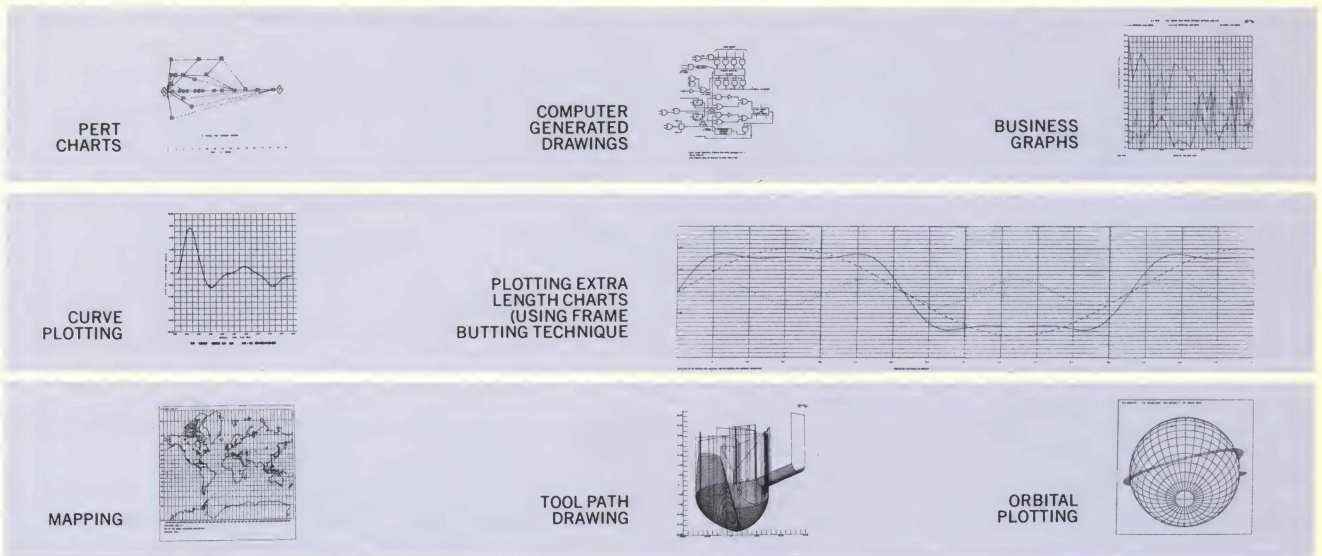


**S-C 4020  
COMPUTER RECORDER**

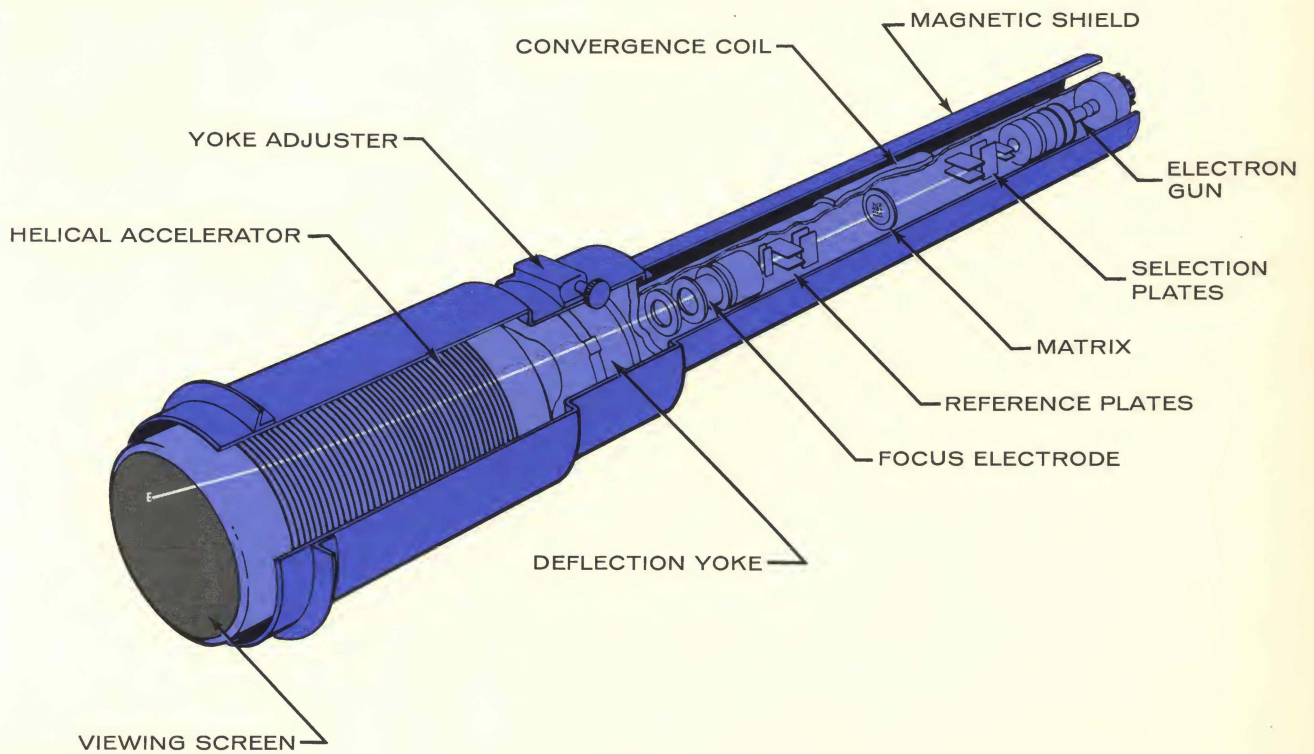


TYPICAL APPLICATIONS (Reproduced from actual S-C 4020 film output)



S-C 4020 Fast, Efficient Computer Recorder—plots curves, prints alphanumeric, checks APT programming, draws schedule networks, charts management data, portrays computer-developed drawings, and generates animated motion pictures. Presents computer output on face of a unique CRT tube known as the CHARACTRON® Shaped Beam Tube (shown below). Information displayed on the tube face is recorded automatically on microfilm and photorecording paper.

## CHARACTRON® SHAPED BEAM TUBE



The S-C 4020 is an electronic system capable of operating on-line with a computer or of accepting digital magnetic tape signals and converting binary or BCD codes into combinations of alphanumeric printing, curve plotting and line drawings. The 4020 records the information at high speeds on both microfilm and photorecording paper. The recorder's microfilm output can be made compatible with existing film storage and retrieval systems.

The 4020's ability to translate coded data into complex annotated graphs and drawings at high speeds makes it an ideal peripheral output tool for either the scientific or business computing installation. This added flexibility in turn makes the computer complex more useful to additional departments within an organization.

The S-C 4020 can be either leased or purchased outright. An experienced customer service organization provides service throughout the United States and in Europe. In addition, 4020 Service Bureaus are in operation on both coasts of the U.S. where recorders may be leased by the job for evaluation purposes. The system has economically justified its use in several dozen computing installations.

#### HOW IT WORKS

The S-C 4020 uses a CHARACTRON<sup>®</sup> Shaped Beam Tube as a generator for characters, lines or curves. The heart of the tube is a small stencil-like matrix (a thin metallic disc with alphanumeric and symbolic characters etched through it), which is placed in front of the electron gun.

The beam of electrons, emitted from the cathode, is collimated, focused and electrostatically deflected to cover only one character in the matrix. The electron beam is extruded through the selected matrix character and impinges on the phosphor of the CSBT. The phosphor is illuminated in the shape of the extruded beam and is projected through the lens onto the microfilm for permanent record.

#### RECORDING

Recording can be accomplished on 35 or 16 mm film, either perforated or non-perforated. The camera is mounted directly opposite the tube screen. For simultaneously recording on paper for hardcopy output, a special camera (F80 or F165) is optically aligned with the tube screen and produces a format on the paper 7½ inches square.

Standard formats, which do not vary from frame to frame, such as company forms, symbols or maps, may be superimposed over the frame by the forms projector; thereby saving valuable computer time.

#### SPEED

The S-C 4020 system can accept data from magnetic tape at rates up to 90,000 six-bit characters per second. The S-C 4020 records this data at speeds of 12,000 characters per second and prints approximately 5,600 lines per minute. Operating on-line with a computer providing 36-bit words, the S-C 4020 records 17,000 characters per second and prints approximately 8,000 lines per minute.

Frames combining characters, axes, vectors and curves vary with the complexity of the drawing, but an average annotated graph can be recorded in a fraction of a second. The equipment's high-density tape adapter (F53 Series) results in minimum use of computer time.

#### USERS SOCIETY

Users of S-C 4020s have organized to share ideas, applications and programming techniques. Named UAIDE for "Users of Automatic Information Display Equipment," the society has a software library and holds yearly seminars to interchange information.

#### COMPUTER OUTPUT SUB-ROUTINE PACKAGE

The S-C 4020 output package consists of a set of programming subroutines for printing and plotting data on the S-C 4020. Packages are presently available for IBM 704, 7090, 7094, GE 225, CDC 160A, 1604, UNIVAC 1107 and other computers.

#### APPLICATIONS

The S-C 4020 can be employed to record tabular and other alphanumeric information such as stock catalogs, program debugging, and other statistical data at speeds of 17,000 characters per second. The equipment's versatility, however, is best illustrated by applications involving combinations of both drawing and character recording.

*Scientific Curves*—In many scientific computer installations the 4020 is being used to plot highly accurate curves involving one or more parameters. All axis and grid lines, annotations and titles are included in the program. For curves requiring more than one frame length, a continuous graph may be plotted by butting the frames together under program control. Typical curves include flight tests, engine performance, missile trajectory simulation, etc.

*Business Graphs*—The recorder is proving its usefulness daily by plotting curves and other business charts for cost analysis, production control, manpower forecasts, projected sales, and other administrative tasks. The machine's ability to summarize the data in a visual form speeds decision making, saving time and money.

*Tool Path Drawings*—Magnetic tapes programmed in APT language to guide machine tools can first be played on the S-C 4020 which makes a drawing of the part. The drawing can be checked for errors prior to making a part, and can also be used for final inspection. In addition to tool path drawings, the 4020 can be used for such computer drafting applications as logic and flow diagrams, ship and missile design.

*Schedule Networks*—PERT and other critical path charts can be produced and updated on the S-C 4020 in seconds. For longer networks, the frame butting technique can be used.

*Mapping*—The 4020 is producing maps for such uses as weather patterns, satellite tracking and population studies. The map itself may be superimposed by the slide projector. The CHARACTRON tube then displays the variable information, or the entire map may be drawn by the tube, allowing area expansion by computer command.

*Sequential Events*—One of the exotic uses of the equipment is the drawing of a series of slightly changing graphs for calculation of core reactor characteristics, simulation of shock waves and explosions, or for training aids. The series is then projected and viewed as a movie giving a time scale sequence.

## SPECIFICATIONS

### DIMENSIONS:

Basic unit	
Length .....	66 in.
Width .....	37 in.
Height .....	74 in.
Basic unit options have the following lengths:	
Tape Adapter .....	22 in.
Photorecording Paper Printer .....	20½ in.

### POWER REQUIREMENTS:

208V, A-C ±5%, 3φ, Power Consumption 3500 watts

### INPUT AND OUTPUT SIGNALS:

Inputs ..... "1" or "Up" + 5 to +50V  
 "0" or "Down" 0 to -50V

Write line rise time: less than 1 microsecond

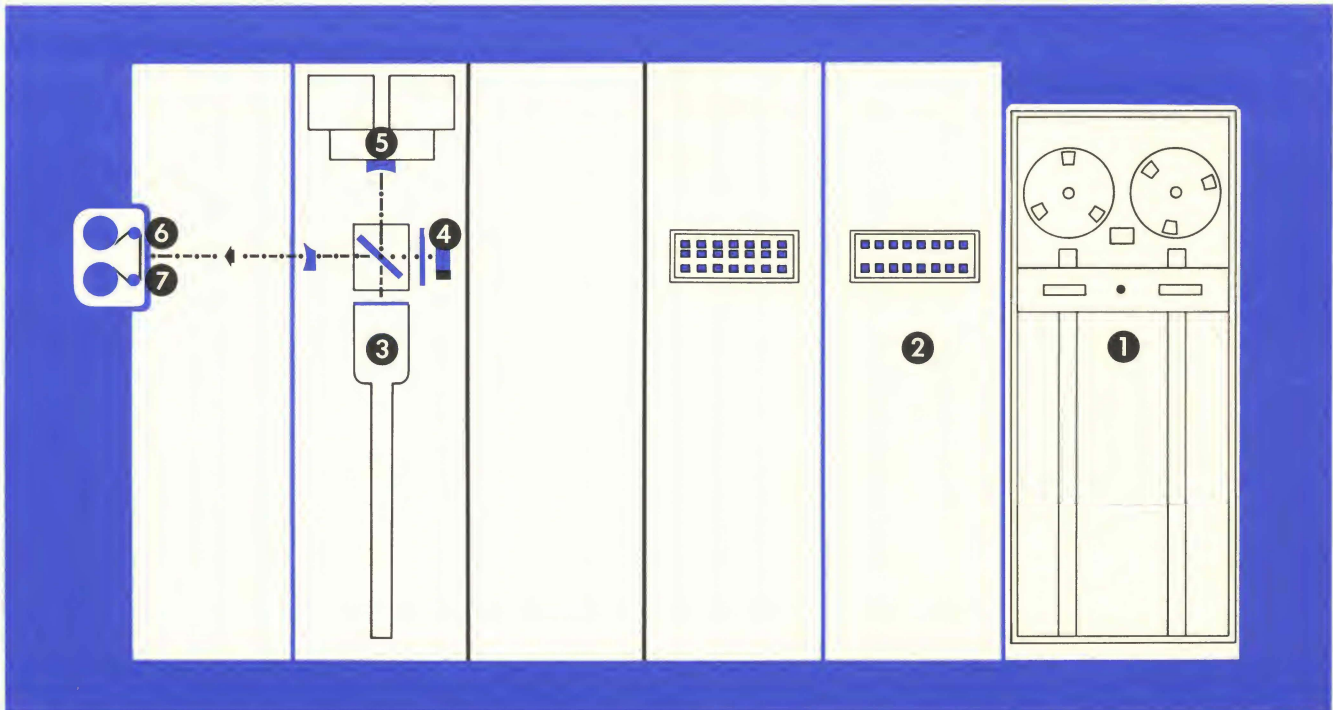
Input Impedances .. 10,000Ω in parallel with 500 pf

Outputs ..... Ready Line: "Up" +10 to ±05V  
 "Down" 0 to ±05V

Resume Pulse ..... Same as ready line

Polarity: Positive or negative, as desired

Rise and Fall Times (10,000Ω, in parallel with 500 pf load): less than 1 microsecond



#### 1. TAPE TRANSPORT

Six channel digital tapes are read at 200, 556 or 800 bits per inch. Compatible tape units include the IBM 729 II, IV, V, VI and 7330 plus UNIVAC IIC, Collins, and others.

#### 2. TAPE ADAPTER

Accepts data from tape up to 90,000 characters per second. Assembles six-bit information from tape and arranges it into 36-bit words.

#### 3. CHARACTERTRON SHAPED BEAM TUBE

Displays the alphanumeric, curves, axes and vectors for recording purposes.

#### 4. FORMS PROJECTOR

By tape control, fixed format from the forms projector can be superimposed on microfilm and photorecording paper.

#### 5. MICROFILM CAMERA

Records combined information from tube face and forms projector onto 16mm or 35mm film for archive storage, reproduction or group viewing.

#### 6. HARD COPY RECORDER (F80)

Records combined information from the CSBT and forms projector simultaneously with the microfilm camera. The photorecording paper must be processed (developed) before viewing. The processed copy may be reproduced for multiple copies.

#### 7. HARD COPY CAMERA/PROCESSOR (F165)

Records the same information as the F80 but has two modes of operation. One mode provides internally processed copy, for "quick look" capability; the other mode requires external processing. In the "quick look" mode, the frame is visible 2½ seconds after exposure and each succeeding exposure is available at ¾ second intervals.

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