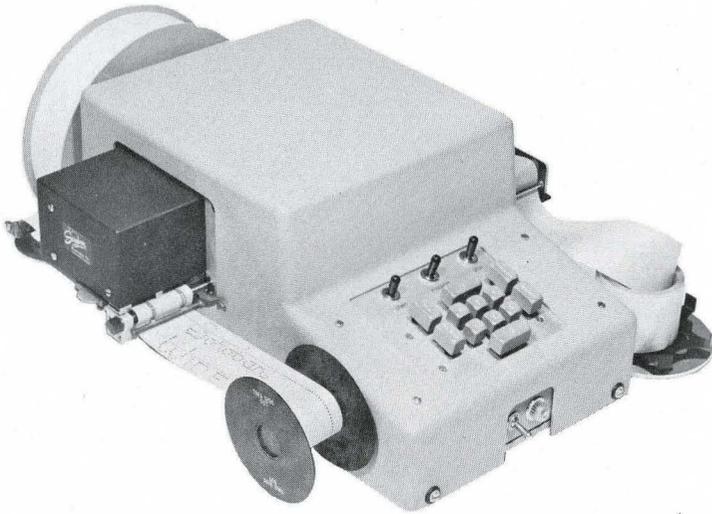




ENGINEERING, INC



TAPE PREPARATION - TAPE REPR



Soroban now produces simple and reliable custom built tape preparation, reproduction, and verification equipments. Equipments tailored to a specific need can be provided for operation with standard 5, 6, 7 and 8 hole narrow tape, or 16 hole wide tapes. All make use of the flexible Soroban Automatic Coding Keyboard which can be supplied with almost any desired coding and keyboard key configuration. When ordering tape preparation equipments please specify the desired coding, keyboard key configuration, whether a single recording is desired for each manual data entry, and whether the basic unit falls in one of the equipment classes described below.

KEYBOARD PUNCHES (Model FKP) The simplest complete tape preparation device manufactured by Soroban consists of a Model FK-104 Coding Keyboard and Paper-Tape Perforator. The equipment permits direct recording of digital data in punched paper tape from manual keyboard key entries.

REPERFORATING KEYBOARD PUNCHES (Model RKP) — Addition of a tape reader and associated controls to the Model FKP Keyboard Punch provides an equipment capable of both preparing tape from manual key entries and reproducing or "reperforating" tapes. During reperforation, tape reproduction may be interrupted for manual insertion of corrections. Control switches are provided which permit single character advance until a desired location has been reached (i.e. single shot advance). Correction data may then be inserted into the new tape by manual entry into the reperforating punch's keyboard.

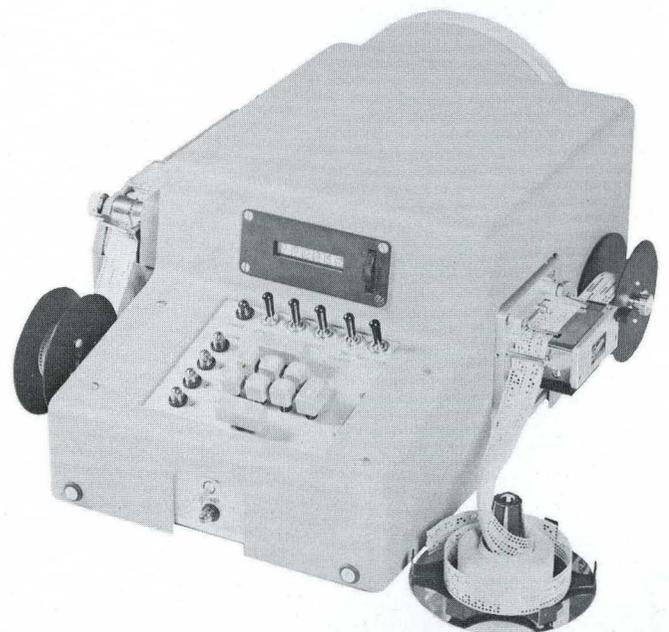
VERIFYING PUNCHES (Model FCP) — Addition of appropriate controlling circuits to the reperforating keyboard punch provides a device capable of tape verification as well as tape preparation and reproduction. During verification, actuation of the keyboard produces a signal which controls the reading of one character from the punched tape reader. Recognition of agreement between codes supplied by the reader and those produced by the keyboard produces a pulse to automatically release the keyboard locking mecha-

nism and permit transmission of the verified code to the punch for recording. When disagreement occurs, the keyboard is maintained in a locked condition and information transmittal is inhibited. Further, as an immediate indication to the operator, the key which has been depressed is restrained in the depressed position. If the information in the keyboard is correct, operation of an override switch permits transfer of the keyboard's digit to the punch. If incorrect, another button releases the keyboard permitting the operator to try again.

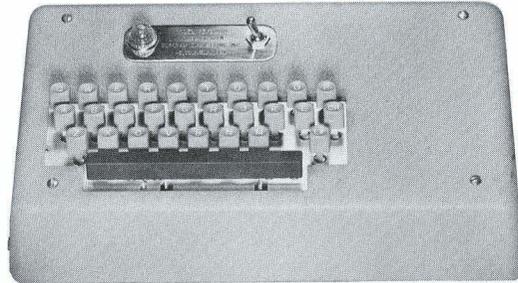
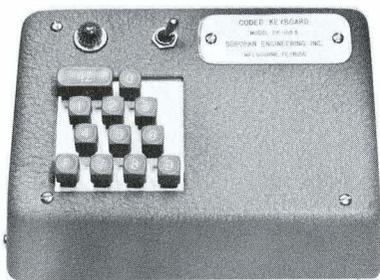
GENERAL SPECIFICATIONS

(Model FKP, RKP, and FCP Tape Preparation Equipments)

Size	Numeric — Height, 8½ inches - width, 14-18 inches - depth, 19 inches. Alphabetical — Height, 8½ inches - width, 19-24 inches - depth, 19 inches
Weight	Generally less than 40 lbs.
Finish	Royal grey fine wrinkle.
Input Power	115 volt, 60 cycles, approximately 70 watts.
Coding	5, 6, 7, 8, or 16 binary digits.
Speed	Keyboard — limited only by driven mechanism. Punch — 15 characters per second, maximum. Reader — 15 characters per second, maximum.
Key Pressure	3½ oz. (can be varied to order).



RODUCTION - TAPE VERIFICATION



Almost all Soroban tape preparation equipments incorporate the versatile and reliable, custom designed series FK automatic coding keyboards. Since few users have comparable requirements, Soroban has established assembly procedures which permit prompt delivery of custom coding equipments. Keyboards can be supplied with key configurations and output codings tailored to meet unique customer requirements.

AUTOMATIC CODING KEYBOARDS (Model FK) — The series FK keyboards are both mechanically and electrically interlocked. One and only one key may be depressed at a given time. Once depressed, all keys are locked in their respective positions until a control signal is provided to the keyboard signifying consumption of the selected code by the controlled mechanism. Either an internal time constant, or a feedback pulse from the controlled device is used to establish the duration of the keyboard's output signal and to prevent multiple electrical outputs from a single key depression.

A mechanical matrix is used to produce digit coding, with a maximum of eight parallel bits per code plus common. Keyboards can be supplied with almost any keyboard arrangement. The simple compact design makes use of high quality components including bifurcated spring-leaves with a wiping contact action, palladium and tungsten contacts, precision mechanical locking mechanisms, etc.

HOW THE CODE IS FORMED

The sequence of operations which produces a coded output from the FK keyboards may be described as follows:

a) As an operator depresses a push-button, an affixed actuator enters coded slots on the spring-loaded permutation bars, locking all bars except those pertaining to the selected code. During this same operation, the actuator displaces the hinged bail causing it to operate the microswitch.

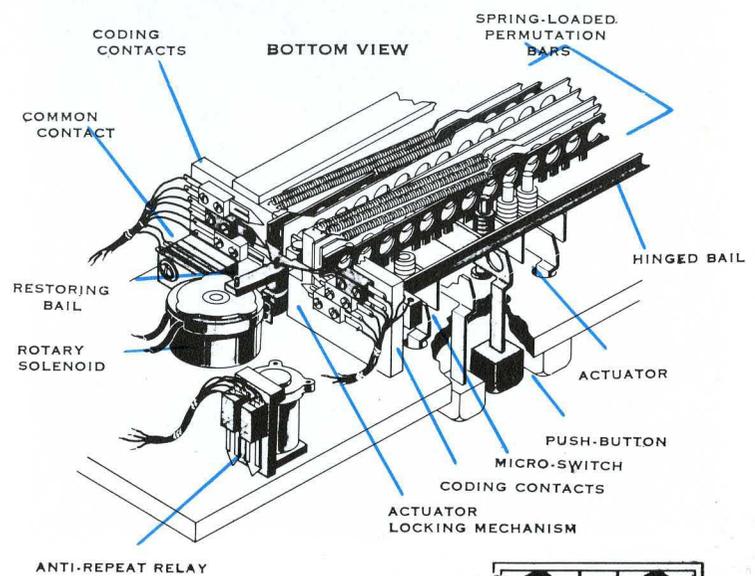
b) The microswitch energizes a Ledex rotary solenoid which operates an actuator locking mechanism forcing the selected push-button to sustain full depression and then lock the entire keyboard from further operation. This same solenoid motion releases the restraining force of the restoring bail permitting the free-moving, or selected code permutation bars to move forward under spring tension.

c) The free-moving permutation bars thereby engage corresponding coding contacts, closing electrical circuits to produce the equivalent electrical pulse code.

d) All preceding conditions are maintained until the anti-repeat relay receives a control signal from either an internal time delay circuit or the driven unit which then releases the rotary solenoid and allows all components to return to their normal unenergized condition.

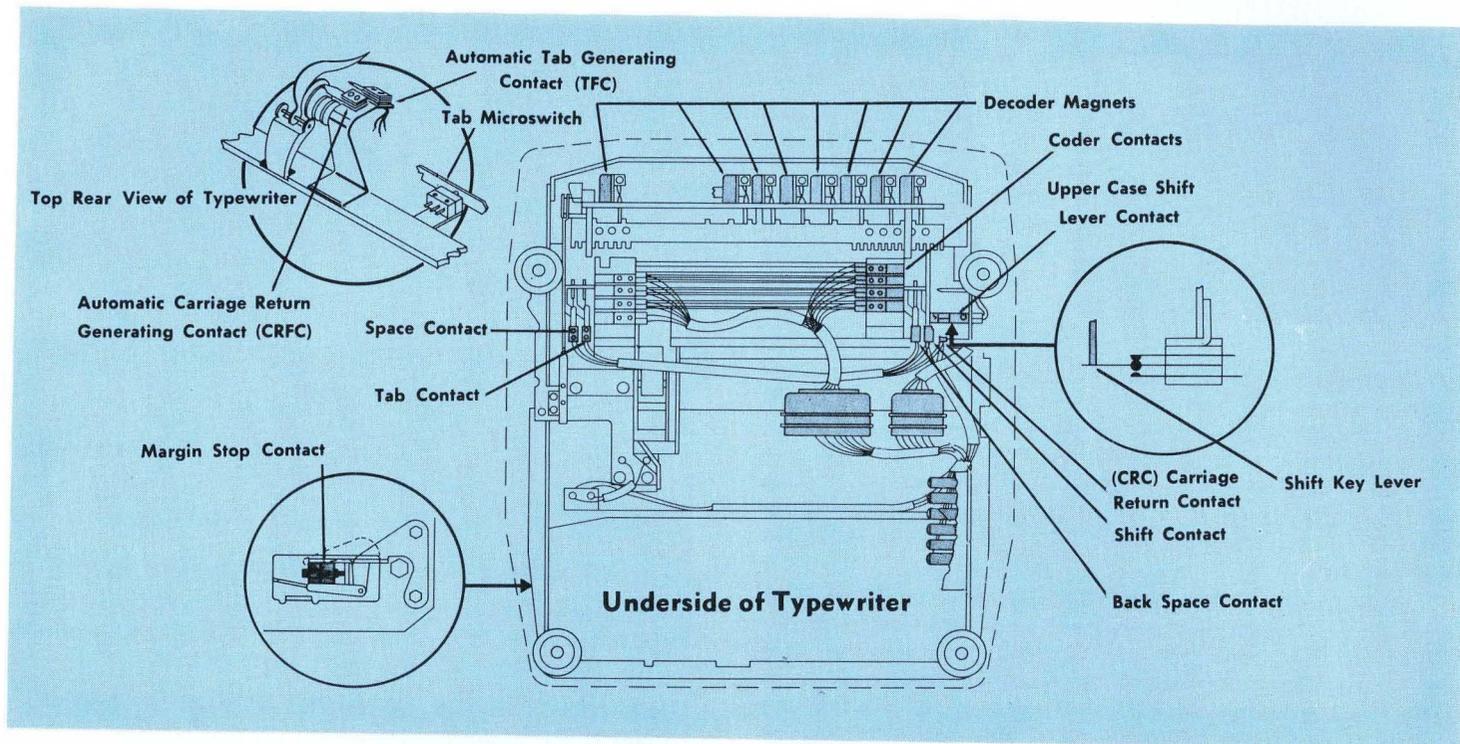
SPECIFICATIONS

Coding	8 bits plus common; mechanically produced.
Speed	Limited only by driven mechanism.
Key Pressure	3½ oz. (can be varied to order).
Electrical Coding Contacts	Bifurcated leaves using palladium contacts — 30 grams minimum force — Type A or C.
Electrical Common Contact	Bifurcated leaf using palladium contacts — Type A or C.
Total Output Load	Unsuppressed, 100 watts AC, but not more than 2 amps., with non-inductive load.
Input	Operable from a specified voltage between 6 VDC and 100 VDC, unfiltered.
Finish	Royal-grey fine wrinkle.
Weight	5 lbs. (Approximately).



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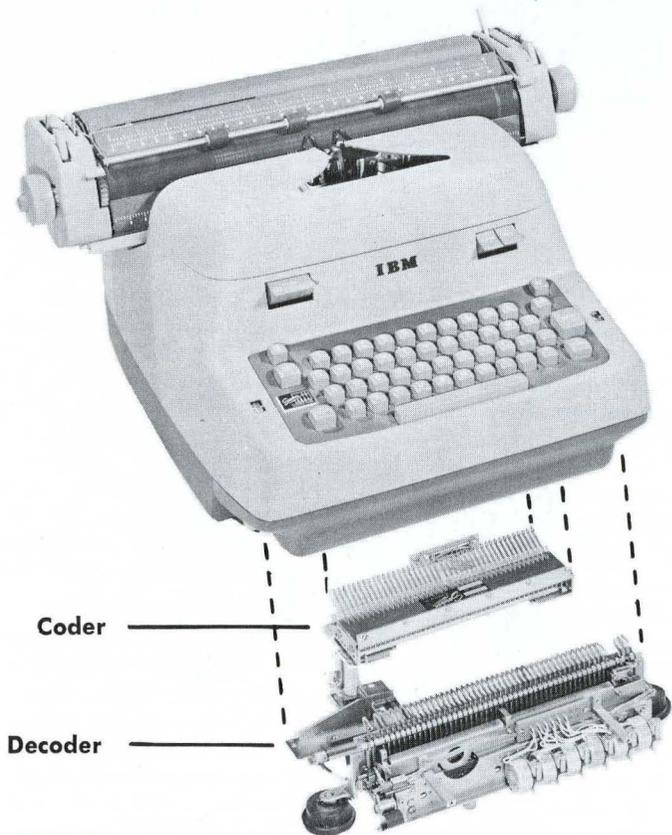
INPUT - OUTPUT



The requirement for automatic tabulation of data represented by coded electrical signals, as well as for automatic tabulation during creation of coded electrical controlling signals justified development of Computeriter tabulating equipments. These machines are capable either of being sequenced from coded electrical inputs or of producing coded electrical outputs from manual keyboard key entries. Basically the machines consist of modern, rugged, electric typewriters equipped with mechanical coders and/or decoders. A printed copy is produced when the typewriter is either sequenced from the coded electrical inputs or operated to produce coded electrical outputs.

Since efficient integration of electrically sequenced tabulators into specialized data processing and automation systems may involve custom equipments, computeriter production has been organized to accommodate unique customer requirements. Upon request, computeriters can be furnished with specific coding, type style, carriage length, special typewriter function control contacts, etc. All such custom features are available in the present three basic types of computeriters manufactured by Soroban.

TABULATING COMPUTERITER (Model ET) — The Model ET Computeriter is designed to tabulate data from coded electrical input signals. The computeriter's mechanical decoder is designed for reliable automatic sequencing of all typewriter functions and type key levers from appropriately coded electrical input signals at a rate of approximately 10 characters per second. Removal of an installed decoder is accomplished by removal of the typewriter's feet and two screws, thereby facilitating typewriter maintenance by normal typewriter service personnel. The computeriter's decoder makes extensive use of ball bearings, nylon bushings, appropriately hardened and plated precision parts, etc., all of which insure long life and trouble-free operation.



TABULATION

CODING COMPUTERITER (Model EC) — The Model EC Computeriter has been equipped with an unusually reliable mechanical coder capable of producing a single code of up to 8 bits for each typewriter keyboard print key entry. A single auxiliary contact is provided on each of the typewriter functions. Thus a coded output is provided for each printed character, while a relay contact is operated for each operated typewriter function key.

INPUT - OUTPUT COMPUTERITER (Model ETC) — The Model ETC Computeriter contains all of the features of both the ET and EC Computeriters.

SPECIFICATIONS

MODEL ET, EC AND ETC COMPUTERITERS

Speed of Operation	10 characters per second.
Noise Level	Noise no greater than that produced during manual operation of the typing mechanism.
Typewriter Characteristics	42 key, 115 volt, 60 cycle, Model B IBM typewriter. 44 key computeriters can be furnished on special order.
Power Supply Requirements	90 volt DC decoder solenoids are used throughout. Maximum current consumption 1.2 amperes. No auxiliary power is required for decoder.
Automatic Tabulate Contacts	Contacts capable of controlling tabulate functions at adjustable column positions can be provided on request.
Automatic Carriage Return Contacts	Contacts capable of directing typewriter carriage return at an adjustable right margin can be provided on request.
Weight Finish	50 lbs. (Approximately). Royal grey wrinkle unless otherwise specified.
Coding	8 bits on either coder or decoder.

THE COMPUTERITER DECODING PROCESS

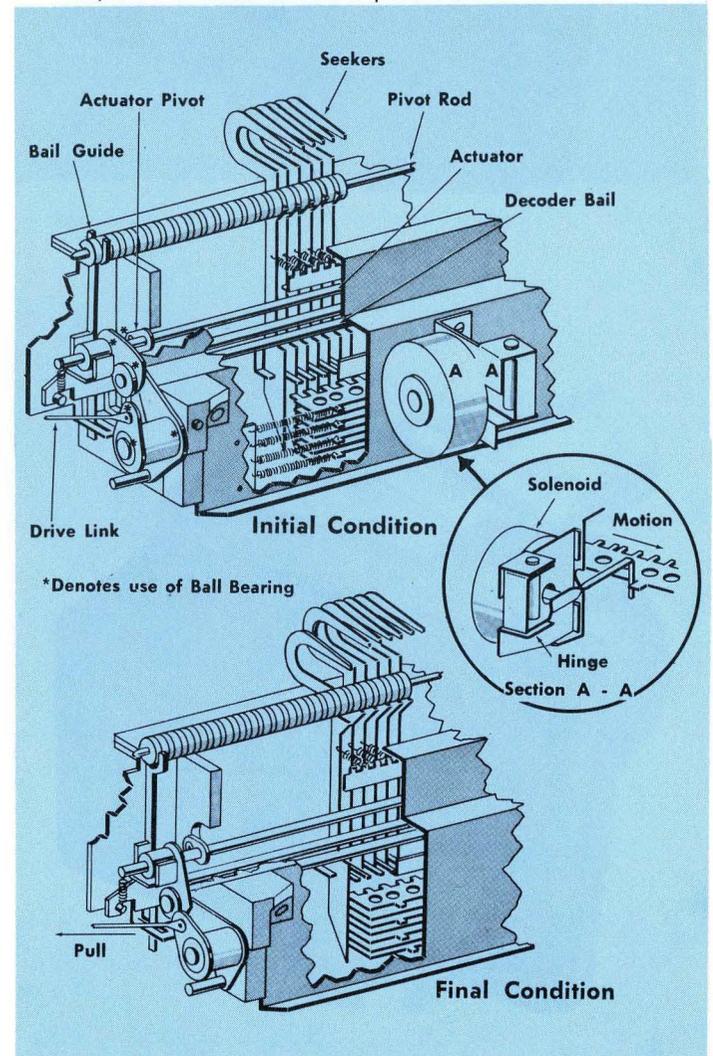
With the decoder installed in the typewriter, the upper end of each seeker is positioned to hook over a pin installed in the side of each typewriter key lever. Thus, a downward motion of a seeker produces a typing action. Decoder power is supplied from a solenoid actuated typewriter cam and appears as a pull on the drive link.

Section AA illustrates how the decoding bars are positioned by a pusher type Ledex solenoid. To accomplish seeker selection for typewriter operation, these spring loaded bars are notched so that for any specific solenoid actuating condition, only one continuous slot can exist across all bars into which a seeker may enter.

In the initial condition, the force of a return spring

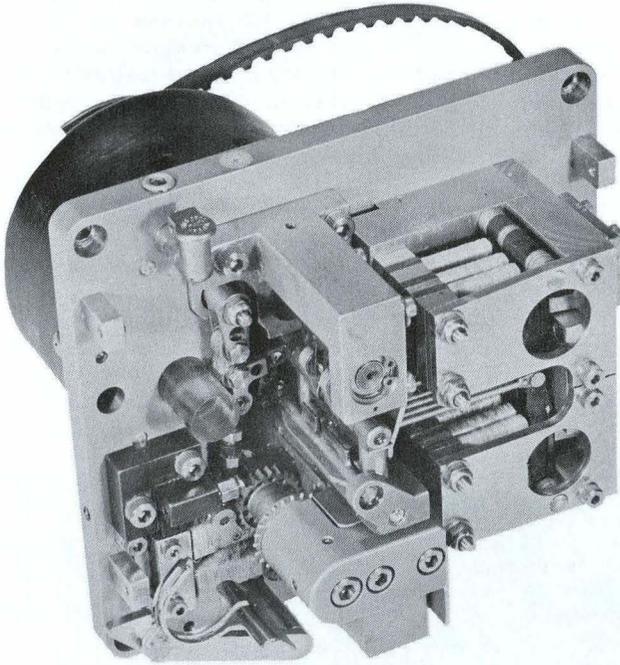
on the drive crank operates a toggle which pushes the pivoted actuator all the way to the rear. In turn, the actuator positions the decoder bail such that all seekers are lifted free of contact with the decoding bars. Thus solenoids may position decoding bars with a minimum of friction and interference.

When decoding bars have been positioned, a pull supplied to the drive link draws the decoder bail forward. Although the spring loaded seekers attempt to follow the bail's motion, all but the selected one are restrained by the notched decoding bars. The selected seeker enters the selecting slot in the decoding bars, pivots around the pivot rod, and follows the decoder bail throughout its stroke. Since the geometry of the bail's motion is determined by the rotational motion of the pivoted actuator, the bail ultimately commences a downward motion and engages the seeker's notch, drawing the selected seeker downward. Although the selected seeker maintains contact with the bail throughout its complete cycle, all other seekers are blocked by the code bars prior to completion of the bail's forward motion, and are free of the bail when downward motion commences. At the end of the downward stroke, the pull on the drive link is released and springs restore all components to their initial positions.



SUPER SPEED TA

Until recently, techniques for recording digital data in perforated tapes have been perfected to meet the needs of the communication industry. The Soroban Model GP-100 probably represents the first tape perforator designed specifically for instrumentation as well as digital computer output-data recording applications. Although originally designed for much higher operating speeds, the GP-100 is presently being released for 240 code per second operation. The design now permits recording of standard 5, 6, 7, or 8 hole patterns to be performed reliably at controlled rates up to 240 codes per second. The perforator executes a basic recording cycle in approximately 4 milliseconds. Since a recording cycle can only be executed on demand, associated electronic control circuits will permit recording of random or asynchronous data at variable rates up to the full 240 codes per second.

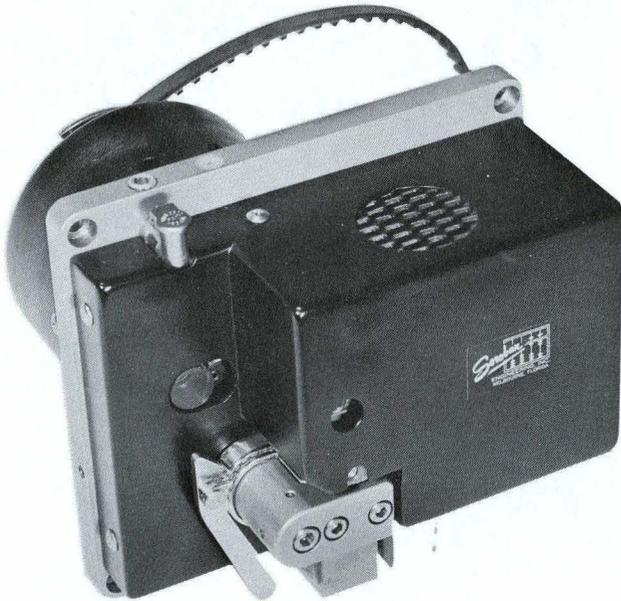


SUPER-SPEED TAPE PERFORATOR (Model GP-100) —

The Soroban Super-Speed Punches are motor-driven devices designed to perforate 5, 6, 7, or 8 hole standard paper or parchment tapes with motor-drive forces supplied to the punch through a Gilmer timing belt. Hole spacings and sizes are those which have been standardized by the communications industry.

The design is predicated upon use of a simple, compact, and reliable interposer system driven from a continuously rotating power source. The basic motion required for operation of the punch is produced by a constant diameter triangular cam and cam-follower, all run in an oil bath, and operated at one-half the cyclic rate of the actual punching mechanism. Toggles double the basic drive frequency to that required for punching and tape feeding. Since actuating signals precisely synchronized with the rotation of the mechanism's drive shaft are required, the design provides independent reluctance pick-ups for synchronization of both punch and tape-advance signals. Mechanisms for positively resetting control solenoids, interposers, and withdrawing punch pins from the die block, etc., are all included to provide a device unequalled in reliability and performance.

Unless otherwise specified, the Model GP-100 is delivered with drive motor on a simple panel mounting and without tape supply or pick-up devices.



SUPER SPEED PERFORATOR MOUNTING PANEL (Model GP-100P) —

When desired, 17½ inch high panels as illustrated can be provided for operation with the GP-100 tape perforator. The equipments contain racks for 1000 foot fan-fold packs of supply paper. Tape pick-up is accomplished by full packs of supply paper. Tape pick-up is accomplished by a motor-clutch driven pick-up reel (Model TR-1) using NAB hubs for tape storage.

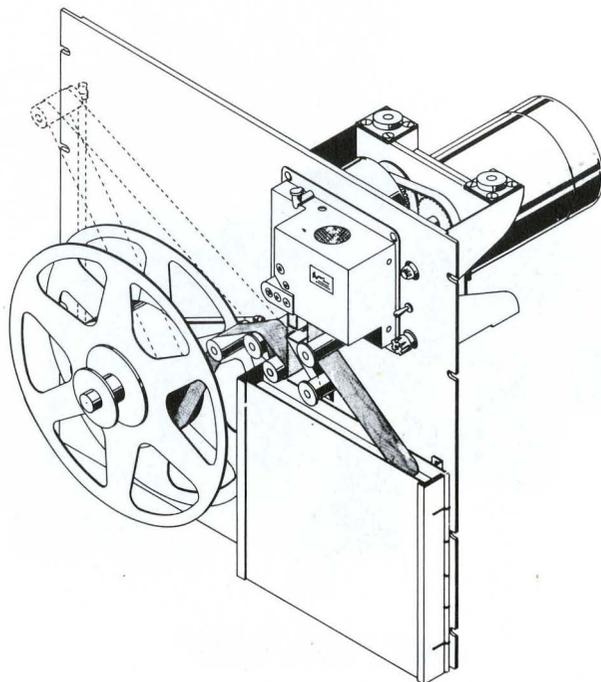
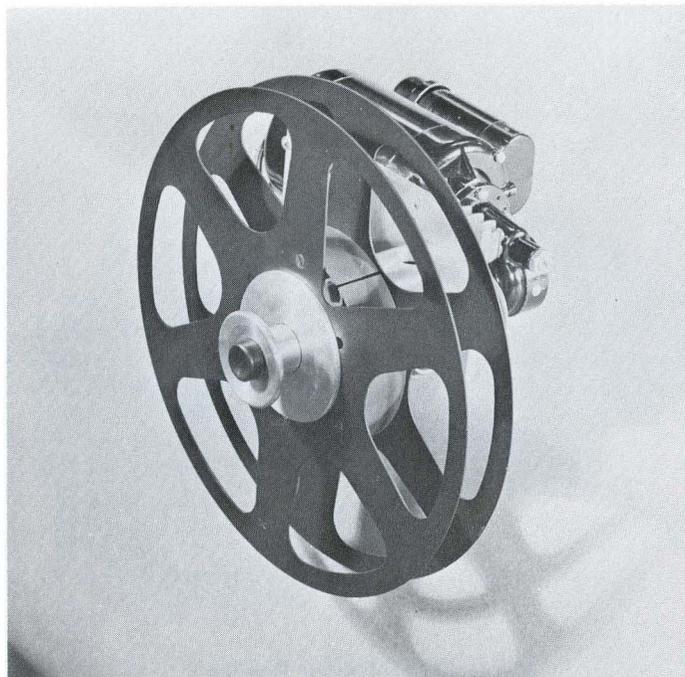
TAPE RECORDING

TAPE REEL DRIVES (Models TR-1 and TR-2) — The TR-1 tape reel has been designed to drive NAB hubs at a speed suitable for 2 feet per second tape pick-up. This speed permits direct spooling of recorded outputs from the GP-100 perforator.

The inertia presented by a roll of supply tape requires a comparable reel drive to isolate the roll inertia from the GP-100 tape transport mechanism. Thus in applications wherein use of fanfold packs becomes impractical, it is suggested that the TR-2 power-driven tape unwinder be used.

SPECIFICATIONS

Operating Speed	240 codes per second
Code Characteristics	Models available for perforating either 5, 6, 7, or 8 level tapes
Weight (Un-mounted Punch)	10 lbs.
Weight (Including Panel & Motor)	25 lbs.
Drive Motor	Hysteresis Synchronous — $\frac{1}{8}$ HP, 3600 RPM, 115 Volt, 60 Cycle
Motor Mount	Motor and punch provided on a center of gravity shock mount
Size	When mounted on a relay rack panel, the punch and motor extend $9\frac{3}{4}$ inches behind, $4\frac{1}{8}$ inches in front of panel.
Code Interposer Magnets	100 ma, 0.37 Henries with armature closed, 0.19 Henries with armature open, 250 ohms resistance, 0.76 milliseconds minimum time constant
Feed Magnets	120 ma, 0.75 Henries with armature closed, 0.40 Henries with armature open, 310 ohms resistance, 1.3 milliseconds minimum time constant
Magnet Insulation	1000 volt DC test 400 volt maximum peak AC signal
Synchronization Signals	2-5 volts, $\frac{1}{4}$ millisecond duration from 2000 ohm source. Individual reluctance pick-ups are provided to indicate duration of punch and feed cycles. Each pick-up provides two signals of opposite polarity which bracket the desired excitation intervals.



ENGINEERING, INC.

PAPER TAPE

A new component for use in data processing and control systems is provided by the Soroban FR series Paper Tape Readers. Designed to read one or two standard paper tapes, these readers offer a new tool to those responsible for the design and integration of automation into control and computing systems.

Although reading is completely mechanical, contoured low-inertia sensing pins coupled with a precision tape advance assures gentle treatment of perforated tapes. Tests have proven that even at the highest operating speeds, tape life has been extended to permit thousands of repetitive readings from a given paper tape. The series FR Readers can be tailored to accommodate special requirements and specifications. Readers may be supplied as solenoid-driven units for operation at speeds up to 20 characters per second, or motor-clutch driven units for operation at speeds up to 45 characters per second.

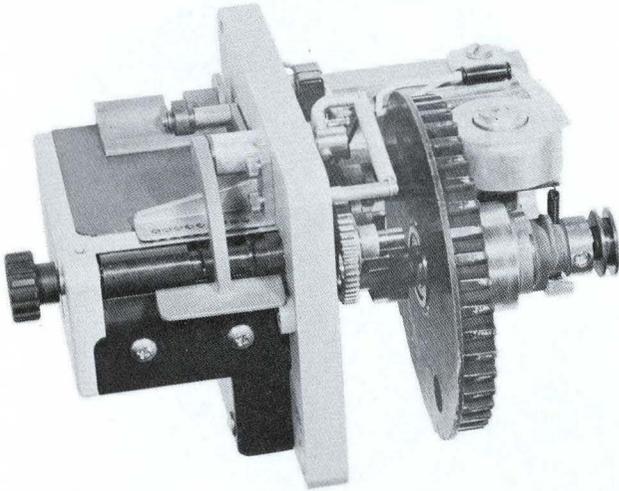
At present two paper tape reading heads are available, namely Model FR-350 for dual or wide tapes and Model FR-310 for single tapes. For example, Model FR-350 readers are designed for reading single 16 level perforated tapes or two tapes of 5, 6, 7, or 8 levels. When reading dual tapes, the reader transports the tapes as though they were a single wide tape. Thus prior to the design of the Soroban 16 level wide-tape punch, the reader found acceptance in applications requiring tapes wider than the previously standard 8 levels. The reader is also ideally suited to applications requiring dual functional control, tape comparison, etc., (i.e. applications wherein information recorded in one perforated tape may be used to control the routing of equal precision information recorded in a second tape, or one tape is to be compared for identity with a second).

The Model FR-310 is a single reader accommodating 5, 6, 7, or 8 level tape for use in such common applications as data inputs to computing and automation devices, remote-control equipment operation, etc.

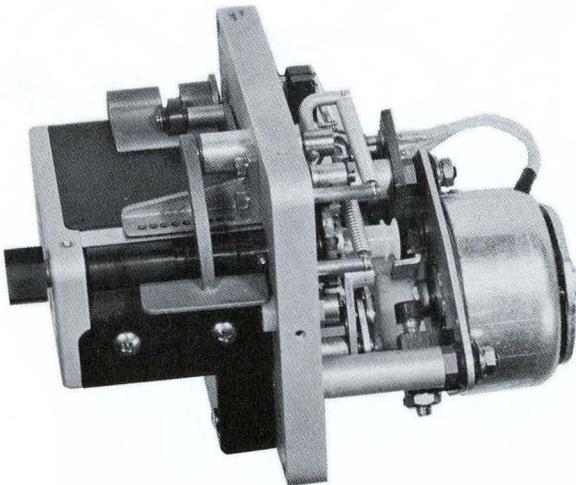
MOTOR CLUTCH-DRIVEN READERS (Models FR-310M, FR-350M and FR-310XM; FR-350XM) — Clutch-driven readers are available in two styles "M" and "XM". The "M" style is designed for operation at 30 characters per second or less and maintains electrical output for approximately 180 degrees of drive-shaft rotation (i.e. 17 ms at 30 cps). The "XM" is capable of 45 characters per second operation with contact closure maintained for approximately 130 degrees (7 ms at 45 cps). All motor-clutch readers are extremely quiet in operation and exhibit expectancies in tape life as great as 10,000 passes using common yellow paper tape.

For optimum equipment life, motor-driven readers should be operated at a speed no greater than that at which associated circuitry can consume the read data. Thus, a block of data codes will normally be read for each clutch cycle of operation. Character by character reading is not recommended.

SOLENOID DRIVEN READERS (Models FR-310S and FR-350S) — The compact self-powered "plug-in" solenoid readers utilize rotary solenoids as the driving force for the standard Soroban tape reading heads. During reading, sensing pins close reading contacts during the solenoid energized stroke, and contacts remain closed until the drive solenoid is de-energized. Tape advance occurs during the



Motor Clutch-Driven Reader



Solenoid Driven Reader

READING

solenoid de-energize stroke thereby allowing the function of tape reading to be interlocked with external circuitry. Solenoid readers are generally considered for applications requiring a maximum reading rate of 20 codes per second. Tests on common .003" thick lubricated paper tapes has verified a life expectancy in excess of 2000 passes.

Motor clutch-driven tape readers are available either in cabinet mountings similar in appearance to the CR-1 illustrated on the next page, or in panel mountings. Typical self-contained reader sub panels are illustrated by the EA and SC panels.

READER PANELS UTILIZING TAPE REELS (Model SC)

Reel mountings are available for use with either single tape or dual tape motor clutch-driven readers. The SC panels, which feature power tape rewind under solenoid control, illustrate the use of reels. SC panels are available for use with motor clutch-driven readers operated at speeds of from 4 to 45 codes per second. On special order, such panels can be provided with dual-speed reader drive motors. The overall dimensions of the SC panel are 15 inches wide and 5 3/8 inches high. The drive motor extends approximately 5 inches behind the panel. When equipped with a single, Model FR-310 reader, the unit extends forward of the mounting panel by 3-7/8 inches. When equipped with a dual or wide tape reader (i.e. Model FR-350), it extends forward 5 1/8 inches.

READER PANELS UTILIZING CENTER FEED TAPE SUPPLY (Model EA) — Center-feed tape supply devices and pick-up reels for single tape systems are illustrated by the EA reader panels. When operated with 5, 6, 7, 8, or 16 level tapes, an EA panel with mounted reader measures 15 inches wide, 5 3/8 inches high, extends 6 1/2 inches behind the panel 5 1/2 inches forward.



Model EA Reader Panel

READER SPECIFICATIONS

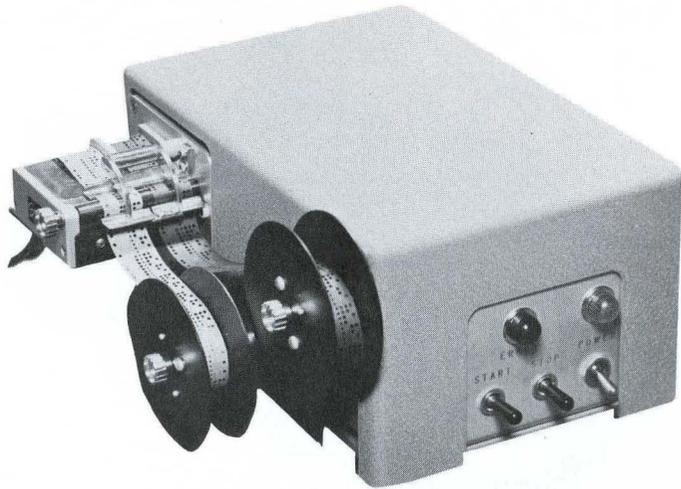
	FR-310S & FR-350S	FR-310M & FR-350M	FR-310XM & FR-350XM
Maximum Operating Speed	18 - cps	Up to 30 cps	Up to 45 cps
Tape Width	See Text	See Text	See Text
Reading Contacts	1 ampere rated 110 volt resistance load; form A, B, or transfer, bifurcated palladium	Same	Same
Common Contact	2 ampere rated; form A, B, or transfer, bifurcated palladium	Same	Same
Solenoid Operating Voltage	Standard units are equipped with 90 volt DC solenoids, 45, 24, and 12 volt solenoids are available on special order	Same	Same
Drive Source	Solenoid consumes 40 watts peak power	Motor-Clutch with 115 volt 60 cps motor	Motor-Clutch with 115 volt cps motor
Weight	FR-310S-1 lb. 15 oz. FR-350S-2 lbs. 8 oz.	Approx. 2 lbs. without drive motor	Approx. 2 lbs. without drive motor
Mounting	Plug-in	Panel or Cabinet	Panel or Cabinet
No-Tape Contact	5 ampere rated form A	Same	Same
Cooling Requirements	Forced air required when operated at speeds in excess of 12 cps	None	None
Contact Timing	Sensing pin contact operation overlaps common contact	Same	Same



Model SC Reader Panel



TAPE COMPARISON

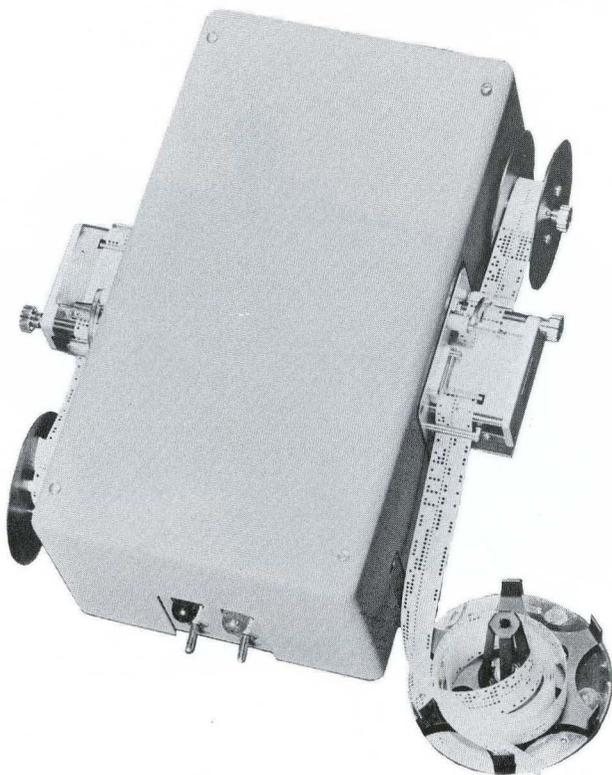


Automation and data processing centers are finding an increasing need for machines which will check tape reproduction and insure that accurate tape copies are being produced. To accommodate these needs, Soroban has produced a variety of tape comparator equipments which proofread and check two or more supposedly identical perforated paper tapes. Generally such comparators read the tapes in synchronism, character by character. Detection of a discrepancy between the tapes halts further tape advance and indicates to an attending operator the presence of an error.

The Soroban CR Comparators have been designed to operate reliably with tapes of similar thickness or with reasonable thickness variations. For example, information recorded in thin lubricated communication tapes can be compared with information recorded in plastic tapes, or in opaque unlubricated parchment as is commonly used in photo readers. Standard CR tape comparators are available for use with either 5, 6, 7, or 8 level tapes.

DUAL READER COMPARATOR (CR-1) — The most compact, rugged, and simple tape comparator produced by Soroban was designed around the Model FR-350 dual tape reader. In this equipment, two tapes are transported as though they were a single wide tape, and compared for identity. The equipment requires an identity of all recorded codes, regardless of "feed" or "delete" codes. Any detected discrepancy inhibits further tape advance, and energizes an "error-indicator" light.

TWIN READER COMPARATOR (CR-2) — The use of two separate single tape readers in a tape comparator permits automatic advance of one or both tapes over deleted or discarded codes. Thus the CR-2 has an operational advantage over the CR-1 in that only comparison of valid information codes is permitted. Although standard CR-2 comparators accommodate tapes of from 5 to 8 levels, special models, designated CR-2W, are available for use with 16 level wide tapes.



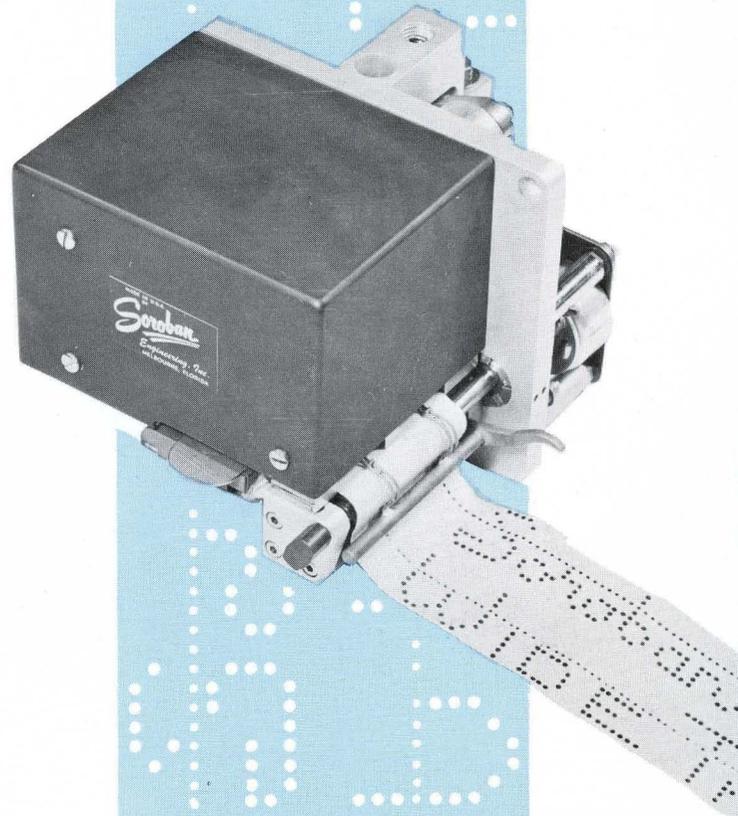
SPECIFICATIONS

	CR-1	CR-2
Reader Design	Model FR - 350M motor clutch driven dual tape reader.	Two Model FR-310S solenoid driven single tape readers.
Comparison Speed	25 - 30 codes per second.	18 - 20 codes per second.
Tape Characteristics	Models are available for 5, 6, 7, or 8 level tapes.	Models are available for 5, 6, 7, or 8 level tapes. Special models are available for 16 level wide tapes.
Error Indication	Tape Advance is inhibited and an indicator lights.	Tape advance is inhibited and an indicator lights.
Mechanical Noise	Practically silent.	Appreciable.

WIDE TAPE RECORDING

The increasing use of tape in sequencing and control of industrial processes has created a market for tapes of greater width than are required in data processing and communications applications. To satisfy this market, Soroban designed dual tape readers which handle two standard 5, 6, 7, or 8 hole tapes as though they were a single wide 10 to 16 level tape. The Model WP-1 Tape Perforator has now been developed to provide a mechanism for directly recording such information into a single wide tape.

WIDE TAPE PERFORATORS (Model WP-1) — The self-contained, plug-in, Model WP-1 perforator is designed to record standard hole patterns in parchment or paper tape at a rate compatible with manual entry of data into a keyboard. The punch can be supplied either to record in two adjacent 5, 6, 7, or 8 hole tapes, or in a single 16 hole $2\frac{1}{8}$ inch wide tape. The design makes use of a simple interposer punch system. Punching forces are supplied by a punch solenoid with a separate and independent solenoid for tape transport, or "feed." Contacts are also provided to permit interlock of punch and feed control circuitry. Since interposer latches are not provided, the design requires actuation of the punch solenoid each time the code hole interposer magnets are excited. Thus, a sixteen hole pattern of code holes either may be progressively recorded across the tape by a sequence of punching operations, or be recorded in a single punching operation. As soon as the necessary data has been perforated, feed may be executed. The last recorded character immediately becomes visible following the tape feed operation.

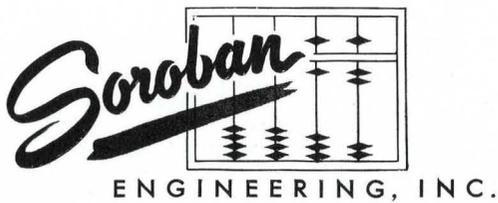


SPECIFICATIONS

Tape Width	For two adjacent standard $1\frac{1}{16}$, $\frac{7}{8}$ or 1 inch wide tapes, or a single $2\frac{1}{8}$ inch wide 16 hole tape.
Operating Speed	10 - 12 operations per second, each consisting of one punching cycle followed by one feed cycle.
Size	5 inches wide, $4\frac{1}{2}$ inches high. The punch extends forward of its main plate by $3\frac{3}{4}$ inches, and to the rear by $3\frac{1}{4}$ inches.
Weight	16 lbs. (approximately).
Power Requirements	Unless otherwise specified 90 volt solenoids and magnets are provided. The punch solenoid consumes 50 peak watts, feed solenoid 14 watts, and code magnets 4 watts.
No-Tape Contact	5 ampere rated, non-inductive load.



ENGINEERING, INC.



QUALITY DATA PROCESSING DEVICES & SYSTEMS
TELEPHONE 2525 • BOX 1717 • MELBOURNE, FLORIDA