ft

Volume, air conditioner 8,000 cu ft

Area, computer 2,126 sq ft

Area, air conditioner 1,000 sq ft

Room size, computer 47 ft 6 in x 45 ft

Room size, air conditioner 50 ft x 20 ft

Capacity, air conditioner 11.6 Tons

Weight, computer 29,110 lbs

A portion of subject building is leased from the Service Bureau Corporation. Therefore, power, air conditioning systems, and site preparations were lessor installed. The following work was performed by lessee in occupying space: installed electrical runs from existing power panel to IBM units; installed electrical receptacles; and installed air deflection registers in elevated steel plate floor.

IH

Power, computer & perip. 127 Kw 211.5 KVA 0.6 pf

Power, air conditioner 71 Kw 83.5 KVA 0.85 pf

Volume, computer & periph. 34,200 cu ft

Volume, air conditioner 3,103 cu ft

Area, computer & per. equip. 3,420 sq ft

Area, air conditioner 387 sq ft

Room size, comp & perip. equip 76 ft x 45 ft

Room size, air conditioner 18 ft x 31 ft x 6 in.  
17 ft x 40 ft x 11'6"

Capacity, air conditioner 82 1/2 Tons

Weight, computer 69,720 lbs

Weight, air conditioner 34,384 lbs

Floor loading 20.5 lbs/sq ft  
100 lbs concn max

False wooden floor atop concrete, false ceilings with air conditioning ducts constructed therein, pre-fab steel constructed walls-glass windows all around. Air conditioning equipment for computer installation completely separate from rest of building.

Illinois Central

Power, comp. & components 98 Kw 156.8 KVA 0.62 pf

Power, air conditioner 120 Kw 150.0 KVA 0.80 pf

Volume, comp. & components 29,598 cu ft

Volume, air conditioner 40,285 cu ft

Area, comp. & components 503 sq ft

Area, air conditioner 1,985 sq ft

Room size, comp. & components 40 ft x 96 ft

Room size, air conditioner 49 ft x 37 ft

Capacity, air conditioner 91.8 Tons

Weight, computer 507,900 lbs

Weight, air conditioner 16,000 lbs

False floor reinforced steel beam construction.  
False ceiling, acoustical with diffused air-condition-

ing and recessed light fixtures. Room of brick construction with inside wall of Johns Mansville construction. Power supplied by public utility company.

McDonnell Aircraft

Power, computer 162.5 KVA

Floor loading 100 lbs/sq ft  
100 lbs concn max

Capacity, air conditioner 75 Tons

Weight, computer 48,400 lbs

3M

Power, computer 250 Kw 300 KVA 0.84 pf

Power, air conditioner 40 Horsepower

Volume, computer 25,780 cu ft

Volume, air conditioner 13,000 cu ft

Area, computer 3,870 sq ft

Area, air conditioner 1,300 sq ft

Room size, computer 34 ft 6 in x 81 ft 6 in  
14 ft 6 in x 26 ft 6 in  
14 ft 6 in x 12 ft 6 in  
23 ft x 20 ft 6 in

Room size, air conditioner 21 ft 6 in x 60 ft 6 in

Floor loading 100 lbs/sq ft  
500 lbs concn max

Capacity, air conditioner 40 Tons

Weight, computer (705 only) 5,300 lbs ea, 10,600 total

Weight, air conditioner 41,000 lbs, total

Raised floor for power and computer cables. Installed separate air conditioning unit and power transformer.

Sandia Corp.

Power, computer 121 Kw 70 KVA 1.732 pf

Power, air cond 49 Hp 60 KVA 0.8 pf

Volume, air conditioner 7,440 cu ft

Area, air conditioner 744 sq ft

Room size, computer 50 ft x 100 ft  
(25 ft x 25 ft vault)

Room size, air conditioner 24 ft x 31 ft  
outside tower

Floor loading 3,580 lbs concn max

Capacity, air conditioner 60 Tons steam fired  
absorption unit

Weight, computer 24,480 lbs

Weight, air conditioner 20,000 lbs

The following alterations were made to an existing building: raised floor (free access); false ceiling; eight (8) plenums; and installation of air conditioning and power. The air conditioning is a built-up system.

SOHIO

Power, computer 113.1 Kw 125.7 KVA 0.90-0.92 pf

Power, air cond 153.2 Kw 170.0 KVA 0.90-0.92 pf

Volume, computer 2,550 cu ft

Area, computer 500 sq ft

Area, air conditioner 2,500 sq ft (including space used in ceiling and floor)

Room size, computer 2,850 sq ft  
21,000 cu ft

Room size, air conditioner 4,139 sq ft

Floor loading 100 lbs/sq ft  
1,000 lbs concn max

Capacity, air conditioner 60 Tons

Weight, computer 42,580 lbs

Weight, air conditioner 53,650 lbs

False ceilings; false floors; converted individual offices into one main room; installed separate air conditioning and humidity controls (with stand-by equipment); installed fire hose; installed separate power lines from transformer to computer room; and installed exhaust hoods for main frame and control units.

Texaco

Power, computer 129.4 KVA

Volume, computer 31,860 cu ft

Volume, air conditioner 4,320 cu ft  
 Area, computer 2,375 sq ft  
 Area, air conditioner 540 sq ft  
 Room size, computer 2,655 sq ft  
 Room size, air conditioner 18 ft x 30 ft  
 Floor loading 900 lbs concen max  
 Capacity, air conditioner 80 Tons  
 Weight, computer 31,870 lbs

Building area was cleared of old partitions and new walls of tile and plastic were constructed. New false ceilings constructed of aluminum acoustical panels which also serve as input areas for air to machine room. Air returned to blower system via olemum construction. Air system protected by electrostatic and standard filters. Free access or pedestal type of floor constructed of 27 inch square metal plates.

USS TC and I

Power, computer 116.8 KVA  
 Power, air conditioner 22.5 KVA 0.85 pf  
 Volume, computer 18,400 cu ft  
 Volume, air conditioner 9,792 cu ft  
 Area, computer 2,300 sq ft  
 Area, air conditioner 1,152 sq ft  
 Room size, computer 56 ft x 41 ft  
 Room size, air conditioner 48 ft x 24 ft  
 Floor loading 120 lbs/sq ft  
 200 lbs concen max  
 Capacity, air conditioner 34.8 Tons  
 Weight, computer 37,530 lbs  
 Weight, air conditioner 10,600 lbs

Ceiling lowered 18 inches for duct work, installed 26 plenums, added relays and separate power transformer servicing EDP equipment only.

WE Hawthorne

Power, computer 200 Kw  
 Power, air conditioner 175 Kw  
 Volume, computer 77,000 cu ft  
 Volume, air conditioner 9,500 cu ft  
 Area, computer 7,000 sq ft  
 Area, air conditioner 866 sq ft  
 Floor loading 85 lbs/sq ft  
 Capacity, air conditioner 80 Tons  
 Weight, computer 60,570 lbs

Computer installed in top floor of existing office building. 10 inch raised steel floor, sectionalized 3 ft x 3 ft for running cables. Outside windows insulated. Entire area sprinkler protected. All air-conditioning overhead except for special duct to main frame.

WE Comp Methods

Power, computer 253 Kw 281 KVA approx. 0.90 pf  
 Only 55% required for present equipment.  
 Power, air conditioner 250 KVA  
 332 HP installed. Not more than 215 HP used at any one time. Balance standby.

Volume, computer 47,000 cu ft  
 Volume, air conditioner 15,300 cu ft  
 Area, computer 5,200 sq ft  
 Area, air conditioner 1,225 sq ft  
 Room size, computer 5,200 sq ft  
 Room size, air conditioner 1,225 sq ft  
 Floor loading 200 lbs/sq ft  
 700 lbs concen max  
 Capacity, air conditioner two 100 Ton Units  
 one 50 Ton Unit

Weight, computer 53,760 lbs  
 Weight, air conditioner 22,850 lbs

Building: steel frame, brick walls. Equipment on 5th floor (top). False ceiling (Accustone) suspended from roof beams under original suspended ceiling. Raised (18") steel plate floor, vinyl tile covered. Original floor wood covered concrete over arched hollow

tile ceiling. Wood covering removed and resurfaced with cement. Air inlet ducts above false ceiling and beneath raised floor. Common return ducts above false ceiling. Recessed trough lighting. Area enclosed with sheet steel partitions two 300 KVA transformers (one is standby) installed on roof and fed from 13,800 volt main circuits from own power house. Air conditioning and lighting power taken from existing 440 volt mains.

PRODUCTION RECORD

Manufacturer

There is only limited production on this system at the present time. Delivery on availability basis only.

COST, PRICE AND RENTAL RATES

Manufacturer	Monthly Charge	Purchase Price
705 Central Processing Unit w/40,000 positions core memory	\$14,150	\$590,000
714 Card Reader	1,500	64,450
717 Printer (150 lines/min)	1,400	55,000
720 Printer (500 lines/min)	1,900	93,000
722 Card Punch	800	43,300
727 Magnetic Tape Unit	550	18,200
730 Printer (1,000 lines/min)	3,900	210,500
734 Magnetic Drum Storage	2,300	90,000
735 Printer Control (730 & 760)	600	32,500
744 Magnetic Drum Power Supply	500	21,500
745 Power Supply	1,200	62,400
754 Tape Control	1,500	78,000
757 Printer Control	650	44,000
758 Card Punch Control	600	36,000
759 Card Reader Control	900	45,000
760 Control & Storage	2,500	111,000
777 Tape Record Coordinator	3,400	156,000
782 Console and Typewriter	1,000	52,000

Monthly rental, average system: \$33,500 & up  
 Purchase, average system: \$1,640,000 & up  
 Maintenance contract is available.

Naval Construction Bn Ctr

Rental contracting and rates for basic system	
Type 705 CPU	\$11,650
Type 782 Console and Typewriter	1,000
Type 745 Power Supply	1,200
Type 754 Tape Control Unit	1,500
Type 727 Magnetic Tape Units (10)	5,500
Total	\$20,850

Rental rates for additional equipment	
Type 714 Card Reader	\$1,510
Type 759 Card Reader Control	935
Type 717 Printer	1,400
Type 757 Printer Control	650
Type 722 Card Punch	800
Type 758 Card Punch Control	650
Type 727 Magnetic Tape Units (4)	2,200
Type 747 TDS Power Supply	500
Type 774 Tape Data Selector	2,524
Total	\$11,169

Mare Island Naval Shipyard

Basic system consisting of 705 II Computer, 782 Console, 10-727 Tape Units, 745 Power Supply, 754 Tape Control, rents at \$23,350/month.

Additional equipment consisting of 714 Card Reader, 720A Printer, 722 Punch, 2-727 Tape Units, 759 Control, 760I Control, 758 Control, rents at \$9,350/mo.

USA TAGO  
 Basic System (Prime Shift)  
 Type 705, 714, 717, 727 (12 units), 745, 747, 754,  
 757, 758, 759, 774, 782, 407, 519 - total rental  
 \$34,425.

Additional Equipment (EAM)  
 11 tp 024, 6 tp 056, 4 tp 082, 2 tp 085, 4 tp 407,  
 1 tp 552, 2 tp 026, 1 tp 080, 3 tp 083, 1 tp 101,  
 2 tp 519, 1 tp 557 - total monthly rental \$6,120.

USA ABMA  
 705, 714, 14-727's, 745, 2-754's, 759, 782 - \$29,450  
 per month (includes maintenance).

	Monthly Rental
Basic System	
1 705 Central Proc. Unit	\$14,150
1 745 Power Unit	1,200
1 782 Console	1,000
1 714 Card Reader	1,500
1 759 Control Unit	900
2 717 Printers	2,800
2 757 Control Units	1,300
1 722 Card Punch	800
1 758 Control Unit	650
16 727 Tape Units	8,800
2 754 Tape Control	3,000
Total Basic Operational Use	\$36,100

Type	Name	Quantity
705	Central Processing Unit	1
714	Card Reader	2
717	Printer	1
720	Printer	1
722	Card Punch	1
727	Tape Unit	30
734	Drum Storage Unit	1
744	Drum Power Unit	1
745	Power Unit	1
754	Tape Control Unit	1
757	Printer Control Unit	1
758	Card Punch Control Unit	1
759	Card Reader Control Unit	2
760	Control and Storage Unit	1
777	Tape Record Coordinator	2
782	Console and Typewriter	1
774	Tape Data Selector	1
747	TDS Power Supply	1
519	Document Machine	1
407	Accounting Machine	1

Total cost \$61,910 prime shift/month. Each system configuration is the same.

USA F ASO  
 Basic System  
 2 705 II's with 4 TDC's, 2 drums and 30 tape drives -  
 \$68,400/month.  
 Additional Equipment  
 2 Card Readers, 2 high speed printers, 2 TDS units  
 (with 407 and 519), and 6 tape drives - \$24,342/month.

USA F ADC  
 Basic System  
 \$1,393,550  
 Basic System  
 \$32,650/month.  
 Service contracting - \$5,295.75/month.

USAF SB AMA  
 First System (Basic)

Qty	Type	Description	Monthly Rental
1	705-I	Central Processing Unit	\$14,150
1	745	Power Supply	1,200
1	782	Console and Typewriter	1,020
1	714	Card Reader	1,615
1	759	Card Reader Control	900
26	727	Magnetic Tape Unit	14,300
2	734	Magnetic Drum Storage	4,600
2	744	Magnetic Drum Power	1,000
1	754	Tape Drive Control Unit	1,500
2	777	Tape Record Coordinator	6,800
38	Pieces,	Total system	\$47,085

Qty	Type	Description	Monthly Rental
1	705-2	Central Processing Unit	\$14,150
1	745	Power Supply	1,200
1	782	Console and Typewriter	1,020
1	714	Card Reader	1,615
1	759	Card Reader Control	900
22	727	Magnetic Tape Unit	12,100
2	734	Magnetic Drum Storage	4,600
2	744	Magnetic Drum Power	1,000
1	754	Tape Drive Control Unit	1,500
2	777	Tape Record Coordinator	6,800
34	Pieces,	Total system	\$44,885

Qty	Component	Rental
1	714 Card Reader	\$1,615
1	759 Card Reader Control	900
1	720A High Speed Printer	1,900
1	760 Control and Storage	2,500
1	722 Card Punch	800
1	758 Punch Control	650
4	724 Magnetic Tape Unit	2,200
1	774 Tape Data Selector	2,500
1	747 Tape Data Selector Power Supply	500
1	717 Printer	1,400
1	754 Printer Control	700
1	727 Magnetic Tape Unit	550
15	Pieces, Total system	\$16,215
USA F Olmsted AFB		
Qty	Component	Rental
1	Central Processing Unit, Mdl 2	\$14,150
2	Card Reader, Mdl 1	3,000
2	Printer, Mdl 1	3,000
1	Card Punch, Mdl 1	800
25	Tape Unit, Mdl 1	13,750
1	Magnetic Drum Power, Mdl 1	500
1	Magnetic Drum Storage, Mdl 1	2,300
1	Power Supply, Mdl 1	1,200
1	Tape Cotl, Mdl 1	1,500
1	Card Punch Control, Mdl 1	600
2	Card Reader, Control, Mdl 1	1,800
2	Control & Storage, Mdl 1	5,000
2	Tape Record Coordinator, Mdl 1	6,800
1	Console & Typewriter, Mdl 1	1,000
	Total Basic Rental Cost	\$56,200

AT and T, LLD  
 Rental for 176 hours per month - Overtime is at 40% of rate for first 176 hours.  
 Present monthly rental including overtime is approximately \$55,000.

Equipment	176 hour rental
IBM 705 II equipped w/console, drum, 15 727 tape units, 2 777 TRC's, power supply and special card reader (modified 026 Keypunch)	\$34,550
720A Printer equipped w/760 Control Unit and a 727 tape unit	4,950
714 Card Reader equipped w/759 Control Unit and a 727 tape unit	2,995
774 TDS equipped w/407 Tabulator, 519 Reproducing Punch, 747 Power Unit, and 727 Tape Unit.	5,305
<b>Total</b>	<b>\$47,800</b>

AT and T, TD  
 CPU \$14,150; 2-714 3,000; 3-720A 5,700; 1-730 3,900; 1-782 1,000; 19-727 10,450; 2-777 6,800; 1-826 145; 1-717 1,400; miscellaneous power and control units \$14,300.

Boeing Wichita  
 Basic System  
 705 CPU, drum, card reader, 2 TCU's, 14 tape drives \$32,260 per month (each of two systems).  
 Additional Equipment  
 3-720A's, 1 card reader, 2 punches, 6 tape drives \$22,310 per month.  
 Con Edison  
 2-705 Model II with 40 K memory and TRCs and 16 tape stations each, 3-714 Card Readers, 3-722 Card Punches, 3-720 Printers, 3-720A Printers \$107,000/monthly  
 Convair Fort Worth

Qty	Description	Rental Month	Excise Tax
1	705 Model II C.P.U.	\$14,150	
1	745 Power Unit	1,200	
1	782 Console	1,000	
2	714 Card Readers	3,020	
2	759 Card Reader Control Unit	1,800	
14	727 Tape Units	7,700	
1	717 Printer	1,400	
1	757 Printer Control Unit	650	
1	720A High Speed Printer	1,900	
1	760 Printer Control Unit	2,500	
1	754 Tape Control Unit	1,500	
1	774 Tape Data Selector Model I with file search feature	2,300	\$230.00
1	747 Tape Data Selector Power Unit	500	50.00
1	407 Tab. Model A2 - Mod. for T.D.S.	910	91.00
1	519 Punch Model 1 - Mod. for T.D.S.	210	21.00
1	046 Tape to Card Punch	161	16.10
1	026 Printing Key Punch	60	6.00
	<b>Total</b>	<b>\$40,961</b>	<b>\$414.10</b>
	<b>Grand Total</b>	<b>\$41,375.10</b>	

Esso Standard  
 Basic System  
 CPU, drum, 2 card readers, 1 card punch, 2 printers, 14 tape drives, tape data selector, condole, power and control units - \$47,000/month, prime shift.  
 Additional Equipment  
 Keypunches and verifiers, sorters, collators, tabulator, calculators, interpreters, summary punches, etc. in support of 705 - \$13,000/month.  
 Firestone  
 Main frame, TCU, 11 tapes, card reader, console cost

\$1,093,500 and rents at \$28,370/month.  
 4 tapes, 717 Printer, 2 720 Printers, card reader, card punch cost \$699,150 and rents at \$13,850/month.  
 Ford Motor Man Ser

Machine	Monthly Rental
705 Central Process Unit	\$14,425.92
712 Card Reader	790.11
712 Card Reader	774.82
717 Printer (2)	3,874.10
722 Card Punch (2)	1,631.20
727 Magnetic Tape Unit (15)	8,410.95
745 Power Supply	1,223.40
754 Tape Control Unit	1,529.25
756 Card Reader Control (2)	632.08
757 Printer Control Unit (2)	5,097.44
758 Punch Control Unit (2)	1,223.40
782 Console Typewriter	1,019.50
<b>Total</b>	<b>\$40,632.17</b>

Ford Div  
 Rental \$ 32,500  
 Approx. cost price \$1,300,000.  
 Hughes

Machine Type	Qty	Monthly Rental
705	1	\$11,650
714	1	1,500
720	2	2,800
722	1	800
727	15	8,250
745	1	1,200
754	1	1,500
758	1	650
759	1	900
760	2	5,000
777	2	6,800
782	1	1,000
<b>Total</b>		<b>\$42,050</b>

Machine Type	Qty	Monthly Rental
705	1	\$11,650
727	12	6,600
745	1	1,200
777	2	6,800
782	1	1,000
<b>Total</b>		<b>\$27,250</b>

IH  
 Basic System  
 2 Central Processing Units  
 2 Power Supply Units  
 2 Console Typewriters  
 25 Tape Units  
 2 Tape Control Units  
 2 Card Readers  
 2 Card Header Central Units  
 3 Printers  
 3 Printer Control & Storage  
 1 Card Punch  
 1 Card Punch Central  
 \$69,826/month.

Additional Equipment  
 1 407 Printer 1 514 Reproducer  
 1 077 Collator 2 026 Keypunches  
 1 552 Interpreter 1 082 Sorter  
 2 101 Statistical Machines  
 \$2,230/month.

Illinois Central  
 CPU with buffers \$23,000/month.  
 13 tape drives 7,150/month.  
 2 720A Printers 8,800/month.  
 2 card readers 4,800/month.  
 1 card punch 1,400/month.  
 4 tape drives 2,200/month.



McDonnell Aircraft

Basic System  
705 II with magnetic drum, 10 tapes, reader, two 720 Printers, and punch cost \$1,888,600 and rent at \$44,180/month.

Additional Equipment  
024, 026, 056, key punch and verifiers; 077, 085, 087, 089 collators; 083 sorters; 101 sorters, 407 tabulators, 408 Bill Weed and tabulation, 519, 521, 528 punches; 604 calculators, 954 posting machine cost \$1,227,345 and rent at \$26,000/month.

3M

Basic System  
705 Model II, 745 Power supply, 782 Console, 754 Tape Control, 10 ea. 727 Magnetic Tape Drives cost \$956,360 each (2 systems) and rents at \$23,500/month each.

Additional Equipment  
714 Card Reader, 759 Card Reader Control, 720 Printer, 760 Control Storage, 720A Printer, 760 Control Storage, 722 Card Punch, 758 Card Punch Control, 2 ea. 727 Magnetic Tape Units cost \$418,075 and rents at \$13,330/month.

Maintenance is \$2,513.50 for prime shift for each basic system listed above.

Sandia Corp.

Basic System  
One 705 II CPU and power, printer, card reader, and ten 727 tape units rent at \$32,000 monthly rental.

Additional Equipment  
A 720 Printer and a TDS with 407 and 519 rent at \$8,000/month.

Maintenance and service are provided by vendor.

SOHIO

Basic System	Cost	Monthly Rental
Central Processing Unit 705 Model II	\$590,000	\$14,150
Power Unit (745)	62,400	1,200
Console (782)	52,000	1,000
10 Magnetic Tape Units (727)	182,000	5,500
Tape Control Unit (754)	78,000	1,500
Additional Equipment		
Card Reader (714)	\$64,450	\$1,615
Reader Control (759)	45,000	900
Printer (717)	55,000	1,400
Printer Control (757)	44,000	650
4 Magnetic Tape Units (727)	72,800	2,200
Printer (730A)	210,500	3,900
Printer Control (735)	32,500	600
Storage Control (760) Model II	111,000	2,500
Card Punch (722)	43,300	800
Punch Control (758)	36,000	650

Texaco

Basic System  
CPU, on line printer, reader, punch and 10 tapes. Peripheral equipment: 2-720A, 1-714 and 1-722. Rent - primary shift \$44,000/month.

USS TC and I

1 CPU; 1 card reader; 1 punch control; 1 console; 1 reader control; 2 printers; 1 power unit; 1 card punch; 2 printer controls; 11 tape drives; 1 tape control. Total cost \$31,800/month.

WE Hawthorne

Qty	Basic System	Monthly Rental(1)
1	705 CPU - 40K	\$14,150
1	745 CPU Power	1,200
1	782 Console	1,000
2	754 Tape Control Units	3,000
16	727 Tape Units	8,800
1	734 Drum	2,300
1	744 Drum Power	500
1	714 Card Reader	1,500
1	759 C. R. Control	900
		<u>\$33,350</u>
	Additional Equipment	
1 (2)	717 Printer	\$1,400
1 (2)	757 Printer Control	650
2	720 Printer	2,800
2	760 Printer Control	5,000
1 (2)	714 Card Reader	1,500
1 (2)	759 C. R. Control	900
1 (2)	722 Card Punch	800
1 (2)	758 Punch Control	650
5	727 Tape Units	2,750
		<u>\$16,450</u>

Notes:

(1) Monthly charge covers the first 176 hours a month the system is in use. Each hour of use thereafter is billed at the rate of 1/176th of 40% of the monthly charge.

(2) May be operated "on-line".

WE Comp Methods

Basic System  
IBM 705 Mod. II; 10 Type 727 Tape Units; 1 Type 754 Tape Unit; control 1 Type 734 Drum; 1 Type 714 Card Reader; rental is \$28,560/month.

Additional Equipment  
1 Type 714 Card Reader; 1 Type 717 Printer; 1 Type 722 Card Punch; 2 Type 720A Printers; controls; and 6 Type 727 Tape Units rent for \$18,010/month.

PERSONNEL REQUIREMENTS

Manufacturer

Operator, programming, and technical training is available as well as assistance at all levels.

Naval Construction Bn Ctr

	One 8-Hour Shift		Two 8-Hour Shifts	
	U	Rec	U	Rec
Supervisors			9	
Analysts	5		5	
Programmers & Coders	18	22	18	22
Clerks	1		1	
Librarians	1		2	
Operators	1		2	
In-Output Oper	3		4	
Tape Handlers	2		4	

Personnel includes Yards and Docks Supply Office. Engineers and technicians are furnished by contractor.

Operation tends toward closed shop.

Methods of training used includes formal classroom and on-the-job.

Mare Island Naval Shipyard

	Three 8-Hour Shifts	
	Used	Recommended
Supervisors	5	6
Programmers	11	15
Clerks	4	4
Operators	6	6
In-Output Oper	10	10

Personnel supervisor requirements shown are for consolidated EDP-EAM operations, programming and administration. Supervisors shown are:

- Head, Data Processing Center
- Head, Programming (Vacant)
- Head, Operations
- 3 Operations Shift Supervisors

Programmer performs functions in Data Processing Center. Analysts are in various departments and may work on any project.

Some clerical control and balancing operations performed by EAM Operators who also operate equipment. Equivalent effort of about two clerks relative to EDP portion. Clerical staff of two persons handle combined EAM-EDP administrative requirements; i.e., filing, letters, personnel actions, etc.

Librarian and tape handling functions performed by peripheral equipment operators.

Engineers and technicians furnished by manufacturer under rental contract.

Operation tends toward closed shop.

Methods of training used includes: programmers - manufacturer's standard programming course (4 weeks plus on-the-job experience) and operators - on-the-job training.

USA TAGO

	One 8-Hour Shift		Two 8-Hour Shifts	
	Used	Recom	Used	Recom
Supervisors	2	2	2	2
Analysts	21	21		
Programmers & Coders	32	32		
Clerks	6	6		
Librarians			2	2
Operators			4	4
In-Output Oper			4	4
Tape Handlers			2	2

Operation tends toward open shop.

Methods of training used includes IBM conducted classes and on-the-job training.

USA ABMA

	One 8-Hour Shift
Supervisors	1
Analysts	11
Programmers	4
Clerks	1
Librarians	1
Operators	2
Engineers IBM	12
In-Output Oper	2

One additional supervisor is required for each additional 8-hour shift. Three additional input-output operators are required for a second 8-hour shift and two additional input-output operators are required for a third 8-hour shift.

Operators are used on 704's, 705 and 709 in rotating shifts.

The 12 IBM engineers rotate shifts on the 704's and 709.

Operation tends toward open shop.

Methods of training used includes on-the-job and formal schooling for programmers and operators.

USA EMC

The computer is operated three shifts a day five days a week. The actual operating hours are continuous from 7:30 A.M. each Monday through 7:30 A.M. the following Saturday. One console operator and two peripheral equipment operators man each shift. These peripheral operators assist the console operator by mounting and dismounting on tape drives which are involved in main frame operations. The operators also perform all "off-line" operations.

The computer room supervisor is assigned to the basic shift (7:30 A.M. - 4:00 P.M.). A tape librarian is also assigned to the basic shift.

Ten analysts are employed in the researching of new projects and the feasibility of utilizing new types of equipment. These analysts also write the basic logic for new operations.

These nineteen people assigned to writing programs. This program writing consists of writing new programs, changing existing programs because of changes in criteria, changing programs so as to take advantage of new programming techniques.

Operation tends toward closed shop.

Programmers receive a basic course in programming from the IBM Corporation. This course runs from three to five weeks depending on the amount of detailed instruction given and practice allowed. At the end of the course the new programmers are assigned to work with more experienced programmers until they become self sufficient.

The original group of console operators and peripheral equipment operators received the basic programming course from the IBM Corporation. The actual operation of the equipment was taught, on the job, by IBM personnel. The more recent additions to the force of peripheral operators have not received the programming course from IBM. They have learned the operation of the equipment, on the job, from our more experienced operators.

USAF Tinker AFB (2)

Supervisors	1
Clerks	0
Librarians	2
Operators	4
Tape Handlers	12

Above requirements is for each system.

Machine operated three (3) shifts seven (7) days per week.

Programmers and coders cannot be identified with individual system.

USAF ASO

	Three 8-Hour Shifts
Supervisors	25
Analysts	14
Programmers	35
Coders	6
Clerks	40
Librarians	3
Operators	40
Engineers	8
Technicians	3
In-Output Oper	8
Tape Handlers	2

Methods of training used includes IBM Educational Center and on-the-job training.

USAF ADC

	Two 8-Hour Shifts	
	Used	Recommended
Supervisors	5	5
Analysts	1	1
Programmers	22	24
Coders	0	2
Clerks	3	3
Librarians	1	1
Operators	4	4
Engineers	2	2
Technicians	0	0
In-Output Oper	2	2
Tape Handlers	2	2

Operation tends toward closed shop.

Programmers attend 705 Course conducted by IBM. On returning to this unit, but after completing practice problem where review of programming techniques are reviewed, programmers are assigned under the supervision of a senior programmer where on-the-job training continues until reaching the fully qualified level.

Operators attend 705 Course conducted by IBM. Other training is obtained through on-the-job training.

USAF SB AMA

SBAMA EDP personnel requirements support the logistical mission. Additional personnel support the PCAM effort. PCAM is utilized in an integrated data processing system to provide extra off-line capability. Coders are included in the programmer category.

Because of the varying quantitative effect and diverse character of the workload in the AMC logistical support, an inflexible recommendation of personnel was not attempted. Cross-trained personnel qualified to employ techniques in various computer configurations provide system flexibility.

Engineers and technicians to service and maintain the EDP equipment are provided on a contractual basis by the manufacturer concerned.

Extra shift time for analysts, programmers and clerks is not on a regularly scheduled basis. Whenever the workload occasion demands, personnel hours are specially scheduled.

Systems Analysis, Development and Programming staff operate on one 8-hour daily shift, 5 days per week. Computer operations staff work on three 8-hour daily shifts, 7 days weekly.

Operation tends toward closed shop.

Methods of training used includes formal training by manufacturer and on-the-job training.

USAF Olmsted AFB

	One 8-Hour Shift		Three 8-Hour Shifts	
	Used	Recom	Used	Recom
Supervisors	1	1	3	3
Analysts	5	5		
Programmers	10	10		
Librarians			2	2
Operators			5	5
In-Output Oper			5	5
Tape Handlers			6	6

Above staffing is sufficient to operate:

- 1 705 II
- 1 720A Hi Speed Printers
- 1 Card to Tape

One operator and 2 tape handlers are used on the 705 at all times.

Methods of training used includes formal IBM classroom training (4 1/2 weeks) and approximately 2 years on-the-job training.

NSA

	One 8-Hour Shift
Supervisors	1
Librarians	1
Operators	1
Engineers	1
Technicians	1

Operation tends toward closed shop.

Methods of training used includes formal class and on-the-job training.

AT and T, LLD

	Two 8-Hour Shifts	
	Used	Recommended
Supervisors	28	
Analysts	7	
Programmers	42	
Clerks	5	10
Librarians	3	3
Operators	5	5
In-Output Oper	8	8

Operators and system analysts are supervisors.

In-output operators and tape handlers are interchangeable.

Operation tends toward closed shop.

Methods of training used includes IBM schools and on-the-job training.

AT and T, TD

	One 8-Hour Shift	Two 8-Hour Shifts
Supervisors	2	3
Analysts, Prog. & Coders	7	
Librarians	1	1+
Engineers 16M	3	4
In-Output Oper & Tape Hand	4	6

Methods of training used includes IBM 705 Programmers School for a-b-c-d- above 1-1, plus console experience and programming. All others - on-the-job training.

Our training section intends to have one of our own people train our 705 people on our premises.

Boeing Wichita

	Three 8-Hour Shifts
Supervisors	5
Programmers	26
Librarians	5
Operators	6
In-Output Oper	7

Operation tends toward closed shop.

Methods of training used includes:

Machine Operators - IBM schools and on-the-job training

Programmers - IBM schools and special classes on programming and advanced languages conducted by company technicians.

Con Edison

	Three 8-Hour Shifts
Supervisors	10
Analysts, Programmers & Coders	22
Clerks	2
Librarians	2
In-Output Oper	19

Methods of training include IBM School and on-the-job training for programmers and on-the-job training for input-output operators.

Convair Fort Worth

	Three 8-Hour Shifts	
	Used	Recommended
Supervisors	4	4
Analysts	4	9
Programmers	14	18
Librarians	1	2
Operators	7	9

Operation tends toward closed shop.

Esso Standard

	One 8-Hour Shift
Supervisors	8
Analysts, Prog. & Coders	20
Clerks (Scheduler)	1
Librarians (Tape)	1
Operators - 705	
Engineers (IBM)	
In-Output Oper	25

Supervisors are for entire Data Processing and Programming Departments. There are 6 operators (705) and 6 IBM engineers for two 8-hour shifts. Tape handling is done by 705 operators.

Operation tends toward closed shop.

Programmers and 705 operators all given programming course by IBM. All other training done on the job.

Farmers IG

	One 8-Hour Shift
Supervisors	1
Analysts	2
Programmers	2
In-Output Oper	1
Tape Handlers	1

Operation tends toward open shop.

Firestone

	One 8-Hour Shift
Programmers	14
Engineers	4
In-Output Oper	5

Methods of training used include IBM Schools, UCLA, and AMA Seminars.

Ford Motor Man Ser

	One 8-Hour Shift
Supervisors	2
Analysts	7
Programmers	15
Operators	2
Engineers	3
In-Output Oper	4

Personnel requirements in our organization are based upon workload and the nature of the application. Two programmers, 2 operators, 2 engineers and 3 input-output operators are required in addition to the first shift shown for running three 8-hour shifts.

Operation tends toward open shop.

Ford Div

	One 8-Hour Shift	
	Used	Recommended
Supervisors	1	1
Programmers	5	
Clerks	2	4
Librarians	1	1
Operators	2	2
In-Output Oper	1	1

One supervisor and 4 operators are used on the second and third 8-hour shift. Two additional input-output operators are recommended.

Operation tends toward open shop.

Hughes

	One 8-Hour Shift
Supervisors	6
Analysts	13
Programmers	18
Clerks	3
Operators	6

Eleven additional operators are required for two additional 8-hour shifts. A three shift total of 57 persons are used. Total figure includes clerical and staff. On-the-job training used.

Operation tends toward open shop.

It is necessary that operating personnel be familiar with all technical procedures of machine operation.

Therefore, all personnel are trained as console operators, hence no figures are given for the in-output operator, tape handler, or technician classifications.

IH

	Three 8-Hour Shifts	
	Used	Recommended
Supervisors	6	6
Analysts	2	2
Clerks	3	3
Operators Console	6	6
Engineers	5	5
In-Output Operators	11	11
Tape Handlers	6	6

Operation tends toward open shop.

Personnel are trained on the actual job. On-the-job training is supplemented by home study course on punched card equipment and by programming school for 705.

This operation serves as a service center. All programming is performed at other locations. Certain of the above personnel are engaged in systems and programming work but only for the internal operation of the computer center.

Illinois Central

	One 8-Hour Shift	Two 8-Hour Shifts
Supervisors		2
Analysts, Prog. Coders	9	
Operators		2
Engineers	3	
In-Output Operators		2
Tape Handlers		2

Operation tends toward closed shop.

McDonnell Aircraft

	One 8-Hour Shift
Programmers	35
Clerks	0
Librarians	0
Operators	2
In-Output Operators	2
Tape Handlers	0

One librarian is recommended. The second and third shifts use a total of 5 additional operators. Six are recommended.

3M

	One 8-Hour Shift	Two 8-Hour Shifts
Supervisors		2
Programmers	16	
Librarians	2	
Operators		12

Operation tends toward open shop.

Sandia Corp.

	First 8-Hour Shift	Second 8-Hour Shift	Third 8-Hour Shift
Supervisors	9	1	
Programmers	24		
Librarians	1	1	
Operators	2	1	2
In-Output Oper	5	2	

Analysis, programming, and coding is performed by one person classified as a programmer.

Operation tends toward open shop.

SOHIO

	One 8-Hour Shift	Two 8-Hour Shifts	Three 8-Hour Shifts
Supervisors	3	3	3
Anal, Prog. Cod.	22	22	22
Librarians	1	1	1
Operators	3	5	5
Engineers	5	5	5
In-Output Oper	1	1	1

One additional input-output operator is recommended.

Operation tends toward closed shop.

Texaco

	One 8-Hour Shift	Two 8-Hour Shifts	Three 8-Hour Shifts
Supervisors	1	1	1
Anal. Prog. Cod.	45		
Clerks	1	1	1
Librarians	1	1	1
Operators	4	7	8
Engineers	3	4	5

An additional clerk and a librarian are recommended. Operation tends toward open shop.

Methods of training includes company operated computer schools, colleges, on job training. Personnel are normally selected from departments of the company. USS TC and I

	One 8-Hour Shift	
	Used	Recommended
Supervisors	4	4
Programmers	21	21
Clerks	4	4
Operators	3	3
Technicians	3	3
Tape Handlers	2	2

Operation tends toward open shop. WE Hawthorne

	Two 8-Hour Shifts
Supervisors	10
Analysts	14
Programmers	19
Clerks	2
Operators	4
Engineers	20
In-Output Oper	4

Operation tends toward open shop.

Methods of training used consists of IBM 705 Programming School followed by on-the-job training under the guidance of experienced personnel.

WE Comp Methods

	One 8-Hour Shift	Total for Two 8-Hour Shifts
Supervisors	7	7
Analysts	26	26
Librarians	1	1
Operators	2	4
In-Output Oper	3	3

One additional supervisor and 1 additional input-output operator is recommended. Development personnel perform all functions of analyzing, programming and coding. There are three levels (tentatively identified as analyst, specialist, and coordinator) through which these personnel progress. All computer employees are classified as management personnel.

Methods of training used are IBM 5 week Programming School, and on-the-job training under IBM personnel and with our more experienced programming personnel and supervisors.

**RELIABILITY, OPERATING EXPERIENCE, AND TIME AVAILABILITY**

Naval Construction Bn Ctr

Average error-free running period	211.6 Hours
Good time	81.38 Hours/Week (Average)
Attempted to run time	81.59 Hours/Week (Average)
Operating ratio (Good/Attempted to run time)	0.9974
Above figures based on period	1 Dec 59 to 1 Jun 60
Passed Customer Acceptance Test	10 Mar 59
Time is available for rent to outside organizations.	

An average of five hours nightly would be available for rent under present workload conditions.

Mare Island Naval Shipyard

Good time	95 Hours/Week (Average)
Attempted to run time	97 Hours/Week (Average)

Operating ratio (Good/Attempted to run time) 0.98  
Above figures based on period 1 Jul 60 to 31 Jul 60  
Passed Customer Acceptance Test 3 Mar 58  
Time is not available for rent to outside organizations.

USA TIAGO

Good time 64.7 Hours/Week (Average)  
Attempted to run time 71.0 Hours/Week (Average)  
Operating ratio (Good/Attempted to run time) 0.91  
Above figures based on period 1 Sep 59 to 29 Feb 60  
Passed Customer Acceptance Test Mar 57  
Time is not available for rent to outside organizations.

USA ABMA

Good time 108.7 Hours/Week (Average)  
Attempted to run time 111.2 Hours/Week (Average)  
Operating ratio 0.978  
Above figures based on period 1 Jan 60 to 31 Mar 60  
Passed Customer Acceptance Test 13 Oct 58  
Time is not available for rent to outside organizations.

USA EMC

Passed Customer Acceptance Test 8 Jul 57  
Time is available for rent to qualified outside organizations.

Our 705 operation runs continuously from 7:30 A.M. each Monday through 7:30 A.M. the following Saturday. The 120 intervening hours are available for production runs with the following exceptions:

Each Tuesday and Thursday from 7:30 A.M. until 1:30 P.M. the computer is used to "debug" and test programs.

Each Tuesday and Thursday from 1:30 P.M. until 5:00 P.M. the computer is turned over to the IBM engineers for their preventive maintenance.

During the period of July 1959 through June 1960 breakdown time averaged 16.13 hours per month.

USAF Tinker AFB

534; 626; 0.85; 1 Apr 60 to 30 Apr 60; time is not available. Above computed on available time after maintenance down time.

USAF Tinker AFB

548; 579; 0.946; 1 Apr 60 to 30 Apr 60; time is not available. Above computed on available time after maintenance down time.

USAF ASO

208; 240; 0.84; 21 Mar 60 to 25 Mar 60; Sep 57; time is not available.

USAF ADC

74; 75; 0.988; 1 Jul 59 to 1 Jul 60; time is not available.

USAF SB AMA

The main frame acceptance dates for each of the IBM 705 systems were System No. 1 24 February 1958 and System No. 2 27 August 1959. Time is not available for rent to outside organizations.

USAF Olmsted AFB

75.8; 78.4; 0.97; Feb 60 to Apr 60; Feb 60; time is not available.

NSA

37.9; 38.2; 0.992; 1 Dec 59 to 31 Dec 59; time is not available.

AT and T, LLD

One hour; 55; 65; 0.85; Jan 60 to Mar 60; May 59; time is not available.

AT and T, TD

Passed Customer Acceptance Test Aug 58  
Time is not available for rent to outside organizations.

Average monthly down time 12-18 hrs. (one shift basis) Dec. 59 - Mar. 60. Preventive maintenance time during working hours 3 to 4 hours/week. 705 main frame checked out each morning 7:30 - 8:30 before working hours.

Boeing Wichita  
200; 240; 0.833 (2 systems); Jan 60 to Apr 60; 1st -  
3 Sep 56, 2nd - 28 May 58; time is not available.  
Convair Fort Worth  
20.6; 93.1; 103.6; 0.90; 21 Mar 60 to 17 Apr 60;  
18 Aug 58; time is not available.

Esso Standard  
50; 59; 0.848; 1 Mar 60 to 31 Mar 60; Apr 56; time  
is not available.

Firestone  
Good time 75 Hours/Week (Average)  
Attempted to run time 75 Hours/Week (Average)  
Operating ratio 0.994  
Above figures based on period Jul 57 to Jul 60  
Passed Customer Acceptance Test 17 Aug 57  
Time is available for rent to qualified outside or-  
ganizations. Time is available only to other 705II  
users under a Mutual Assistance Contract.

Ford Notor Man Ser  
Average error-free running period 8 Hours  
Good time 67.7 Hours/Week (Average)  
Attempted to run time 87.1 Hours/Week (Average)  
Operating ratio 0.77  
Above figures based on period Jan 59 to Dec 59  
Passed Customer Acceptance Test Mar 56  
Time is available for rent to qualified outside or-  
ganizations.

Ford Div  
100; 50; 50.5; 0.993; Aug 59 to May 60; 31 Jul 59;  
time is not available.

Hughes  
Building 105 System  
Good time 376.19 Hours/Month (Average)  
Above figure based on period 1 Feb 60 to 29 Feb 60  
Passed Customer Acceptance Test Dec 56  
Time is not available for rent to outside organiza-  
tions.

Service Bureau System  
Good time 242.25 Hours/Month (Average)  
Above figure based on period 1 Feb 60 to 29 Feb 60  
Passed Customer Acceptance Test Jun 59

A total of 149.1 hours of lost time was accumulated  
for both systems due to program failure, re-run time,  
operator error, and machine failure.

An additional down time for preventive maintenance  
of 62.8 hours and 106 hours for the two systems,  
respectively, was accumulated in February 1960.

IH  
Good time 206.7 Hours/Week (Average)  
Attempted to run time 230.1 Hours/Week (Average)  
Operating ratio 0.895

Above figures based on period 1 May 60 to 31 May 60  
Passed Customer Acceptance Test 15 Aug 57

Some time is available for rent if the time request-  
ed falls at times not required in order to meet our  
schedule. This is primarily over weekends and some-  
times on Monday nights.

Illinois Central  
7; 46; 53; 0.866; 1 Mar 60 to 31 Mar 60; 1 Oct 58;  
time is not available

McDonnell Aircraft  
106.3; 114.4; 0.929; 4 Apr 60 to 30 Apr 60; Aug 57;  
time is available.

3M  
65; 73; 0.89; Oct 56 to date; Nov 56; time is avail-  
able at some periods of the month.

Sandia Corp.  
141; 152; 0.93; Jan 60 to 31 May 60; 1 Aug 58; time  
is not available. Machine trouble for the past 3  
months has been exceptionally high. Normally the  
operating ratio would be about 0.98.

SOHIO  
105; 110; 0.955; 1 Jan 60 to 31 Mar 60; Aug 56;  
outside rental is available, dependent upon our sch-  
edules and size of job.

Texaco  
15; 87; 93; 0.935; Jan 60 to Jun 60; Apr 57; time is  
not available.

USS TC and I  
15; 52.6; 56.0; 0.94; 1 Apr 60 to 15 May 60; 1 Dec  
56; Time is available depending upon availability  
of scheduling to meet requirements of outside organ-  
ization.

WE Hawthorne  
5; 61.8; 66.9; 0.93; 28 Mar 60 to 22 May 60; Sep 57;  
time is not available.

WE Comp Methods  
67.58; 73.16; 0.92; 28 Dec 59 to 26 Jun 60; 14 Jan  
58; time is not available.

Bilateral agreement with Esso Std. Oil, Bayway,  
N.J. Refinery, for reciprocal use of computer in case  
of machine breakdown.

## ADDITIONAL FEATURES AND REMARKS

### Manufacturer

Special Representatives  
This group offers overall consulting service in  
connection with the study of possible uses.

### Educational Program

One-week classes conducted for executives at IBM  
educational departments in Endicott and Poughkeepsie,  
New York. Comparable classes are available in sever-  
al major cities across the country. These courses  
are designed to acquaint executives with the organ-  
ization, operating characteristics, capacities, and  
applications of the 705. Customers who complete this  
course are better able to evaluate the advantages,  
economics and wide business applications of the 705.  
In addition to the executive class, courses are avail-  
able to qualified methods personnel. These classes  
are of longer duration and provide knowledge of pro-  
gramming and necessary operating details.

### Programming Service

Personnel are available for consultation with field  
representatives and customers. A library of programs  
common to many problems is available for adoption  
as sub-routines by customer. Automatic coding as  
listed under automatic coding are available. Sym-  
bolic coding methods and assembly programs are avail-  
able.

### Sales Engineering

Engineers are available to assist in preparing the  
site for physical installation. This assistance be-  
gins twelve months in advance of delivery. Many  
systems have been installed.

### Naval Construction Bn Ctr

Outstanding features are variable word length.  
Alphanumeric. Modular memory and input/output read  
while write and high speed rewind.

Unique system advantages include compatibility  
with other IBM systems. Generalized utility programs  
provided by manufacturer. Autocoder system for cod-  
ing. Ability to have input/output devices on-line  
or off-line by merely flipping a switch.

Adopted procedures for magnetic tape labelling,  
storage, shipping, and protection from humidity,  
temperature and physical, electrical, fire, or other  
damage are: all tapes have internal and external  
labels. The internal label is automatically checked  
at the start of any program run. This also prevents  
writing on a tape that is not old enough to erase.  
A fireproof tape vault is provided with a capacity of  
over 3,000 tapes.

#### Mare Island Naval Shipyard

Outstanding feature is no special RPQ to equipment except on-line-off-line switch on card reader, as well as standard one on the control.

Internal program tape label control. Tape control (library) is on insert cards on tape case. Labelon used for temporary special identification. Separate storage of grandfather tapes and transaction tapes for emergency recovery. Tapes not normally shipped.

#### USA TAGO

All magnetic tapes are labeled with "Labelon" pressure sensitive tape. Storage is accomplished in steel lock cabinets subject to the same temperature and humidity controls as the computer. Provisions for a tape vault are in the planning stage. Duplicate tapes are shipped to an alternate storage site packaged in the same manner as new tapes in order to permit file recovery in case of total site destruction.

A Taylor temperature-humidity recorder linked to an automatic audio-visual alarm system insures operation in the safe ranges of 60-80 degrees Fahrenheit and 40-60% relative humidity.

Employees are instructed in procedures designed to prevent damage to tapes and equipment in case of fire or other emergency.

#### USA ABMA

Outstanding features are read-while-write and variable length records.

External labels - pressure adhesive. Tape cabinet storage. Shipping - General Humidity: kept in computer room - fireproof building.

#### USA EMC

Magnetic tapes are labeled at the time of production, with a heavy paper label which fits into the slot provided on the reel. The tapes are stored in metal racks in a partitioned area of the computer room thus they receive the same protection as the computer itself.

#### USAF ASO

35 character identification record at beginning of each tape. "Labelon" tag on reel (written by operators). Tape library kept in humidity-temperature controlled room.

#### USAF ADC

Unique system advantage is that it provides efficient, effective and economical centralized control on command-wide applications.

Tapes are stored in the Tape Library in the air conditioned computer room. A separate master file of tapes is stored in a vault in another location for fire prevention. All tapes are labeled when used and a master file is maintained by Run Number and Tape Number.

#### USAF SB AMA

Outstanding features are flexibility of on-line data processing operation to handle a maximum of 26 input/output magnetic tape files in one computer system and 22 files in the second system.

Unique system advantages are that it permits the processing of data from source data to finished report on-line to conform to desired format and system is flexible to permit off-line simultaneous operations without committing the main frame.

Adopted procedures for magnetic tape labelling, storage, shipping, and protection from humidity, temperature and physical, electrical, fire or other damage are:

Adequate fire protection measures such as automatic sprinkling systems, fire extinguishers and other devices are provided in readily accessible locations. In addition, fire prevention precautionary measures

such as "no smoking" are enforced in proximity to magnetic tape files.

AMC Standard Utility Package label and file identification procedures are used on other than Advanced Logistics Systems. A file and label identification system specially developed for the Advanced Logistics System and an integral part of A.L.S. is used.

Contractor specifications are used as a guide for humidity and temperature controls in the operational phase of EDP.

A combined librarian-scheduling unit for expediting and synchronizing data flow with operational schedules provides internal managerial control of EDP operations.

#### AT and T, LLD

A unique system advantage is the variable word length.

Tape handling: Magnetic tape labels used, smoke detection devices used, operating areas isolated from each other by fire proof partitioning, remote storage of tapes, and alarms transmitted to remote 24 hour coverage for all important operating conditions.

#### AT and T, TD

Tape handling: Tape labeling - All tapes internally labeled before use, and external labels applied before each usage. Tapes in daily use stored in library in 705 room with humidity temperature and fire control systems. Tapes are rotated from permanent storage at a location away from New York on a quarterly basis. Shipping in metal fireproof boxes.

#### Boeing Wichita

Outstanding features are that the two 705 II systems are completely compatible and separated by a fire wall. This offers scheduling flexibility and partial backup in case of catastrophe.

Tape handling: Magnetic tape labelling used. Previous cycle master files stored in remote area for reconstruction if necessary. Tapes sealed in plastic for shipping or warehousing. Working files stored in metal cabinets in humidity and temperature controlled area. Smoke detectors installed. No sprinkler system.

#### Con Edison

Tape handling: Tapes kept in several storage rooms adjacent to but separated from the computers by suitable fire resistant walls. Mylar tape is used which does not require close humidity control.

#### Convair Fort Worth

Tapes stored in metal open racks in computer room under humidity and temperature control present in the room. Only fire protection available is that which is installed in computer room. Each reel of tape has a permanent number assigned and a temporary label for data stored on tape. Cross-reference Kardex ledger card kept for each reel of tape: 1 - by permanent reel number and 1 - job number (data stored on tape).

#### Firestone

No magnetic tape labelling. Humidity maintained at 40% - 60%, temperature at 70° to 75°. CO<sub>2</sub> fire protection in tape storage rooms.

#### Ford Motor Man Ser

All tapes are identified by number on the reel. Some applications use internal tape I.D. records. All tapes, with the exception of the master tapes, are filed in standard files in the computer room. The master tapes, 1050 reels, are stored in fireproof vaults (heat capacity of vault - 4 hours).

#### Ford Div

All input tapes and master tapes are stored in fire proof vault, excess are stored in computer room under humidity control. All tapes are given tape identification in the job program.

Hughes

Outstanding feature is that tape drives have illuminated dial setting display. A unique system advantage is the variable word length type system.

Tape containers stored in cement block fire-proof vault with constant humidity and temperature. External tape labelling system used.

IH

An outstanding feature is a switching device to switch on-line card header from one computer to the other.

All tapes are magnetically labelled and checked at the start of each job. Guides for tape changes and console operators are prepared mechanically from a deck of input-output data cards. Computer room controlled closely from humidity and temperature controls--no sprinkler system. Fire extinguisher conveniently placed and all personnel trained in their usage.

JM

Outstanding features are accuracy, speed, flexibility and variable length records.

Separate room for tape storage. S.O.P. to pull rings when job completed on CPU and only librarian puts them back on. Tapes held until output tapes are used in following job and it is completed and checked out.

Sandia Corp

A unique system advantage is the 705 Processor, with variable field length.

Tapes are stored in a vault, primarily for security, also for fire.

SOHIO

Outstanding features are variable word length core memory, full character representation for each memory position, and read-while-write feature.

We do not have any programmed tape labelling. Each tape used has an external label listing all necessary data (Input/Output of various programs, printing or punching, release dates, etc.). The entire computer room is controlled around the clock for both temperature and humidity. We have standby units in case of failure. We do very little shipping of tape, but if we do, they are packaged in the same container that they came in. For fire protection, we have very little burnable material in the computer room. Also we have a master key switch to turn off all power, and a fire hose.

WE Hawthorne

No magnetic tape labelling used. Tapes are stored in metal cabinets in an air-conditioned vault adjacent to the machine room. All areas are protected with a sprinkler system.

WE Comp Methods

Separate external reel labels for tape and data identification. Internal labeling for data identification and protection partially in use. Tape stored in open steel cabinets in separate library enclosed in 6 ft 6 in high steel and glass partitions, with fire resistant computer room. Tapes are not removed from computer room. Data on tape not sent out or received. Temperature and relative humidity consistently maintained at 75° and 50% respectively. Absolute limits: Temperature upper 80° lower 50°. Relative humidity upper 60% lower 40%. Smoke alarm in return air duct terminating in IBM customers engineers room and Plant Fire Headquarters. Portable CO<sub>2</sub> extinguishers installed at frequent intervals around perimeter of room.

## FUTURE PLANS

Manufacturer

There is growth upwards from the 705 with complete program compatibility to the 7080 Data Processing System.

Naval Construction En Ctr

In the proposal stage is a plan to install an IBM 1401 Data Processing System to replace the Type 774 Tape Data Selector and the Type 607 Electronic Calculator at a net savings to the government. This will provide more computing capacity and faster off-line operations at reduced cost.

Mare Island Naval Shipyard

IBM 1401C with 1402, 1403 and one 729 on order to replace 720 Printer.

IBM 1401C with 1402, 1403 and two 729 requested (now pending) to replace card reader, punch and EAM equipment and intended to divert from 705 some of smaller jobs.

Preliminary review for replacement with solid state machine. Primary reason being increased capacity and speed at lower rentals on newer computers. No determination made as to replacement machine or date of replacement.

USA TAGO

Add an IBM 1401 complex to replace peripheral output equipment.

USA EMC

EMC forwarded to higher authority a justification for acquiring IBM 1401 Data Processing Equipment. This equipment was justified primarily on the basis of its replacing certain IBM 700 series equipment used for card reading, punching, and printing. The requested equipment operates at much faster speeds than the presently used equipment, has 4000 positions of core memory, and rents for nearly \$500 less per month.

The IBM 1401 equipment requested consists of:

1	1401/C3	Processing Unit
1	1402/1	Card Read Punch
1	1403/2	Printer
4	729 II	Tape Units

The IBM 1401 Processing Unit will be equipped with four special devices which provide for high-low-equal compare, multiply-divide, print storage, and advance programming. In addition, we have requested the IBM 705 II Central Processing Unit be modified to provide for reading cards directly into memory.

The present IBM 700 series equipment to be released when the IBM 1401 equipment becomes operational is as follows:

2	717	Printers
2	757	Printer Control Units
1	722	Card Punch
1	758	Card Punch Control Unit
1	714	Card Reader
1	759	Card Reader Control Unit
1	727	Tape Unit

In our development of projects for ADPS applications we will determine whether they can best be performed on the IBM 1401 equipment or the IBM 705 II, and will program the application for the appropriate equipment.

We are currently studying all large scale computers in regard to our projected workload requirements for EMC and the recently announced single manager mission for military construction supplies. It is anticipated that these studies will result in a justification for computer equipment of much greater capacity than we are presently using. These studies will probably be completed by the first of next year.



USAF ASO

2 IBM 705 Mod III Systems, each with 16-729 Mod III Tape Units and 3 IBM 1401 Mod C Systems each with 3-729 Mod IV Tape Units will replace the present equipment.

USAF ADC

The acquisition of a IBM 1401 is planned. This will replace the 720 Printer and Card Punch now in use.

USAF SB AMA

IBM 1401 Computer Systems are scheduled to be acquired at Norton AFB. These are to be used in conjunction with the IBM 705 Systems to relieve the large scale computers of the less involved processing, particularly in editing and sorting operations. In addition, this equipment will replace peripheral items such as tape data selectors and printers.

Future developments involving EDPE in AMC activities are generated at Hq AMC, Wright-Patterson AF Base, Dayton, Ohio.

USAF Olmsted AFB

Following programs will be implemented:

- Weapon System Stock Control and Distribution, Prime Class Stock Control and Distribution
- Air Vehicle Configuration Status
- AT and T, LLD

Magnetic tape to magnetic tape transmission.

IBM 1401 to replace peripheral equipment.

IBM 1401's to remote locations tied to central data processing center by magnetic tape-to-tape transmission.

AT and T, TD

Replace present 705 II with 705 III with 729 III high speed tape drives.

Replace present 720A's (3) and 730 (1) printer with four (4) 1401 systems.

Boeing Wichita

Plan to replace two 705 II Systems with one 705 III System, with drum, 80K memory, two DSU's and twenty tape drives.

705 auxiliary equipment will be replaced with 1401 Systems by early 1961.

Hope to reduce to 14 tape drives on-line by file grouping output for processing on 1401 Systems.

Considering a low speed, low priced RPQ "on-line" card input device for use with 705 III to replace Type 714 Card Reader.

Con Edison

Changing main frames from 705 Model II to 705 Model III in June and July 1960.

IBM Model 1401 printer punches to replace most of present peripheral equipment.

Convair Fort Worth

New equipment plans

Install 2 IBM 1401-C3 Systems to replace:

- 1 Card Punch
- 1 Card Reader and Control Unit
- 2 150 lines/min printers and control units
- 1 500 lines/min printer and control unit
- 1 Tape Data Selector and power unit

Install 1 IBM 7080 Computer to replace 1 IBM 705 Computer.

Esso Standard

We have on order two IBM 1401 Tape Systems. These systems will be used for our smaller computer jobs, and for processing input and output in support of the 705 System. This will permit release of most of our 700 series peripheral equipment and some of our EAM (punched card) equipment.

Firestone

All peripheral off-line equipment to be replaced with 2 1401 complexes consisting of:

- 1 1401
- 1 1402
- 1 1403
- 2 729 II

IBM 705 I II

Ford Motor Man Ser

Our present plans call for exchange of all auxiliary equipment and replace it with 2 1401 Systems.

Ford Div

Planned replacement of present peripheral equipment with two IBM 1401 installations. Also, considering replacement of existing 705 when capacity utilization makes replacement necessary.

As to prospective applications, new applications are being built principally in the sales and manufacturing area. These will include analysis of sales data, forecasting of vehicle options and accessories, maintenance of master bills of material, and related computer applications.

Hughes

Integrated systems study now being formalized.

(A data processing system has not been chosen as yet).

Consideration is being given for replacement of existing peripheral equipment (card punch, printer, and card reader) with IBM 1401 Tape System.

RAMAC (305) will be installed at El Segundo Plant Site to handle manufacturing production requirements. (Scheduled for mid-summer).

EAM projects, in corporate areas, are being converted to the 705 Data Processing System.

Convert existing 705 Model I System to 705 Model II System.

Hughes

Installation, by lessor, of a 5,000 KVA transformer to stabilize line transients.

III

We have proposed the replacement of the 2 705 Systems by one 7080 System. Also our three printers stations, one card-to-tape station, and one tape-to-card station are to be removed and replaced by 3 of the 1400 series systems.

Anticipated applications to be added are:

Credit and Collections

Machine loads

Monthly works costing and closing

Illinois Central

IBM Model 7080 to replace existing equipment.

3M

Three (3) Type 1401 Systems are on order. Various projects underway to fill up available time on the computer.

Sandia Corp.

It is anticipated that the 705 II will be replaced with a 7090 and two (2) 1400's.

New applications:

Personnel, Tool Accountability, Budget, and Parts List

SOHIO

Equipment

Replace Model II 705 with a Model III 705.

Replace independent equipment, for 705 System, and tabulating EAM equipment with three 1401 Systems.

Replace 705 Model III System with a 7080 System by end of 1961. This is to handle expected increase in load.

Systems and Production Plans

Purchasing, payroll and manpower statistics, retail billing, yield accounting, inventory control, stockholder accounting, property accounting, general accounting, refinery scheduling, pipeline scheduling, forecasting (various functions), and linear and non-linear programming.

Texaco

Install IBM 7090 with 16 789 IV tapes on line.

Install 5 IBM 1401 Systems in Houston, 1 in Los Angeles, 3 in New York, and 2 in Chicago.

Release present 705 and peripheral equipment following checkout of above 7090 System.

WE Hawthorne  
The present IBM 705 II EDPM will be replaced with an IBM 705 III. Only the magnetic drum and the card reader along with their respective control units will be retained. In addition, the auxiliary equipment consisting of 3 printers, a card reader, a card punch, and several tape units will be replaced by two IBM 1401 C EDPM's and one IBM 1401 D EDPM.

#### WE Comp Methods

Orders were issued for replacement of present 705 Mod. II and drum with IBM 705 Mod. III with 80,000 core storage. Also to replace present peripheral equipment with three IBM 1401 Systems except one Type 714 Card Reader will be retained for "on-line" use - new system will use high speed - high density type 729 tape units.

Other areas planned for future computer processing include:

Inventory control, stock record keeping, equipment and component shop ordering, customer engineered order editing and entering, shop accounting, wage incentive crediting, and customer contract preparation and billing.

## INSTALLATIONS

U. S. Naval Construction Battalion Center, Port Hueneme, California  
Mare Island Naval Shipyard, Mare Island, California  
U. S. Army, The Adjutant General's Office, The Pentagon Building, Washington 25, D. C.  
U. S. Army Ballistic Missile Agency, Bldg. 4663, Redstone Arsenal, Alabama  
U. S. Army Engineer Maintenance Center, 52 Starling Street, P. O. Box 119, Columbus 15, Ohio  
U. S. Air Force Headquarters, OCAMA, Tinker Air Force Base, Oklahoma (2)  
U. S. Air Force Aviation Supply Office, 700 Robbins Avenue, Philadelphia 11, Pennsylvania  
U. S. Air Force Headquarters, Air Defense Command, Ent Air Force Base, Colorado Springs, Colorado  
U. S. Air Force San Bernardino Air Materiel Area, AMC, Norton Air Force Base, California  
U. S. Air Force Headquarters, MAAMA, Olmsted Air Force Base, Pennsylvania  
National Security Agency, Fort George G. Meade, Maryland  
American Telephone & Telegraph Company, Long Lines Department, Mt. Kisco, N. Y.  
American Telephone & Telegraph Company, Treasury Department, 50 Varick Street, New York, New York  
Boeing Airplane Company, Wichita Division, Wichita, Kansas  
Consolidated Edison Company of New York, Inc., 4 Irving Place, New York 3, New York  
Convair, A Division of General Dynamics Corporation, Fort Worth, Texas  
Esso Standard, Division of Humble Oil & Refining Company, Baton Rouge Refinery, P. O. Box 551, Baton Rouge, Louisiana  
Farmers Insurance Group, 4680 Wilshire Blvd., Los Angeles, California

The Firestone Tire & Rubber Company, Akron 17, Ohio

Ford Motor Company, Computer Services Department, Room 1109, Rouge Office Building, Dearborn, Michigan  
Ford Division of Ford Motor Company, Rotunda & Southfield, Dearborn, Michigan

Hughes Aircraft Company, Industrial Dynamics - General Offices, Florence Avenue & Teale Street, Culver City, California (2)

International Harvester Company, 180 North Michigan Avenue, Chicago 1, Illinois

Illinois Central Railroad Company, 135 E. 11th Place, Chicago 5, Illinois

McDonnell Aircraft Corporation, Box 516, St. Louis 66, Missouri

Minnesota Mining and Manufacturing Company, 900 Bush Avenue, St. Paul 6, Minnesota

Sandia Corporation, Electronic Data Processing Department 3450, Sandia Base, Albuquerque, New Mexico

The Standard Oil Company (Ohio), Midland Building, Cleveland 15, Ohio

Texaco, Inc., Data Processing Division, P. O. Box 2332, Houston 1, Texas

Tennessee Coal and Iron Division, United States Steel Corporation, P. O. Box 599, Fairfield, Alabama

Western Electric Company, Inc., Hawthorne Works, Hawthorne Station, Chicago 23, Illinois

Western Electric Company, Inc., Computer Methods, 100 Central Avenue, Kearny, New Jersey

U. S. Air Force, Headquarters Mobile Air Materiel Area, Brookley Air Force Base, Alabama

Harvard University, Littauer Statistical Laboratory, 94 Prescott Street, Cambridge 38, Massachusetts

Prudential Insurance Company of America, Home Office, Newark, New Jersey

U. S. Air Force Mobile Air Materiel Area, Brookley Air Force Base, Alabama

# IBM 705 III

IBM 705 III Data Processing System

## MANUFACTURER

International Business Machines Corporation

Photo by International Business Machines Corporation, products development Laboratory

## APPLICATIONS

### Manufacturer

This is a general purpose computer for both scientific and commercial applications. The system is commercially oriented with Applied Programming Packages very prominent in this area.

### U. S. Army Signal Supply Agency

Located at 225 S. 18th Street, Philadelphia, the system is used for inventory control of 200,000 Signal Corps items, requisition processing and stock distribution, procurement status and allotment accounting, preparation of catalogs, computation of requirements, and managerial reports such as budget estimation.

### U. S. Navy Ships Parts Control Center

Located at Mechanicsburg, Pa., one of the major uses of the electronic data processing system is the maintenance of perpetually current inventory records for approximately 155,000 items of ships repair parts. Master inventory records are updated through the media of transaction reporting cards received from twenty reporting activities. The transaction reporting system was implemented shortly after installation of

the EDPS in August 1956. An analysis of items having experienced any type of action during the current week provides the tool for improved stock positioning and more effective management control. The machine is also being used to develop component and item population data; in the preparation of Shipboard Allowance Lists; budgeting and inventory analysis and in the automatic maintenance of voluminous technical engineering data files.

### U. S. A. F. Wright-Patterson AFB, Ohio

Located at the Statistical Services Division, the system is used for Hq AMC cataloging and standardization.

This application combines cataloging and standardization to accomplish the following objectives:

Prescreen all contractor-recommended items prior to contractor's preparation and submission of provisioning documentation etc., to the Air Force end article prime depot. Results of prescreening function will validate, reject, or correct stock numbers submitted by the contractor with part-number data for prescreening, furnish the contractor with the known stock numbers for items submitted for pre-

Photo by International Business Machines Corporation, Products Development Laboratory

screening, furnish the contractor with the stock number and electrical accounting machine (EAM) identification data for each Federal item of supply to which a part number is referenced when the part number submitted for prescreening is referenced to more than one Federal stock number (FSN), isolate each part number submitted for prescreening that is not indexed to an existing stock number in the master files, and provide a printout product that will constitute an order to ship specific description patterns to the contractor.

Screen items for AMC components by Federal supply class (FSC), by item name; by manufacturer's code; by FSN; or by part number. Results of this screening will provide EAM cards and/or EAM listings-products to be determined upon the specific request for screening.

Compile data for publication of Air Force master cross-reference indexes S-00-1-1, "Part Number to Federal Stock Number," and S-00-1-2, "Federal Stock Number to Part Number." Each of these publications is to be compiled annually, and their addenda, quarterly, if required.

Compile data for publication of management data count reports of items and stock-control data elements on FSC group basis and on FSC group and class basis, as well as on management-code basis.

Provide products for use in management by exception situations; e.g., list Federal data that have been in the master files for more than 2 months without

stock-control data, list stock-control data for which Federal data are not in the master files, and list stock-control data cards that contained error when received.

Additionally, this system supports the AMC centralized data development function in the preparation, testing, debugging and operational simulation of data systems prior to command implementation.

Air Weather Service Climatic Center  
Located in the Grove Arcade Building, Asheville, North Carolina, the system is used for the processing of weather data.

Social Security Administration  
Located in the Social Security Bldg., Woodlawn, Baltimore 35, Maryland, the system is used for maintenance of social security accounts, establishment of new accounts, identification of incorrectly reported account numbers, tape search for summary earnings records of accounts involved in claims, selecting addresses from master tape and addressing correspondence, compilation of statistical tables, and computation of old-age, survivors, and disability benefits.

Veterans Administration  
Located at Hines, Illinois, the system is used in currently maintaining the payment, accounting, and statistical records for payment of compensation and pension to veterans and other beneficiaries.

U. S. Dept. of Agriculture, Commodity Stabilization Service  
Located at New Orleans, Louisiana, the system is used

Photo by International Business Machines Corporation, Products Development Laboratory

for processing cotton price support loan and purchase program transactions: This embraces loan making and liquidation, reconcentration, and producer settlements consisting of approximately 9 million bales per year.

Cotton inventory management: This includes the maintenance of inventory control acquisitions, maintenance and disposition of CCC owned cotton. Accordingly, payments to warehousemen for storage and services, payment to railroads for transportation and handling. Sales and other dispositions are included as a part of this application. These records serve operational, accounting, budgetary, and general management needs on an integrated basis. The inventory consists of approximately 1.3 million bales records.

Acreage reserve sight draft application: This involves maintaining accountability on national basis for the acreage reserve sight drafts. Approximately 500,000 drafts per year.

Dairy herd improvement application: This consists of keeping records of the geneology of dairy herds as a study of improving breeding. The study involves in excess of 2 1/2 million records.

Grain inventory warehouse receipt application for the Dallas CSS Commodity Office: The Dallas Commodity Office is an area grain office which utilizes the New Orleans computer on a data processing center basis for this application. This includes the maintenance of warehouse receipts representing price support grain inventory which are in storage, in inland warehouses and the related issuance, loading orders, and blend-

ing of grain through the use of linear programming techniques.

Commonwealth Edison Company, Chicago  
Located in Room 441, Commonwealth Edison Company, 72 W. Adams St., Chicago, Illinois, the system is used for customer billing and accounting, property records accounting, various engineering applications, extraction of data from master customer file tapes, upon request, for various special reports, and extraction of customers' names and addresses, upon request, for special mailings to customers.  
Commonwealth Edison has approximately 2,000,000 customers who are in the most part billed bi-monthly. We have a 7 day cycle on the computer wherein each day, file maintenance is performed on approximately 300,000 accounts, 50,000 meter readings are posted, 50,000 bills are produced, cash is posted to approximately 50,000 accounts and customer account reference listings are produced to provide current information for use by our customer contact people.

Eastman Kodak Company  
Located at Rochester, New York, the system is used for customer billing, accounts receivable, sales reporting, scientific computing, payroll, inventory control (finished goods), production planning and scheduling, and cost accounting.

IBM Methods  
Located at the IBM Mfg. Plant, Poughkeepsie, N. Y., the system is used for payroll, labor and burden, general accounting, budgets, property record account-

Photo by International Business Machines Corporation, Products Development Laboratory

ing, production performance, cost accounting, personnel, accounts payable, inventory control, manufacturer's planning, long range load, quality control, and requirements generation.

International Harvester Co., Motor Truck Div. Located on Meyer Road, Fort Wayne, Indiana, the system is used for:

Payroll - calculation of gross wages and associated labor distribution; development of net wages and preparation of pay drafts; accumulations for quarterly and annual state and federal reports.

Material Requirements - explosion of monthly production forecast to piece part level; all requirements are accumulated by part number and adjusted for lead time, inventory, scrap, and production breaks. For manufactured parts, raw and bulk material requirements are calculated; for purchased parts, vendor records are prepared. During the month if gross requirements equal or exceed 20% of the bank, the necessary modification documents are prepared.

Vendor Release - adjust purchase order tape developed from material requirements for percentage split between vendors as specified. Using the adjusted purchase order tape, establish lot buy quantities and price differential quantities, and develop resulting vendor schedule for delivery and fabrication.

District Office Property Accounting - maintain inventory of trucks at company owned district offices. Prepare monthly statements of sales and inventory

status. Prepare monthly and quarterly listings for districts of chassis in their inventories. Develop sales statistics and lists of trucks available for transfer.

Production Progress - maintain perpetual status of units built, open orders and scheduled for production. Daily built statistics provide the basis for calculating line labor pay. Each month, the production forecast is developed mechanically from statistics contained in these records. During the month, as required, an analysis is made of built, slotted orders, and forecasted schedules to determine if a forecast revision is necessary.

Costing Applications - maintain parts master records with all necessary cost factors and statistics. Calculate market and average costs for both manufactured and purchased parts and assemblies; summarize to develop a prime cost for each component unit of a truck. These costs are used to cost accumulative production and to value sales and inventory by year of production. By applying adjustments to costs as developed, calculate amounts to be used in determining sales prices.

Stock Status of Major Components - develop a daily inventory of major component parts and assemblies by processing receipts, disbursements, and miscellaneous adjustments with previous balance records. Also, anticipated production for the next 5 days is exploded to show probable conditions for that period.

Photo by U. S. Department of Health, Education and Welfare

Line Stocking - explode the production anticipated for the fifth day hence; combine with previous balance records to prepare a list showing the part number requirements for next 5 days by assembly locations.

Engineering Calculations - engineering work encompasses several phases. In the research area we do calculations involving gear ratio, torque conversion and bearing load analysis. Some calculations actually design such units as camshafts and drive lines. Still other computations may be classified as data reduction and involve performance study and stress analysis. In the record keeping category a weekly analysis is prepared on time spent on assigned projects.

Westinghouse Electric Corporation

Located on Sharpsville Avenue, Sharon, Pa., the system is used for manufacturing information, engineering design and drafting, industrial engineering, production scheduling and factory loading, finished goods and raw material control and purchasing, manufacturing cycle efficiency and production material control, factory expense and budget statements, hourly and salary payroll and industrial relations statistics, material layout and scrap loss reduction, and sales statistics.

## PROGRAMMING AND NUMERICAL SYSTEM

Internal number system      Binary Coded Alphanumeric  
 Alphanumeric char/word      Variable  
 The 705 is not a fixed word length system. It is possible to have both variable field and variable record lengths. There are no words, each character of a record being individually addressable.  
 Alphanumeric char/instruction      5  
 Instructions decoded      51  
 Arithmetic system      Fixed point  
     Floating point is programmable.  
 Instruction type      One address  
 Number range       $-10^{255} < m < 10^{255}$   
 Instruction word format

Oper				
Address with zone bits as indicators				

Automatic built-in subroutines include store-for-print and transmit.

Automatic coding: 705 Processor including Autocoder III, file maintenance and report/file writing, decision making and Fortran.

This is a programming system which will translate programs written in any one or a combination of the following service languages into object programs in

Photo by U. S. Department of Health, Education and Welfare

actual machine language.

#### Autocoder III

An advanced programming language in which programs may be written by stating the data processing involved.

#### File Maintenance and Report/File Writing

A specially designed language, the use of which enables a programmer to express the specifications for a report and/or a file in a simple set of statements.

#### Decision Making

A specially designed language, the use of which enables a programmer to express the conditions required for making a decision, in simple concise statements.

#### Fortran

A programming language in which a scientific problem can be expressed in statements closely resembling the language of mathematics.

Registers and B-boxes include one 256 character accumulator, 14 auxiliary storage units (16 characters each), and one auxiliary storage unit (32 characters).

## ARITHMETIC UNIT

Incl Stor Access  
Microsec

Add 6x6	95.8 (6 digits added to 6 digits)
Mult 6x6	770.8 (6 digits times 6 digits)
Div 10/6	3159.2 (6 digits divided by 6 digits)

Multiply time =  $58 + N_s (63 + 9.3N_m)$

where  $N_s$  = Number of digits in Multiplier

$N_m$  = Number of digits in Multiplicand

Divide time =  $90 + 9N_s + 9(N_s - N_m)(6.7N_m + 37)$

where:  $N_s$  = Number of digits in dividend

$N_m$  = Number of digits in divisor

Construction (Arithmetic unit only)

Vacuum tubes > 2,100

Transistors 0

Condenser-diodes > 6,900

Magnetic cores > 3,500

Arithmetic mode Serial

Timing Synchronous Central Processing Unit

Asynchronous Input, Output Devices

Operation Sequential Central Processing Unit

Concurrent Simultaneous reading,  
writing and computing are possible.



**STORAGE**

Manufacturer	No. of Char	Access
Media		Microsec
Core	40,000 or 80,000	9.3
Magnetic Drum	Up to 100 drums 60,000 char each	8,000
Magnetic Tape	> 14,000,000 char/reel	7,300
No. of units that can be connected		60 Units
No. of char/linear inch	200 or 556	Char/inch
Channels or tracks on the tape		7 Tracks/tape
Blank tape separating each record		0.75 Inches
Tape speed		75 or 112.5 Inches/sec
Transfer rate		15,000; 22,500; 41,667; 62,500 Char/sec
Start-stop time		10.8 or 7.3 Millisec
Average time for experienced operator to change reel		60 Seconds
Physical properties of tape		
Width		0.5 Inches
Length of reel		2,400 Feet
Composition		Mylar
Mylar is DuPont's trademark for its polyester film.		
USA SSA		
40,000 alphanumeric character magnetic core memory, each character separately addressable; 60,000 character magnetic drum; magnetic tape.		

Media	No. of Alphanum/Char	Access
USN SPCC		
40,000 character magnetic core; 19 magnetic tape stations.		
USAF W-P AFB		
40,000 MC; 60,000 MD; 18 MT		
Average access time to magnetic drum is such that the first character is available in 8 milliseconds; subsequent characters, in sequence, are each available in 40 microseconds.		
AWS CC		
Magnetic Core	40,000	13
Magnetic Tape	5,760,000	10,000+67 n/char
	16,012,800	7,500+16.5 n/char
Magnetic tape storage consists of Type 729 Model I and Model III tape drives.		
Social Security		
40,000 MC; MT		
VA		
80,000 MC; MT		
USDA CSS		
80,000 MC; 16 MT		
Commonwealth Edison		
40,000 MC; 60,000 MD; 13 MT		
Eastman Kodak		
40,000 MC		
IBM Methods		
80,000 MC; MT		

Photo by U. S. Department of Health, Education and Welfare

International Harvester  
 40,000 MC; MT  
 Westinghouse  
 40,000 MC; 60,000 MD; MT

**INPUT**

Manufacturer	Media	Speed
	Magnetic Tape	See above
	Card	250 cards/min
	Operator's Console	Manual
	Magnetic Drum	25,000 char/sec
	USA SSA	
	Magnetic Tape and Cards	
	USN SPCC	
	One Card Reader and Control Unit	
	Eight 729 Model I Tape Units	
	Eight 729 Model III Tape Units	
	Three 727 Tape Units	
	USAF W-P AFB	
Media		Speed
18 Type 727 Tape Units		15,000 char/sec
1 Type 714 Card Reader		240 cards/min
Sixteen tape units are on line, 2 are off line.		
Buffering between tape units and magnetic core memory is provided by 2 Type 777 Tape Record Coordinators. In addition, a Type 754 Tape Control Unit is		

on line for control of a maximum of ten Type 727 Tape Units.  
 AWS CC  
 Magnetic Tapes and Punched Cards  
 Social Security  
 Punch cards converted to tape in off-line operations.  
 VA  
 Media

	Speed
Card Reader	250 cards/min
Card Image Tape	15,000 char/sec
Lo Speed Tape	15,000 char/sec
Hi Speed Tape	62,500 char/sec
USDA CSS	
1 714 Card Reader	
1 759 Card Reader Control	
8 729 I Tape Units	
8 729 III Tape Units	
2 767 Tape Data Synchronizers	
Above units are on line	
Commonwealth Edison	
Punched Cards and Magnetic Tape	
Eastman Kodak	
IBM 714 Card Reader	200 cards/min
IBM Methods	
Magnetic Tapes and Punched Cards	
International Harvester	
Magnetic Tape	75 in/sec Card to tape detail
Magnetic Tape	112.5 in/sec Previous balance records

Westinghouse	
Medium	Speed
Magnetic Tape	15 char/sec

### OUTPUT

Manufacturer	Media	Speed
	Magnetic Tape	See above
	Card	100 cards/min
	Printers	150, 500, 1,000 lines/min
	Typewriter	600 char/min
	Magnetic Drum	25 char/sec

In addition to the above components, an IBM 1401 Data Processing System may be used for peripheral operations. The speeds of the 1401 components are:

Card Reading	800 cards/min
Card Punching	250 cards/min
Printer	600 lines/min

The tapes from the 705 III are completely compatible with the 1401 System.

USA SSA  
Magnetic Tape, Cards and High Speed Printer  
USN SPCC  
One Type 720 Printer and one Type 760 Control Unit (500 lines per minute)  
One Type 717 Printer and Control Unit (150 lines per minute)  
Eight 729 Model I Tape Units

Photo by Eastman Kodak Company

Eight 729 Model III Tape Units  
Three 727 Tape Units  
One Card Punch and Control Unit  
USAF W-P AFB

Media	Speed
2 Type 717 Printer	150 lines/min
1 Type 722 Card Punch	100 cards/min
Magnetic Tape	15,000 char/sec

The printer and punch are used off line only normally.

AWS CC	
Magnetic Tape	15,000 char/sec
Card Punch	62,500 char/sec
Printer	100 cards/min
	150 lines/min

120 print positions  
Magnetic tape output consists of Type 729 Model I and Model III tape drives.

Social Security  
Magnetic tape converted to printed copy, microfilm and punched cards in off-line operations.

VA	
717 Printer	150 lines/min
Lo Speed Tape	15,000 char/sec
H1 Speed Tape	62,500 char/sec
Card Punch	100 cards/min

Photo by International Business Machines Corporation, Methods DS Manufacturing

USDA CSS  
 One 717 Printer  
 One 757 Printer Control  
 Eight 729 I Tape Units  
 Eight 729 III Tape Units  
 Two 767 Tape Data Synchronizers  
 Two 748 Tape Data Synchronizer Power  
 One 722 Card Punch  
 One 758 Card Punch Control  
 Above units are on line  
 Two 714 Card Readers  
 Two 759 Card Reader Controls  
 One 722 Card Punch  
 One 758 Card Punch Control  
 Three 729 Printers (500 lines/min)  
 Three 760 Printer Controls  
 Seven 729 I Tape Units  
 Commonwealth Edison  
 Media Speed  
 Magnetic Tape 75 in/sec IBM 727 Tape Units  
 Punched Cards 100 cards/min IBM 722 Card Punches  
 Printer 500 lines/min IBM 720-2-Printers  
 13 IBM 727 Tape Units connected to main frame.  
 All card to tape, tape to card, and tape to printer  
 operations are off-line. Tape density is 200 char/in.  
 Eastman Kodak  
 IBM 722 Card Punch 100 cards/min  
 ANelex Printers 667-1,000 lines/min  
 Purchased 1960  
 IBM Methods  
 Magnetic Tapes, Punched Cards, and 150 lines/min  
 Printer  
 International Harvester  
 Magnetic Tape 75 in/sec  
 Report tapes or tapes-to-card records  
 Magnetic Tape 112.5 in/sec  
 Balance forward tapes for additional processing  
 In one case, where the small number of cards to  
 be punched does not restrict computer operations,  
 the punch is connected to the main line and cards  
 are punched during the processing.  
 Westinghouse  
 Magnetic Tapes 15 char/sec  
 Off-line card to tape, tape to punch and tape to  
 printer.

## CHECKING FEATURES

Manufacturer  
 Character code check on internal operations and data  
 transmission; sign check for arithmetic instructions;  
 overflow; character code check during transmission  
 from storage to I/O units; horizontal and vertical  
 parity check on magnetic tape; dual level sensing;

two gap head for verification of tape writing; two  
 read stations in card reader; echo checking on line  
 printer; row-count comparison in card punching.

## POWER, SPACE, WEIGHT, AND SITE PREPARATION

Manufacturer  
 Power, computer 145.1 KVA  
 Weight, computer 39,815 lbs  
 Physical planning manual is available.  
 USA SSA  
 Power, computer 138 KVA 120/208V - 4 wire  
 Volume, computer 23,400 cu ft  
 Volume, air conditioner 6,000 cu ft  
 Area, computer 2,600 sq ft  
 Area, air conditioner 500 sq ft  
 Room size, computer 40 ft x 65 ft  
 Room size, air conditioner 25 ft x 20 ft  
 Floor loading 1,000 point load  
 Capacity, air conditioner 40 Tons  
 Weight, computer 39,355 lbs  
 Weight, air conditioner 18,000 lbs  
 First floor location prepared with false ceiling  
 and raised floor. Air conditioning equipment is  
 located approximately 50 feet from the computer room.  
 Building modification cost about \$100,000 and air  
 conditioning \$75,000. Power is supplied by an air  
 core transformer used exclusively for the computer.  
 USAF W-P AFB  
 Power, computer 164.9 KVA  
 Volume, computer 25,280 cu ft  
 Volume, air conditioner 3,200 cu ft  
 Area, computer 2,939 sq ft  
 Area, air conditioner 320 sq ft  
 Room size, computer 60 ft x 49 ft  
 Room size, air conditioner 20 ft x 16 ft  
 Floor loading 250 lbs/sq ft  
 1,000 lbs concen max sq in  
 Capacity, air conditioner 40 Tons  
 Weight, computer 54,491 lbs  
 Weight, air conditioner 3,000 lbs  
 Air conditioner is located remote from computer.  
 Site was prepared within an existing building. Modi-  
 fications included raised flooring of wooden panel  
 type, false ceiling approximately 8 2/3 feet from  
 floor, wiring of various circuits to provide about  
 170 KVA, erection of walls of cinder block type.  
 Various other minor modifications were accomplished  
 to suit the area to effective computer operation.

AWS CC

Power, computer 119.0 KVA  
 Volume, computer 22,560 cu ft  
 Volume, air conditioner 4,000 cu ft  
 Area, computer 2,820 sq ft  
 Area, air conditioner 400 sq ft  
 Room size, computer 2,000 ft plus C.E. space  
 and tape files  
 Room size, air conditioner 400 sq ft  
 Floor loading 80 lbs/sq ft  
 Capacity, air conditioner 60 Tons  
 Weight, computer 35,760 lbs

Building site is of stone and masonry construction with non-supporting interior walls. Modifications to the building consisted of construction of a raised floor of a raceway type, 8 inches high so that cables which connect the machines can be laid under the machine floor. A false ceiling of acoustic material was installed, reducing the room volume and providing a return air plenum for the air conditioning system. Also, a 600 amp. feeder line was installed from independent transformers (150 KVA) to a distribution panel in the computer room.

Social Security

Power, computer 1,500 KVA  
 Area, air conditioner 2,050 sq ft  
 Room size, computer 63 ft x 150 ft  
 Floor loading 150 lbs/sq ft  
 Capacity, air conditioner 1,000 lbs concen max  
 Capacity, air conditioner 276 Tons

During construction of a reinforced concrete and brick building to house the agency, the following modifications were made to the area provided for the EDPM installation. Sectional floors with cable space beneath. Separate 1500 KVA power transformers and associated switching gear. Separate air conditioning system. Cold air is fed through ceiling ducts. The larger units of the system are provided with hoods to exhaust the heated air.

VA

Power, computer 155.14 KVA  
 Volume, computer 2,296,250 cu ft  
 Area, computer 13,578 sq ft  
 Basic warehouse remodeled to provide false ceilings, raised floors, provision for air conditioning, separate transformers, etc.

Commonwealth Edison

Power, computer 195.1 KVA 0.80 pf  
 Power, air conditioner 250 Kw  
 Volume, computer 30,000 cu ft  
 Volume, air conditioner 22,000 cu ft  
 Area, computer 3,000 sq ft  
 Area, air conditioner 1,950 sq ft  
 Room size, computer 5,000 sq ft  
 Room size, air conditioner 1,950 sq ft  
 Floor loading 75 lbs/sq ft  
 Capacity, air conditioner 150 lbs concen max  
 (Overgirder)

Capacity, air conditioner 250 Tons  
 Weight, computer 59,980 lbs  
 Weight, air conditioner 24,000 lbs

False ceiling, cable trenches in floor, floor is concrete over fill.

Eastman Kodak

Power, computer 150 Kw 170 KVA 0.88 pf  
 Volume, air conditioner 10,000 cu ft  
 Area, computer 2,938 sq ft  
 Area, air conditioner 800 sq ft  
 Room size, computer 4,800 sq ft  
 Room size, air conditioner 20 ft x 40 ft  
 Capacity, air conditioner 85 Tons

Figures are for two systems as listed under Price. Area developed was originally warehouse area on 2nd

floor of two-story building. Exterior windows were removed and closed with masonry. Masonry walls were constructed to enclose a computer room, maintenance room, tape storage room, conditioner equipment room, clerical area and transceiver area. A suspended metal pan acoustic ceiling was installed throughout the areas. A raised 1 1/4 inch thick plywood floor was installed 12 inches above concrete building floor in computer room only to permit under floor cable runs to various machines. An asphalt tile floor was installed throughout areas. All ductwork for air distribution installed above suspended ceiling. All areas lighted with fluorescent fixtures.

IBM Methods

Power, computer 181.5 Kw 203.8 KVA 0.89 pf  
 Power, air conditioner 22 HP (fan motors)  
 Fan system uses central chilled water  
 Volume, computer 46,816 cu ft  
 Volume, air conditioner 1,600 cu ft  
 Area, computer 4,256 sq ft  
 Area, air conditioner 200 sq ft  
 Room size, computer 76 x 56 x 11 ft  
 Floor loading 300 lbs/sq ft  
 Capacity, air conditioner 1,000 lbs concen max  
 Capacity, air conditioner 82 Tons

Existing concrete block building has 6 inch concrete slab floor; built-up roof on steel joists contains fan systems for air conditioning, chilled water for which is supplied from central distribution system, insulated main ducts feed over roof to branch ducts above suspended acoustical ceiling; "Doweloc" raised floor installed 1 ft 2 in over concrete slab; power supplied by outdoor 300 KVA transformer with 500 Amp feeder; loading dock installed to permit loading and unloading of machines.

International Harvester

Power, computer 165.6 KVA 0.75 pf  
 (entire system)  
 Power, air conditioner 186 Kw 0.75 pf  
 Volume, computer 390.72 cu ft  
 Volume, air conditioner 16,800 cu ft  
 Area, computer 3,256 sq ft  
 Area, air conditioner 1,680 sq ft  
 Room size, computer 48 ft x 82 ft  
 Room size, air conditioner 20 ft x 42 ft (2 floors)  
 Floor loading 17 lbs/sq ft  
 Capacity, air conditioner 250 lbs concen max  
 Capacity, air conditioner 120 Tons  
 Weight, computer 54,920 lbs

A new building was constructed specifically to house the computer and air conditioning equipment. Building is 1 story brick, with concrete floors and metal partitions. Cable ducts were constructed throughout the floor area of the machine room. Concrete floor is topped with wood and finished with plastic tile.

Westinghouse

Power, computer 120 Kw 150 KVA 0.8 pf  
 Volume, computer 35,000 cu ft  
 Volume, air conditioner 6,300 cu ft  
 Area, computer 3,900 sq ft  
 Area, air conditioner 420 sq ft  
 Capacity, air conditioner 80 Tons  
 Weight, computer 50,000 lbs

Metal false ceiling, reinforced concrete building, raised wood floor on concrete, walls metal studs lath and plaster, separate 150 KVA transformer and voltage regulator, and cold air ducts above ceiling - warm air return thru ceiling plenum.

**PRODUCTION RECORD**

Manufacturer  
Only limited production at present. Delivery on availability basis only.

**COST, PRICE AND RENTAL RATES**

Manufacturer	Monthly Charge	Purchase Price
714 Card Reader	\$ 1,500	\$64,450
717 Printer (150 lines/min)	1,400	55,000
720 Printer (500 lines/min)	1,900	93,000
722 Card Punch	800	43,000
727 Magnetic Tape Unit	550	18,200
730 Printer (1000 lines/min)	3,900	210,500
734 Magnetic Drum Storage	2,300	90,000
735 Printer Control (730 & 760)	600	32,500
744 Magnetic Drum Power Supply	500	21,500
754 Tape Control	1,500	78,000
757 Printer Control	650	44,000
758 Card Punch Control	600	36,000
759 Card Reader Control	900	45,000
760 Control and Storage	2,500	111,000
777 Tape Record Coordinator	3,400	156,000
705 III CPU	15,000	788,000
739 Additional Core Storage	6,000	340,000
767 Data Synchronizer	3,500	200,000
748 D. S. Power Supply	700	53,000
782 II Console Control	1,100	58,000
745 II Power Supply	1,500	100,000

Monthly rental, typical system: \$43,000 and up  
Purchase price, typical system: \$2,063,000 and up  
Maintenance contract available.

USA SSA	Monthly Rental
Basic System	Qty
705 Model III CPU	1 \$15,115
727 Magnetic Tape Units	12 6,600
734 Magnetic Drum Storage Unit	1 2,300
744 Magnetic Drum Power Unit	1 500
745 II Power Supply	1 1,500
754 Tape Control Unit	1 1,500
782 II Console and Typewriter	1 1,100
<b>Total</b>	<b>\$28,615</b>
Additional Equipment	
714 Card Reader w/counter	1 \$1,510
720A High Speed Printer	1 1,900
722 Card Punch w/counter	1 810
758 Card Punch Control Unit w/validity checking feature	1 650
759 Card Reader Control Unit	1 900
760 Control and Storage Unit	1 2,500
727 Magnetic Tape Unit	1 550
<b>Total</b>	<b>\$8,820</b>

Maintenance included in rental.  
USN SPCC  
Prime shift rental amounts to \$50,210 per month.  
USAF W-P AFB  
Central Processing Unit with console, 18 Type 727 Tape Units, 2 Type 777 Tape Record Coordinators, 1 Type 754 Tape Control Unit, 1 Type 744 Drum, 2 Type 717 Printers, 1 Type 714 Card Reader, 1 Type 722 Card Punch and associated power and control units; rental \$45,300 monthly.

AWS CC

Rental contracting and rates for total system

Type	Name	Monthly Rental
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AWS CC

Rental contracting and rates for total system

Type	Name	Monthly Rental
705 III	Central Processing Unit	\$15,000
745	Power Supply	1,500
782	Console Control Unit	1,100
714 (2)	Card Reader	3,020
759 (2)	Card Reader Control Unit	1,800
717	Printer	1,400
757	Printer Control	650
722	Card Punch	800
758	Card Punch Control	600
729/1 (4)	Magnetic Tape Unit	2,800
729/3 (4)	Magnetic Tape Unit	3,600
767	Data Synchronizer	3,500
748	Data Synchronizer Power Unit	700
	<b>Total Monthly Rental</b>	<b>\$36,470</b>

Social Security

Rental Rates for Basic System  
Rental rates shown are for prime shift. Additional time is charged at 40% of prime shift rental.

No.	Description	Monthly Rental
3	Central Processing Units (including power supply & console)	\$52,350
28	729 Model III Tape Units	30,800
14	729 Model I Tape Units	9,800
8	Data Synchronizer and Power Supply	33,600
	Rental Rates for Additional Equipment	
4	720 Printers w/control unit	\$15,600
6	Card Readers w/control unit	12,625
3	Card Punch w/control unit	1,400
15	729 Model I Tape Units	8,400
	The magnetic tape to microfilm printer cost	\$250,000.

VA

One 705 III CPU, two 745 DSU, one 739 aux. core memory, six 729 I Tape Units, six 729 III Tape Units rent for \$41,600 monthly.

Two 714 Card Readers, one 717 Printer, one 720A Printer rent for \$12,650 monthly.

Commonwealth Edison

One IBM 705 Model III, one Type 734 Magnetic Drum, two Type 777 Tape Record Coordinators, 13 Type 727 Tape Units. Base rental for 176 hrs/month is \$34,420.

Two Type 714 Card Readers, two Type 720-2 Printers, two Type 722 Card Punches, six Type 727 Tape Units. Base rental for 176 hrs/month is \$19,860.

Maintenance is included in rental cost.

Eastman Kodak

One installation consists of:

	Qty	Cost Price	Monthly Rental
705 Model III High Speed	1	\$1,010,000*	\$17,300
745 Power Unit	1	100,000	1,500
782 Console	1	58,000	1,100
7211 Tape Control Unit	1	161,000*	3,110
729 III Tape Drives	10	300,000*	9,450
714 Card Reader	1	97,500	1,500
759 Card Reader Control Unit	1	54,000	900
722 Card Punch	1	44,400	800
758 Card Punch Control Unit	1	36,000	600
ANalex Print Station	1	150,000	-
727 Tape Drives	3	89,400	1,650
<b>Total</b>		<b>\$2,100,300</b>	<b>\$37,910</b>

\*Estimated. Systems are rented.

IBM Methods

Type	Component	Qty	Total Price	Monthly Rental
705 III	Central Processor	1	\$788,000	\$15,000
714	Card Reader	1	64,450	1,500
759	Card Reader Control	1	45,000	900
717	Printer	1	55,000	1,400
757	Printer Control	1	44,000	650
729I	Magnetic Tape Unit	10	275,000	7,000
729III	Magnetic Tape Unit	7	339,500	6,300
745II	Power Supply	1	100,000	1,500
748	Data Synch. Power Supply	2	106,000	1,400
739I	Magnetic Core Stor-	1	340,000	6,000
754	Tape Control Unit	1	78,000	1,500
767	Data Synchronizer Unit	2	400,000	7,000
782II	Console Typewriter	1	58,000	1,100
			<u>\$2,692,950</u>	<u>\$51,250</u>

System is rented. Rental includes maintenance.

Additional equipment consists of:

714	Card Reader	1	\$64,450	\$1,500
759	Card Reader Control	1	45,000	900
720A	Printer	1	93,000	1,900
760	Control and Storage	1	111,000	2,500
722	Card Punch	2	86,600	1,600
758	Card Punch Control	2	72,000	1,200
727	Magnetic Tape Unit	4	72,800	2,200
			<u>\$544,850</u>	<u>\$11,800</u>

International Harvester

System consists of:

- 1 - 705 III & Power Supply
  - 2 - 767 Data Synchronizers & Power Supplies
  - 8 - 729 III Tape Drives
  - 12 - 729 I Tape Drives
  - 1 - 722 Card Punch & Ctrl. Unit
  - 2 - 714 Card Readers & Ctrl. Units
  - 2 - 720 Model 2 Printers & Ctrl. Units
  - 4 - Transceivers and Telephone Signal Units
- Total prime shift rental is \$56,600/month.  
Total prime shift rental is \$700/month.

Westinghouse  
CPU, console, 12 tapes, 1 magnetic drum rent for \$29,600/month.

Reader, punch, 2 printers, 3 tapes rent for \$10,000 per month.

PERSONNEL REQUIREMENTS

Manufacturer

Operator, programming, and technical training available as well as assistance at all levels.

USA SSA

	Programming One 8-Hour Shift		Operations Three 8-Hour Shifts	
	Used	Recomm	Used	Recomm
Supervisors	10	11	4	
Analysts	7	12		
Programmers	23	33		
Clerks	3	4		
Librarians			1	2
Operators			5	
In-Output Oper			3	
Scheduler			1	

Three supervisors and seven analysts expend part of their effort in analyzing and supervising the activities of the Electrical Accounting Machines Division.

Input-output operators double as tape handlers. Operation tends toward open shop.

Methods of training used includes IBM Programming School for programmers, analysts, and operators, and formal and "on-the-job" training for programmers, analysts, and operators.

- Programmers - 12 mos.
- Operators - 6 mos.
- Analysts - 12 mos. (6 mos., if a former programmer)

USN SPCC

Personnel requirements are as follows:

Operations Branch:

- 1 Branch Supervisor
- 3 Shift Supervisors
- 6 Digital Computer System Operators
- 1 Scheduler
- 1 Assistant Scheduler
- 5 Peripheral Equipment Operators
- 1 Clerk

Analysis Branch:

- 1 Branch Supervisor
- 3 Supervisory Analysts
- 7 Analysts

Program Branch:

- 1 Branch Supervisor
- 4 Supervisory Computer Programmers
- 20 Computer Programmers
- 2 Mathematicians (Trainees)

Operation Branch personnel work on a three shift rotating basis. Analysis and Program Branch personnel work only on the prime shift.

All EDPS personnel receive initial training in programming and additional on-the-job training for their regular assignments.

USAF W-P AFB

	One 8-Hour Shift		Two 8-Hour Shifts		Three 8-Hour Shifts	
	U	R	U	R	U	R
Supervisors	1	1	2	2	3	3
Analysts	1	1	1	1	1	1
Programmers	1	1	1	1	1	1
Clerks-Stock	1	1	2	1	2	2
Librarians	1	1	1	1	1	1
Operators	5	5	10	10	14	14

Includes 2 PCAM operators/shift.

Operation tends toward open shop.

Programming and operator training is provided by equipment manufacturer. Training in housekeeping functions such as tape handling, library operation, etc., are taught on-the-job.

AWS CC

	Two 8-Hour Shifts	
	Used	Recommended
Supervisors	7	7
Programmers	16	16
Clerks	1	1
Librarians	1	1
Operators	3	3
In-Output Oper	4	4
Tape Handlers	4	4

Operation tends toward closed shop.

Programmers:

Trainees for programmer positions are recruited from Civil Service registers of eligible mathematicians. They are subjected to a 120 hr. class (4 hrs. per day) of training covering the field of 705 programming. Additionally, the remaining 4 hrs. per day are spent in classroom study of subjects covered in the formal sessions. These classes are taught by IBM Technical Representatives and Programming Section Supervisors.

Operations Supervisors and Console Operators:

Personnel assigned as operations supervisors and console operators are subjected to the same training

as programmers. Additionally, console trainees are given on-the-job training by the console operator in the operation of the system.

Social Security

	Three 8-Hour Shifts
Supervisors	25
Analysts	18
Programmers	80
Clerks	15
Librarians	24
Operators	9
Engineers	18
In-Output Oper	63
Tape Handlers	40

Programming and operation are under separate supervision. Programming is in the Methods Branch which also prepare procedures for all operations, on and off of the machine and is responsible for over-all planning.

Programmers operate the machines during program testing and debugging. All other operating is done by the Report Processing Branch. Chiefs of both branches report to the Assistant Director in charge of the Accounting Operations Division.

Engineers are employees of IBM. Service is included in rental.

Operation tends toward closed shop.

Methods of training used includes a six-week programming course followed by on-the-job training.

VA

	One 8-Hour Shift		Three 8-Hour Shifts	
	Used	Recomm	Used	Recomm
Supervisors	4	4		
Analysts	8	10		
Programmers	5	9		
Clerks	2	2		
Librarians			6	6
Operators			6	6

Methods of training used includes IBM schools and on-the-job training.

Commonwealth Edison

	One 8-Hour Shift	Two 8-Hour Shifts	Three 8-Hour Shifts
Supervisors	6	7	8
Analysts	18	-	-
Programmers	8	-	-
Clerks	2	-	-
Operators	1	2	3
Engineers	2	3	4
Technicians	1	-	-
In-Output Oper	2	4	6
Tape Handlers	1	2	3

For the most part our staff has been acquired from within our own organization. However, we have hired a few analysts from the outside who have been math majors to meet increasing demands in the area of engineering applications.

Computer operating personnel rotate over the 3 shifts.

Operation tends toward open shop.

Methods of training used includes: methods analysts, programmers and computer operators attend the manufacturer's school for 4 weeks plus 3-4 weeks training under our own supervision.

Peripheral equipment operators and tape handlers are given on-the-job training under our own supervision.

Eastman Kodak

	One 8-Hour Shift
Supervisors	5
Analysts	2
Programmers	35
Clerks	13
Librarians	1
Operators	10
In-Output Oper	20

Above personnel figures are for following work schedules:

Supervision	1 shift
Analysts	1 shift
Programmers	1 shift
Clerks	1 shift
Librarian	1 shift
Operators	3 shifts on 1 computer system 2 shifts on 1 computer system
Input-Output Op	3 shifts

No recommendations are made as this depends on the amount of work being done currently and amount of work planned for the future.

Operation tends toward closed shop.

Methods of training used includes manufacturer's training courses, Kodak-developed course, and on-the-job training.

IBM Methods

	One 8-Hour Shift	Three 8-Hour Shift
Supervisors	1	3
Analysts	8	
Programmers	20	
Librarians		1
Operators		6

The data processing organization is composed of four groups:

- Methods Development
- Methods Programming
- Programming Standards
- Computer Operations

All operating people are sent to 705 Programming School for three week period and then trained on-the-job. Additional classes are held for the operators as new applications are installed.

International Harvester

	Two 8-Hour Shift	Three 8-Hour Shift
Supervisors	1	
Analysts	6	
Programmers	16	
Operators (Console)	1	1
Engineers	2	2
Technicians	1	
Tape Handlers	4	3

Some individuals do coding as write programs. Tape handlers and input-output operators are interchangeable or synonymous. Engineers and technicians are IBM employees.

Operation tends toward closed shop.

Tape handlers and console operators receive on-the-job training from the supervisor. Programmers receive basic training in programming at manufacturer's school for customers. Practicle training received from more senior programmers.

Westinghouse

	Two 8-Hour Shifts
Supervisors	5
Analysts, Programmers & Coders	20
Clerks	1
Librarians	1
Operators	2
Tape Handlers	4

Operation tends toward open shop.



Methods of training used are IBM schools plus on-site training.

## RELIABILITY, OPERATING EXPERIENCE, AND TIME AVAILABILITY

### USA SSA

Good time 91 Hours/Week (Average)  
Attempted to run time 101 Hours/Week (Average)  
Operating ratio (Good/Attempted to run time) 0.90  
Above figures based on period from Apr 59 to Mar 60  
Passed Customer Acceptance Test 16 Jul 56  
Time is available for rent to qualified outside organizations.

Original system consisted of a 705 Model I, later changed to a Model II and III. Changeover was accomplished with no break in production.

Figures are for basic system only.

### USN SPCC

The machine is operating on a three shift, five day week basis. All preventive maintenance is performed by the International Business Machines Corporation before the start of the prime shift and during weekends. Average main frame available productive time since installation of the Model III during June 1959 is 85%.

### USAF W-P AFB

Good time 74.9 Hours/Week (Average)  
Attempted to run time 90.3 Hours/Week (Average)  
Operating ratio (Good/Attempted to run time) 0.83  
Above figures based on period 1 Jan 60 to 30 Jun 60  
Passed Customer Acceptance Test 10 Feb 59  
Time is available for rent to qualified outside organizations.

Time is scheduled for agencies within Air Materiel Command when computer time available at those agencies is not sufficient to permit the completion of work to meet established deadlines. Donation of time has been made to another Air Force major command pending the installation of that command's own EDP system.

### AWS CC

Average error-free running period 21 Hours  
Good time 66 Hours/Week (Average)  
Attempted to run time 75 Hours/Week (Average)  
Operating ratio 0.88  
Above figures based on period 4 Jan 60 to 31 Mar 60  
Passed Customer Acceptance Test 14 Dec 59  
Time is not available for rent to outside organizations.

### Social Security

Time is not available for rent to outside organizations.

System may be made available to other government agencies, if time becomes available. Jobs for other government agencies may be handled on a reimbursable basis if time is available. The present machines have been installed recently to replace earlier models.

### VA

Time is not available for rent to outside organizations.

### Commonwealth Edison

Good time 93 Hours/Week (Average)  
Attempted to run time 108 Hours/Week (Average)  
Operating ratio 0.86  
Above figures based on period 1 Apr 60 to 31 Jul 60  
Passed Customer Acceptance Test Oct 59  
Time is not available for rent to outside organizations.

Installed IBM 702 July 1955. Installed IBM 705 Model II April 1957 (replaced 702). Installed IBM 705 Model III October 1959 (replaced 705 II).

### Eastman Kodak

Good time 171.2 Hours/Week (Average)  
Attempted to run time 180.0 Hours/Week (Average)  
Operating ratio 0.95

Above figures based on period 1 Jan 60 to 10 Jun 60  
Passed Customer Acceptance Test May 59  
Time is available for rent to qualified outside organizations.

Per agreement with other 705 users, some computer time can be made available (mostly weekends) in cases of extreme emergency.

### IBM Methods

105; 131; 0.80; Mar 60 to Jun 60; time available to qualified organizations

This computer is sometimes used as standby for customer use and customer test.

### International Harvester

58; 64; 0.91; 1 Nov 59 to 30 May 60; 1 Sep 59; time not available

Running time does not include set up time. "Attempted to run" time is only machine failure; it does not include reruns necessitated by erroneous input data.

### Westinghouse

Average error-free running period 2 Hours  
Good time 72 Hours/Week (Average)  
Attempted to run time 82 Hours/Week (Average)  
Operating ratio 0.88

Above figures based on period from Jan 60 to Sep 60  
Passed Customer Acceptance Test Jul 56  
Time is available for rent to outside organizations.

## ADDITIONAL FEATURES AND REMARKS

### Manufacturer

#### Special Representatives

This group offers overall consulting service in connection with the study of possible uses.

#### Educational Program

One-week classes conducted for executives at IBM educational departments in Endicott and Poughkeepsie, New York. Comparable classes are available in several major cities across the country. These courses are designed to acquaint executives with the organization, operating characteristics, capacities, and applications of the 705. Customers who complete this course are better able to evaluate the advantages, economics and wide business applications of the 705. In addition to the executive class, courses are available to qualified methods personnel. These courses are of longer duration and provide knowledge of programming and necessary operating details.

#### Programming Service

Personnel are available for consultation with field representatives and customers. A library of programs common to many problems is available for adoption as sub-routines by customer. Automatic coding as listed under Programming and Numerical System (automatic coding) are available. Symbolic coding methods and assembly programs are available.

#### Sales Engineering

Engineers are available to assist in preparing the site for physical installation. This assistance begins twelve months in advance of delivery.

### USA SSA

Adopted procedures for magnetic tape labelling, storage, shipping, and protection from humidity, temperature and physical, electrical, fire, or other damage include especially constructed shipping containers for impact protection during cross country shipments of magnetic tape.

### USAF W-P AFB

Outstanding feature is microsecond interrogation.

A cinder block vault in an air conditioned area, certified for storage of classified material serves to provide excellent physical protection. Tape Library System demands labeling and storage methods consistent with good housekeeping practices.

Air Materiel Command Automatic Data Processing  
System  
Type Systems

Organization	305	650B	650T	650TR	705II	UFC	U <sub>h</sub> I	1105	205	220
Hq AMC					1					
WPAFB	1	1								
MAAMA		1	2		1					
MOAMA		1	1		2					
OCAMA	*1	1	3		2					
OOAMA		1		1	1					
ROAMA		2				1		1		
SAAMA		3			2					
SBAMA		1							1	1
SMAMA		4				1		1		
WRAMA		3				1		1		
DAFD		2					1	1		

The 2709th AF Veh Cont Grp, Memphis, Tenn., has 1 IBM 650B and one IBM 705 II, the NATO Materiel Supply Services Agency, Chateauroux, France has 1 IBM 650B, and the Air Materiel Force, Pacific Area, Tachikawa AFB, Japan, has 1 IBM 650B.

\* 705 II - 305 coupled configuration  
AWS CC

Magnetic tapes are labeled with an identification label written magnetically as the first record on tape and a "Label-on" type plastic sticker on the reels identifying the information which the reel contains. Tapes are stored in metal cabinets under the same dust-free and humidity controlled, air conditioned conditions as are maintained in the computer room. The air conditioning system is controlled to maintain temperature and relative humidity within limits specified by IBM. A round the clock surveillance with ample fire extinguishing equipment is being maintained. An investigation is currently under way to determine the adequacy of the present fire protection facilities.

Social Security

All active tapes contain magnetic header labels. Tape reels are labeled with pressure-sensitive tape. Tapes are stored in cabinets in separate air conditioned library room, separated from machine rooms by brick fire-wall. Each reel is in a plastic container. For storage outside of air-conditioned area, tapes are sealed in moisture-proof bags. Tapes which may be needed for reconstruction of our records following a disaster are stored in an out of town records center.

Commonwealth Edison

Outstanding features are consolidation of data into magnetic tape files, accuracy and uniformity of computer processing, reduction in personnel and related dollar savings, up to date information provided on customers accounts to customer contact people, consistency of handling data and rejection of incorrect information, and reduction in time over previous system in rendering customer bills.

1st record on tape provides identification, external labels are used for visual identifications and expiration date. Tape stored in fireproof vault. Temperature and humidity controlled at all times, within specified limits. Pyr-a-larm protection system installed to detect smoke. Will soon provide alternate storage area for previous cycle of tapes

to minimize effect of catastrophe in computer area.

Eastman Kodak

Temperature and humidity under rigid control. Entire area protected by sprinkler system. We have a separate tape retention vault at a different location for storage of back-up tapes for protection in the event of emergency.

IBM Methods

A unique system advantage is a 705 III with ability to operate as 705 I, 705-2 or 705-3 with 754 Tape Control or data synchronizers.

A daily security storage program for protection of tapes is in effect. Tape labels written and tape reels physically labeled.

International Harvester

Adopted procedures for:

**Magnetic Tape Labeling:** Each reel of input contains an 80-column label as the first record. This label identifies the file - but does not include any statistics regarding number of times the reel has been processed or destruction date. Labels are written on tapes saved for future processing, but not on those prepared for immediate auxiliary printing or punching. No attempt is made to determine whether scratch tapes do not have label from prior processing.

**Storage:** Tapes not actually in use for processing at any given time are stored in a fireproof vault adjoining the machine room. Regular tape storage racks hold reels which are arranged by applications.

**Shipping:** No requirements for shipping tapes between locations.

**Protection from Humidity:** - Temperature and Other Damage: The vault previously mentioned is a part of the area served by the air conditioning system. Rigid temperature and humidity controls are maintained, and when the allowable limits are exceeded, a warning buzzer with signal light so notifies the occupants of the machine room. The air conditioning is composed of 3 compressors, 1 of which is strictly for standby purposes so that 2 can always be in operation when the computer is operating. When the computer is not operating, a single compressor is adequate for maintaining proper temperature and humidity throughout the building.

As an added precaution against fire, heat detectors are located throughout the ceiling of the machine room. These are set to bring in an alarm at 225° F. Fire extinguishers are mounted on the wall throughout the building for added protection. The building construction is as fireproof as possible.

Westinghouse

80 character magnetic tape label.  
Tapes stored in metal cases in 705 machine room.  
Humidity controlled between 40% and 50% relative.

## FUTURE PLANS

Manufacturer

There is a growth upwards from the 705 with complete program compatibility to the 7080 Data Processing System.

USA SSA

High speed tapes for input, output.  
An IBM 1401 System is on order to replace all peripheral equipment listed.

USN SPCC

Two IBM 1401 Data Processing Systems are currently on order. A Model C-3 and a Model D-3 are scheduled for delivery. This equipment will replace the Types 717 and 720 Printers, the card punch and the card reader. Installation of the Type 1401 Systems will

provide a maximum printing capacity of 1200 lines per minute in lieu of the current capacity of 650 lines per minute, and will also provide additional processing time for certain applications such as; sorting, editing, etc.

#### AWS CC

A study is under way to determine the feasibility of replacing some of the components of auxiliary equipment (i.e. printer, card punch or card reader) with a 1401 Data Processing System. This system would be used to perform the auxiliary card to tape, tape to card, tape to print and tape to tape operations.

#### Social Security

Replacement of all input-output units by six 1401 Systems.

Replacement of 705's by 7080's.

Planning the following new applications:

- Personnel Statistics
- Payroll
- Property and Supply inventories
- Budget
- General Ledger Accounting

#### VA

An IBM 1401 is planned for installation.

#### USDA CSS

This agency has on order 2 1401-C3 Central Processing Units, 2 1402 Card Read Punch Units, 3 1401-D3 Central Processing Units, 3 1403-2 Printers, 5 729 Model II Tape Units. This equipment will replace our present off-line configurations.

#### Commonwealth Edison

Equipment on Order

Additional 40,000 positions of memory for present 705 III (this will eliminate the magnetic drum).

3 IBM 1401 Tape Systems (to replace present card readers, punches and printers).

1 IBM 7080 Computer - to replace the 705 III.

1 Farrington Optical Scanner - to be used in conjunction with our customer accounting system where-in the cash stub portion of our bill which is returned by the customer at the time of payment will be processed through the scanner to read the printed account number and dollar amount and convert this information directly to magnetic tape.

Future Plans for Computer Application

- General Accounting
- Payroll
- Stockholder Records
- Additional Engineering Applications

In Process

We are presently converting our manual billing system for large industrial customers to an IBM 305 RAMAC. This conversion will be completed by the end of 1960. The 305 is housed in the same room as the 705. The 305, being a random access type computer, will be able to provide current account information upon request through the inquiry feature provided. Again, the uniformity and accuracy of computer processing will be a decided improvement over the present manual system.

#### Eastman Kodak

Our work in the future will consist of extension of work already being done, particularly in the areas of inventory control and production planning and scheduling.

As to acquisition of new systems, we have on order two IBM 1401 Tape Systems and two IBM 7080 Computer Systems.

#### IBM Methods

The 705 III System (now installed) will be replaced with a 7080 System, increasing the overall speed by a factor of about 5.5. This system will be supported

by two 1401 Systems for off line operations and computing problems requiring less speed and storage.

#### International Harvester

It is anticipated that present card reading, card punching, and printing components will be replaced by 1401 Tape Systems - 1400 series equipment to be received:

- 2 card readers and punch units
- 2 printers
- 2 1401 Computers (4,000 positions of storage)
- 5 tape drives

Investigation is presently underway to determine the possibility of replacing present 705 with a 7080. This appears to be the logical conversion to provide for constantly increasing volume and additional applications.

Beginning the first of August, an order status tape has been established. This contains all open orders for trucks in detail by component units required to build those trucks. Each day, this tape will be increased by order received and relieved of trucks built. The built trucks will be exploded down to the part number level to provide the disbursement factor for a complete daily stock status updating. These stock status records will become the perpetual book inventory. Stock status will, of course, include daily receipts, and mortgaged material for the next 5 days production will be developed.

We expect to install a more comprehensive sales analysis program than is currently being used.

#### Westinghouse

Plan 60 KC Tapes.

Plan 1401-C to replace present peripheral equipment.

Plan complete integration of manufacturing operating systems.

## INSTALLATIONS

U. S. Army Signal Supply Agency  
225 S. 18th Street  
Philadelphia, Pennsylvania

U. S. Naval Ships Parts Control Center  
Mechanicsburg, Pennsylvania

Wright-Patterson Air Force Base  
Statistical Services Division  
Ohio

Air Weather Service Climatic Center  
225 D Street, S.E.  
Washington 25, D. C.

Social Security Administration  
Department of Health, Education & Welfare  
Social Security Building  
Woodlawn  
Baltimore 35, Maryland

Veterans Administration  
Data Processing Center  
Hines, Illinois

Commodity Stabilization Service  
U. S. Department of Agriculture  
New Orleans, Louisiana

Commonwealth Edison Company  
72 W. Adams Street  
Chicago, Illinois

Eastman Kodak Company  
Rochester, New York

IBM Methods - DS Manufacturing  
South Road  
Poughkeepsie, New York

International Harvester Company  
Motor Truck Division  
Box 1109 Meyer Road  
Fort Wayne, Indiana

Westinghouse Electric Corporation  
Sharpsville Avenue  
Sharon, Pennsylvania

Western Electric Company  
100 Central Avenue  
Kearny, New Jersey

Western Electric Company  
Hawthorne Station  
Chicago 23, Illinois (Proposed)

Standard Oil Company of Ohio  
717 Republic Building  
Cleveland 15, Ohio

Boeing Airplane Company  
Plant II  
Wichita, Kansas (Proposed)

Consolidated Edison Company of New York  
4 Irving Place  
New York 3, N. Y.