Operating Instructions for

MODEL 7100

Conversational Terminal

by

Friden

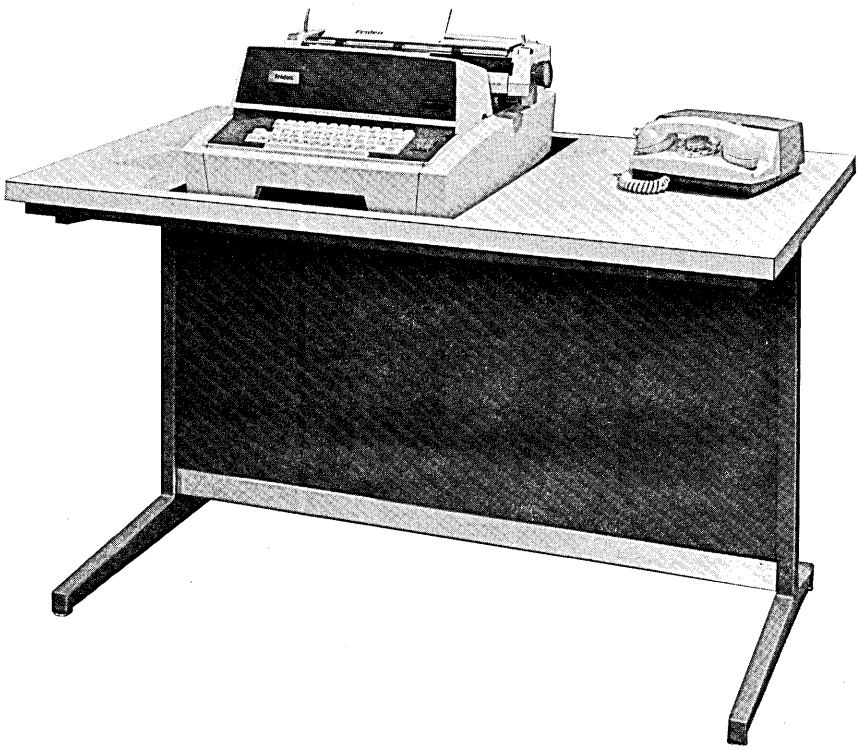

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Figure 1. Model 7100 Conversational Terminal

IT'S A PLEASURE welcoming you to the world-wide FRIDEN* family as operator of the Model 7100 Conversational Terminal.

We are confident that you will master the Model 7100 with ease. Its standard, fully electric keyboard, so familiar to your touch, requires no retraining of your fingers.

This booklet shows you how to operate and care for your Model 7100. You will want to read it thoroughly . . . and keep it available for ready reference.

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POWER

The Model 7100 can be plugged into any standard 115-volt wall outlet. Power is controlled by the ON/OFF switch (1) to the right of the keyboard.

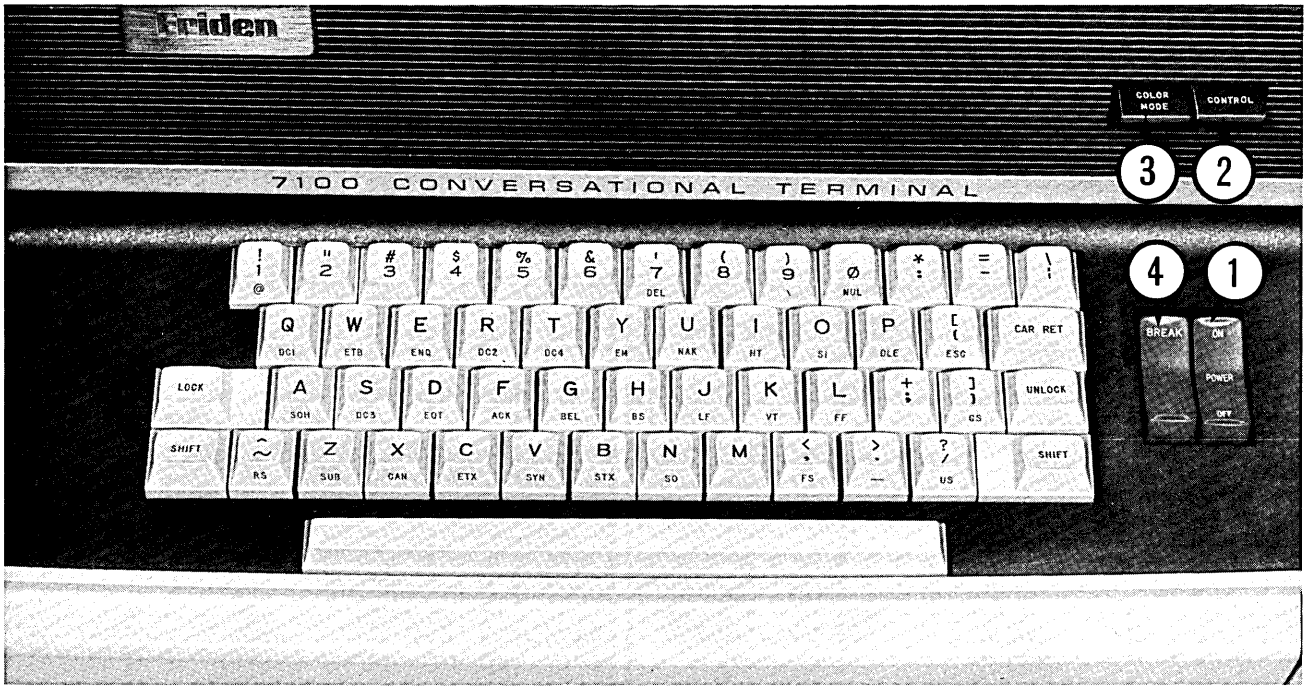


Figure 2. Keyboard of Model 7100 Conversational Terminal

KEYBOARD

Keyboard Layout

The keyboard of the Model 7100 has been carefully designed to transmit all 128 characters of the USASCII code -- and at the same time to maximize the speed and accuracy of typing by the standard layout of characters found on a normal typewriter.

Two design features make this possible. First, the Model 7100 has four more keys than the average typewriter. (For example, a "1" key has been added next to the "2" key because in USASCII, the alphabetic character "l" (lower case L) has a different code than the numeric character "1".) Second, the Model 7100 is a three-case machine. In addition to the upper and lower cases found on a typewriter, the Model 7100 has a "control case".

The characters transmitted by the Model 7100 when in the control case are shown on the front of the keys. For the most part, these are control characters, which have no graphic equivalents.

Case Shifting

For shifting between upper and lower case, the Model 7100 operates just like an ordinary typewriter, except that there are separate LOCK and UNLOCK keys.

To shift to the control case, depress the CONTROL panel switch (2), and while holding this switch down, depress the appropriate key(s). The Model 7100 will transmit the desired control case characters, and will print the equivalent upper case characters. As soon as the CONTROL panel switch is released, the Model 7100 will revert to normal upper or lower case transmission and printing.

AUTOMATIC COLOR SHIFT

Automatic shifting of ribbon color is available in modes, as controlled by the COLOR MODE panel switch (3), Figure 2. With this switch in the up position, all transmitted messages print in red. All received messages print in black (received control characters do not print).

With the switch in the down position, all control case codes cause printing (in red) of the corresponding upper case characters on the keys. All other codes print in black, in both the transmit and receive mode.

COMPUTER INTERRUPT FEATURE

Depressing the BREAK/NORM switch (4), Figure 2, sends a "break" signal to the computer by transmitting a continuous NUL signal (spacing signal).

The BREAK/NORM switch may be depressed while the Model 7100 is receiving and printing a message from the computer, to signal the computer to stop transmission. The proper operation of the Computer Interrupt Feature depends on the ability of the associated computer to recognize and properly respond to the BREAK signal.

NOTE: This feature is operative only in full duplex installations (where simultaneous transmission and reception is possible).

CARRIAGE CONTROLS

These features provide ease and flexibility of operation:

1. Margin Release Lever -- permits the carriage to be moved for typing beyond the margin. Just raise the lever and pull the carriage as far as possible to the right.

2. Platen Variable Button -- used to position paper at other than standard line spacing.

3. Platen Knobs -- turn the platen to allow paper to be inserted, positioned, or removed.

4. Carriage Release Buttons -- conveniently located on either side, these buttons release the carriage for moving by hand. The carriage cannot be moved unless the power is on.

5. Paper Release Lever -- in the forward position, this lever frees the paper for positioning or removal.

6. Line Space Lever -- adjusts to the selection of single or double line spacing.

7. Multiple Copy Control Lever -- moves the platen back and forth to compensate for thickness of multiple documents and carbons.

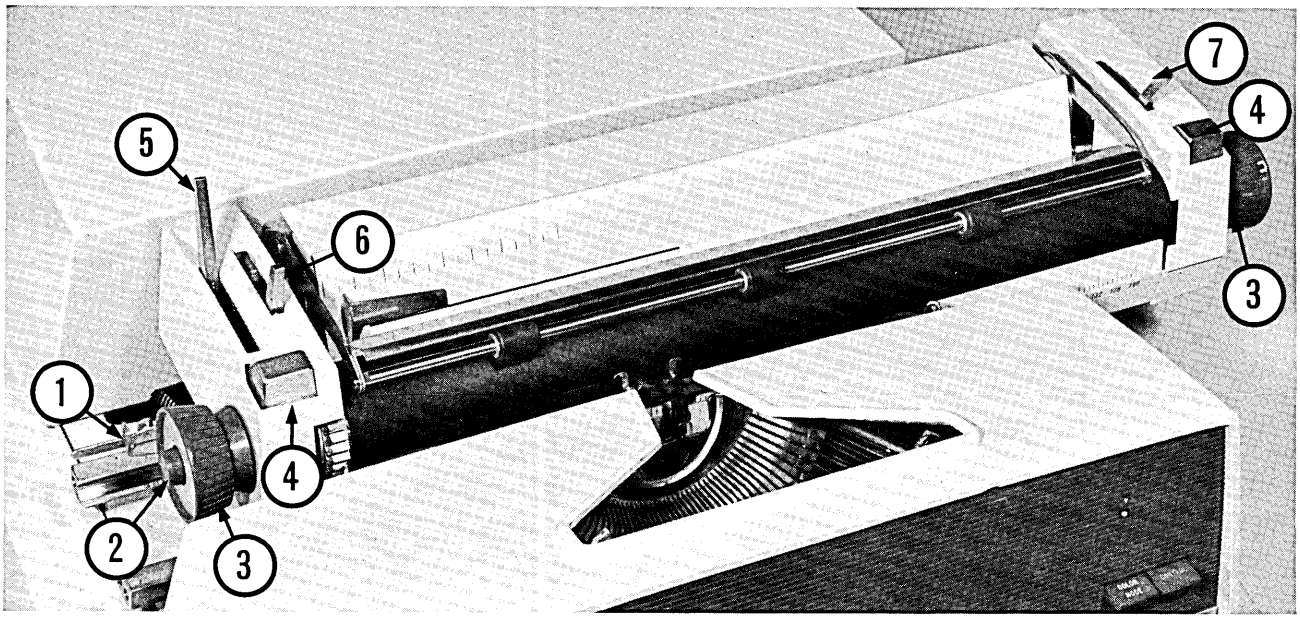


Figure 3. Carriage Controls of Model 7100

REMOVING AND REPLACING THE PLATEN

It is not generally necessary to remove the platen. If you should find reason to remove it, use the following steps.

To remove the platen:
Lift the paper bail (1).

Remove the carriage end covers (2) by lifting.

Holding the ends of the platen in each hand, pull the right and left platen latches (3) forward.

Lift the platen up and out of the machine.

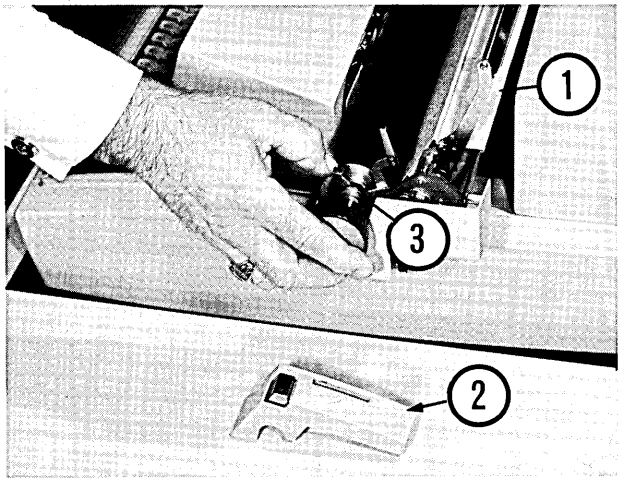


Figure 4. Removing the Platen

To replace the platen:
Bring the left platen latch forward and insert the left end of the platen first.

Figure 5. Replacing the End Cover Plates

Push the platen to the left as far as it will go, making certain it fits tightly against the latch.

Replace the end cover plates by positioning them over the ends of the carriage with the cover spring clamp over the projection on the carriage (4). Press firmly into position.

(NOTE: When replacing the left cover plate, the line spacing lever should be at position 2.)

REMOVING AND REPLACING THE FRONT COVER

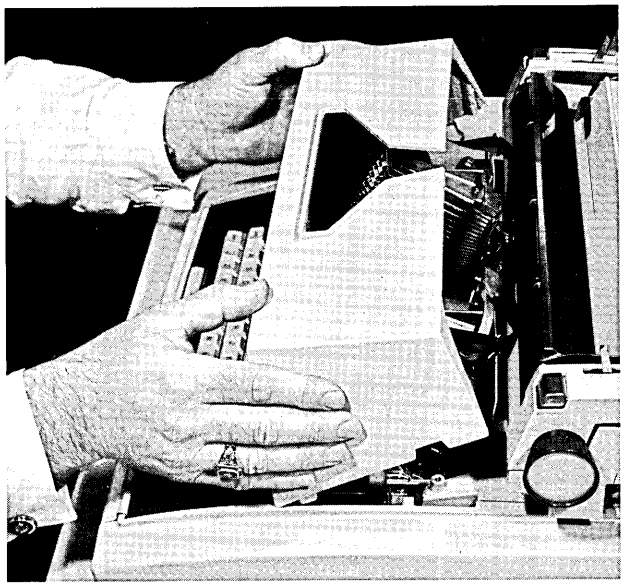


Figure 6. Removing the Front Cover

The front cover can be easily removed to change the ribbon or clean the type bars.

To remove the front cover:
Firmly grasp the sides of the cover.

Tilt the cover forward, lift up, and remove.

To replace the front cover:
Tilt the cover and align it squarely with the front of the machine.

Position the groove at the bottom of the front cover over the curved top of the keyboard plate.

Push the cover back and down so that the spring clip snaps into place.

SETTING THE MARGIN

To set the margin:
Remove the paper table by pulling it forward.

Position the carriage so the front paper scale is aligned with the desired margin position.

Push down on the center of the margin stop and slide it all the way to the left. Then slide it back to the right as far as it will go.

Replace the paper table.

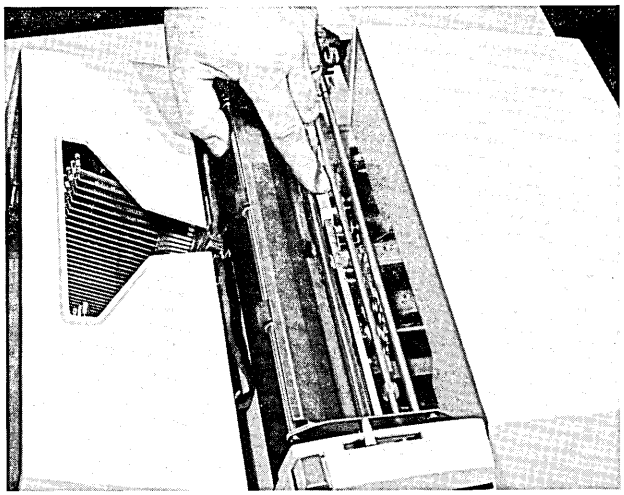


Figure 7. Setting the Margin

CHANGING THE RIBBON

The specially designed ribbon mechanism makes ribbon changing fast and easy.

To change the ribbon:
Remove the front cover (as shown on the opposite page).

Wind the ribbon to the fullest spool. If spool does not turn freely, move the manual ribbon release lever (1).

Remove the old ribbon by pulling out the spool retaining spring (2).

Place the empty spool on the left spool holder (3).

Insert the new ribbon on the right spool holder (4).

Thread the ribbon through the right ribbon reverse lever (5) and the right ribbon guide (6). Turn the ribbon so the outside edge (red) is on the bottom.

Thread the ribbon through the ribbon position guides (7), the left ribbon guide (8), and the left ribbon reverse lever (9).

Secure the leading edge to the tab on the empty spool.

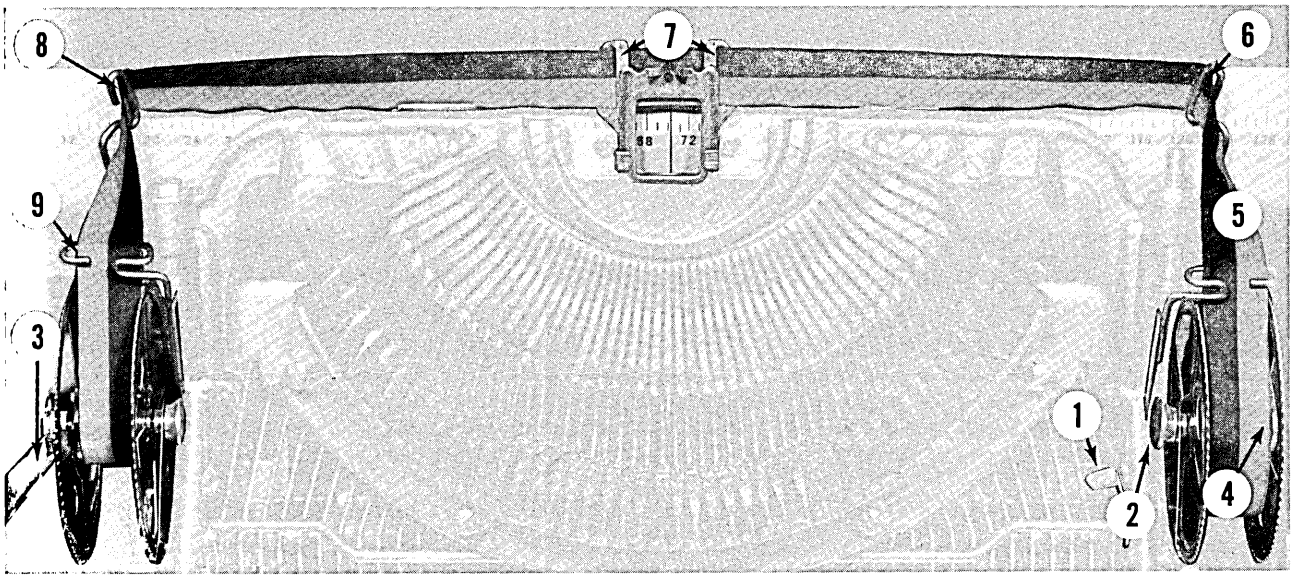


Figure 8. Details of Ribbon Mechanism

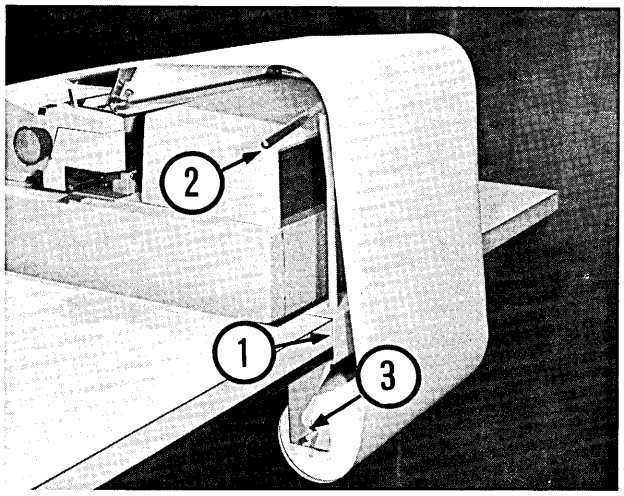


Figure 9. Support Device for Continuous Roll Paper

PAPER HANDLING

Three methods of paper handling are available on the Model 7100 Conversational Terminal. Paper may be inserted by hand in single sheets, fed from a continuous roll, or fed with fan-fold forms using a Flexofeed device. The writing machine may be equipped with a standard platen or a pin-feed platen.

Continuous Roll Paper

For handling continuous roll paper, a special roll-holding support device is used as shown in Figure 9. To install, slip the channel portion of the support (1) over the rear lip of the desk until it will go no further. After determining the center of the average writing line, align the peak of the support assembly (2) with this center. Secure the device in place by tightening the two thumb screws.

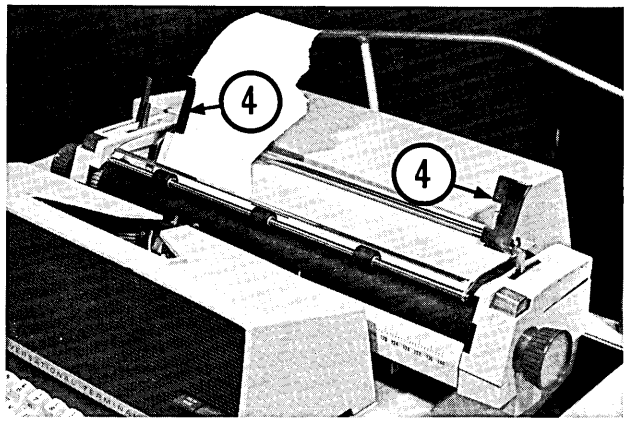


Figure 11. Proper Adjustment of Edge Guides

Remove the rod with its two spacer rollers and rubber washers (3) from the package. When using a narrow roll of paper, insert the rod through paper roll spool, and slip on rubber washers — one on each side — so that they bear against the spool flange. Follow with spacers and install complete roll assembly in locating slots on hanger (rod has two grooves which mate with the hanger slots). When using a wide roll of paper, install spacers as near the grooves in the rod as possible, with the rubber washers on the outboard ends nearest the grooves. Slip roll of paper on the rod and install complete assembly as above.

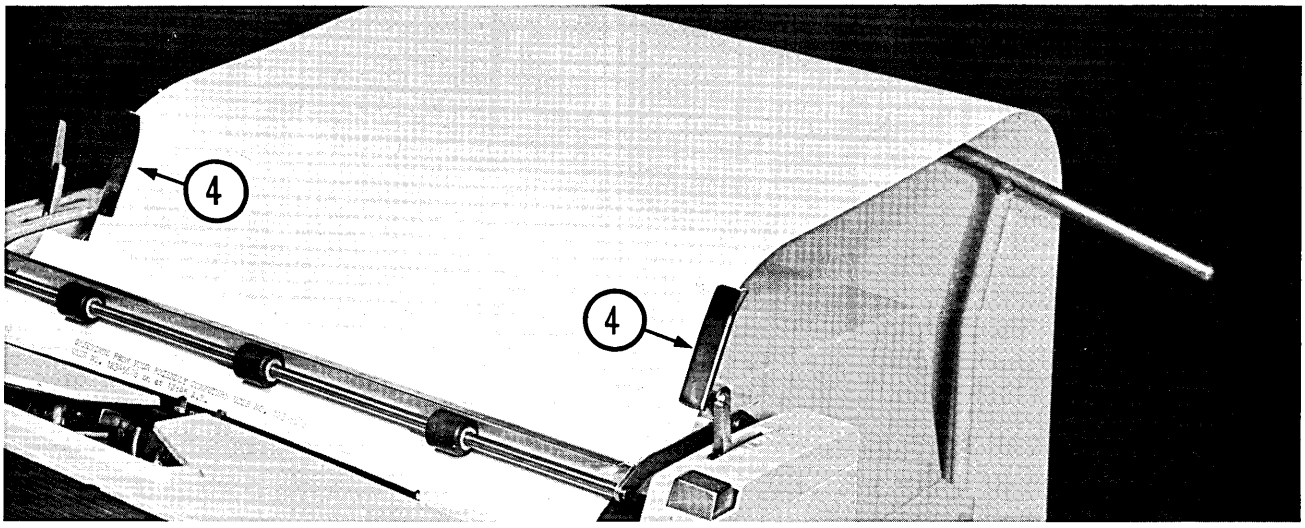


Figure 10. Proper Method of Feeding Roll Paper

See that the paper unrolls from the bottom and progresses over the outside of the roll up to the peak of the support assembly as shown in Figures 9 and 10. Bring the end of the paper over the peak of support assembly and down through the edge guides ④ into the paper feed rollers on the platen in the usual manner to a normal typing position.

Feed the typed copy back up through the edge guides and across the top of the incoming supply of paper. Allow it to continue down the back of the machine where it may be accumulated in a suitable container.

IMPORTANT: Edge guides must be adjusted as close as possible to the edge of the paper without causing the paper to drag on them as it goes through. Guides must be turned to a nearly vertical position so the paper does not bend sharply as it enters the area of the paper table. Paper is torn away in Figure 11 to show proper adjustment of the edge guides.

Pin-fed Continuous Form Paper (Fan-fold Forms)

For handling pin-fed fan-fold continuous form paper, a FRIDEN Flexofeed device is available. It installs on the carriage as shown in Figure 12. The special stand with its two shelves for holding continuous forms is assembled and placed at the rear of the Model 7100 machine desk as shown in Figure 13. Align the shelves with the continuous forms and adjust shelf height so the paper feeds easily to the Flexofeed supporting racks from the bottom shelf, returning to the top shelf. The Flexofeed has a chain-driven pin-feed device ① , Figure 12, which moves the paper through the writing machine as the platen is indexed after carriage return. Be sure that the pin-feed holes are engaged on the pins in this device before operating the Model 7100 Conversational Terminal.

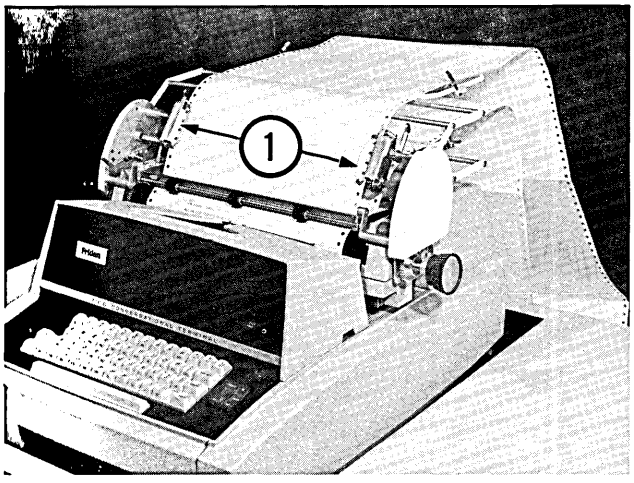


Figure 12. FLEXOFEED Device for Pin-fed Fan-fold Continuous Forms

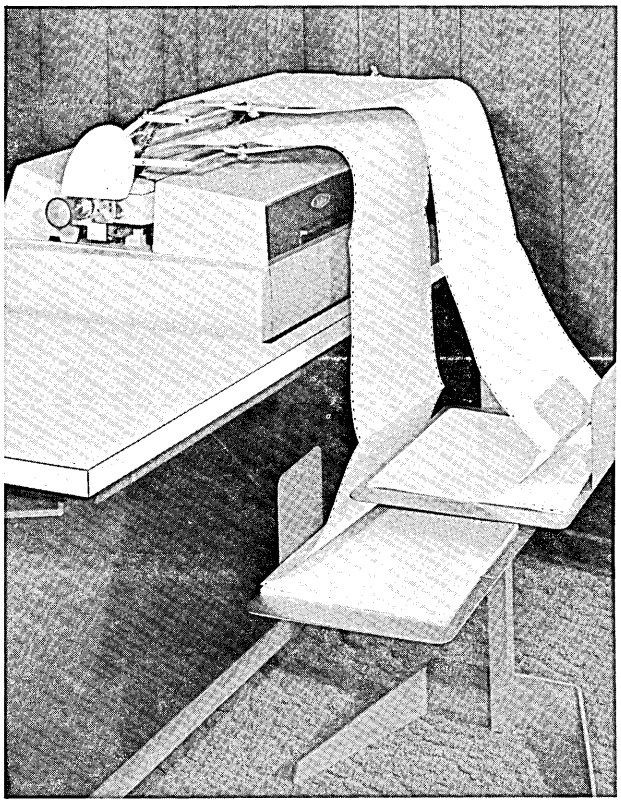
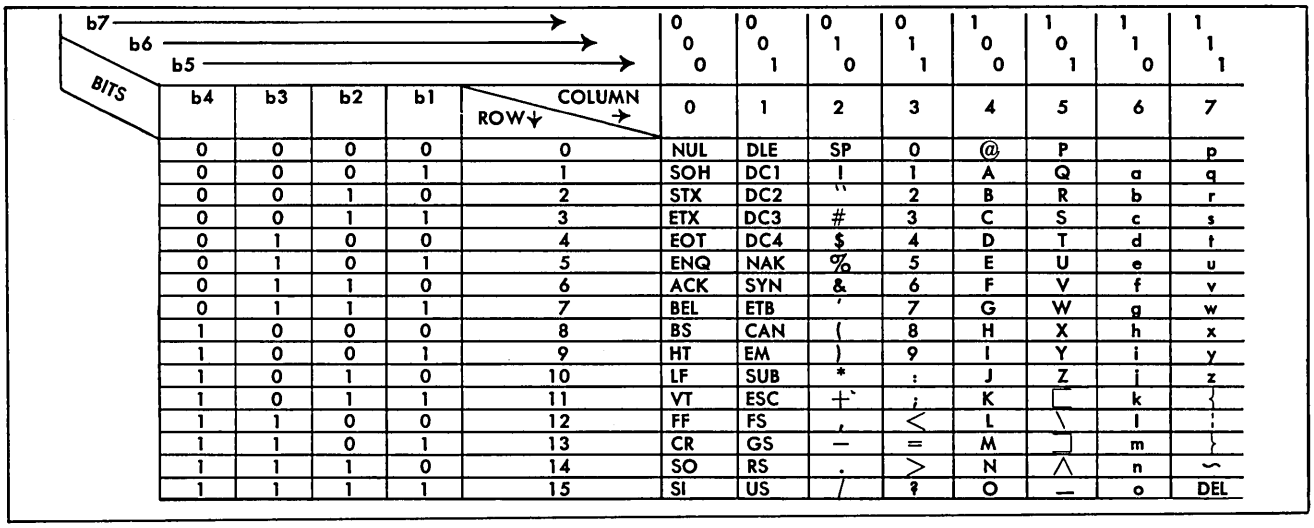


Figure 13. Special Stand for Continuous Forms

CARING FOR THE MODEL 7100

Your Model 7100 deserves the very best of care. Learning to keep it in smooth running order is just as important as learning how to operate it correctly.

Dust it daily: Use a camel's-hair brush when cleaning around the keys or other areas not easily reached.



b7 →					0	0	0	0	1	1	1	1
b6 →					0	0	1	1	0	0	1	1
b5 →					0	1	0	1	0	1	0	1
BITS	b4	b3	b2	b1	ROW ↓ COLUMN →	0	1	2	3	4	5	6	7
	0	0	0	0	0	NUL	DLE	SP	0	@	P		p
	0	0	0	1	1	SOH	DC1	!	1	A	Q	a	q
	0	0	1	0	2	STX	DC2	"	2	B	R	b	r
	0	0	1	1	3	ETX	DC3	#	3	C	S	c	s
	0	1	0	0	4	EOT	DC4	$	4	D	T	d	t
	0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u
	0	1	1	0	6	ACK	SYN	&	6	F	V	f	v
	0	1	1	1	7	BEL	ETB	'	7	G	W	g	w
	1	0	0	0	8	BS	CAN	(	8	H	X	h	x
	1	0	0	1	9	HT	EM	)	9	I	Y	i	y
	1	0	1	0	10	LF	SUB	*	:	J	Z	j	z
	1	0	1	1	11	VT	ESC	+	;	K	[	k	{
	1	1	0	0	12	FF	FS	,	<	L	\	l	|
	1	1	0	1	13	CR	GS	-	=	M	]	m	}
	1	1	1	0	14	SO	RS	.	>	N	^	n	~
	1	1	1	1	15	SI	US	/	?	O	_	o	DEL

Figure 14. USASCII Code Chart

ERROR CORRECTION

Procedures for correcting typing, format or data content errors transmitted from the keyboard of the Model 7100 depends on the specific software system of the associated computer. In the USASCII Code (see Code Chart above), two control codes are assigned for error correction purposes:

BS (Backspace), (Control H) when depressed, will not cause carriage to backspace, but will send a code to the computer which may be interpreted to delete or ignore the immediately preceeding character.

After this code is transmitted, the operator can type the correct letter and proceed with the message.

CAN (Cancel) (Control X) when depressed, will send a code to the computer to indicate that the data with which this code is sent is in error or is to be disregarded. CAN is usually used to "erase" an entire line or message.

When the operator has determined how much of the message has been deleted, the correct material can be typed.

CONNECTING THE MODEL 7100 TO A COMPUTER SYSTEM

Your Model 7100 may be connected to the associated computer in several ways:

1. Via Private Lines - A private line permanently connects the Model 7100 to an input-output channel of the computer. The line may be supplied by a common carrier and connected to the line via a data set. If the distance is less than 50 feet, the Model 7100 may be directly connected without the use of digital subsets. In either case, you are "on line" at all times and it is only necessary to determine that the POWER ON-OFF Switch is "ON".
2. Dialed Telephone Network - If you are operating via the dialed telephone network, it will be necessary to place a telephone call to the computer before transmission may begin. The data set at your Model 7100 will have a conventional telephone dial. Make sure the POWER ON-OFF Switch of the Model 7100 is "ON" before you dial.

Your call may be answered automatically by the computer or manually by an operator at the computer center. In either case, when you are connected to the computer, you will hear a "beep" or tone transmitted from the data set at the computer. Now, depress the DATA key on your data set, and transmission may begin.

The above procedure may vary slightly depending on the data set used. Check the manufacturer for detailed instructions.

In either connection via private lines or connection via dialed telephone network, procedures for insuring that the channel is operating reliably and for initiating a transmission to or from the computer will vary with the software systems of the computer.

OPTIONAL FEATURES

Two optional features are available on the Model 7100: mechanical nonprint, and received parity check.

Mechanical Nonprint

The mechanical nonprint feature permits the operator to manually prevent the Model 7100 from printing transmitted or received characters.

To initiate mechanical nonprint, move the nonprint lever (located on the right side of the Model 7100) to the rear. To restore printing, move the lever forward.

Received Parity Check

The received parity check feature checks the parity of each code received by the Model 7100. If the terminal detects an invalid code (odd parity), the character "M" prints (in red) in place of the invalid code, and the terminal continues typing.

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SP 9375

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GENERAL PROGRAMMING AND INSTALLATION REQUIREMENTS FOR 7100 CONVERSATIONAL TERMINAL

INTERCONNECTION REQUIREMENTS

Connection is made to the modem (modulator-demodulator) via cable and connector in accordance with EIA (Electronic Industries Association) Standard RS-232-B. Connection can be made without a modem up to a distance of approximately 50 feet. (If such a direct connection is desired, a suitable cable with female connectors must be made up.)

The Model 7100 is provided with a male 25-point connector (Cinch or Cannon DB-25 P) on an 8-foot cable. Pin numbers are connected as follows:

Pin Number	Circuit (per EIA Std RS-232-B)	Description
1+7	AA+AB	Chassis Ground
2	BA	Transmitted Data
3	BB	Received Data
20+4	CD+CA	Terminal Ready/Request to Send
24	Mu Test	Do not connect

MODEM REQUIREMENTS

Modem requirements are as follows:

1. Public telephone network -- Bell System Data Sets Model 103A2 or 103G or equivalent.
2. Leased narrow or voice band -- Bell System Data Set Model 103F, or Western Union 180 baud modem, or their equivalent.

TRANSMISSION CHARACTERISTICS

Transmission and reception by the Model 7100 is character asynchronous, bit synchronous, serial-by-bit-by-character as follows:

1. During data transmission (circuit BA), the signal elements consist of a start bit (spacing), seven character bits (serialized from low order to high order), and an even parity bit. The equivalent of a stop bit (or bits) results from the terminal returning to the marking condition during the time interval between characters. The clock controls the duration of each space or mark signal except during the idle, or non-transmission condition. Minimum possible bit-times are shown in the following chart:

Minimum Possible Bit Times

Bits/Second	Characters/Second	Bit Time	*Stop Bits
100	10	10 ms	1
110	10	9.09 ms	2
122	12.2	8.2 ms	1
134.2	12.2	7.45 ms	2

*During data transmission, i.e., during operation of the keyboard, the stop bits are provided by a suitable time interval between characters. Faster keyboarding is possible if the stop bit(s) are not required by the receiving terminal or computer.

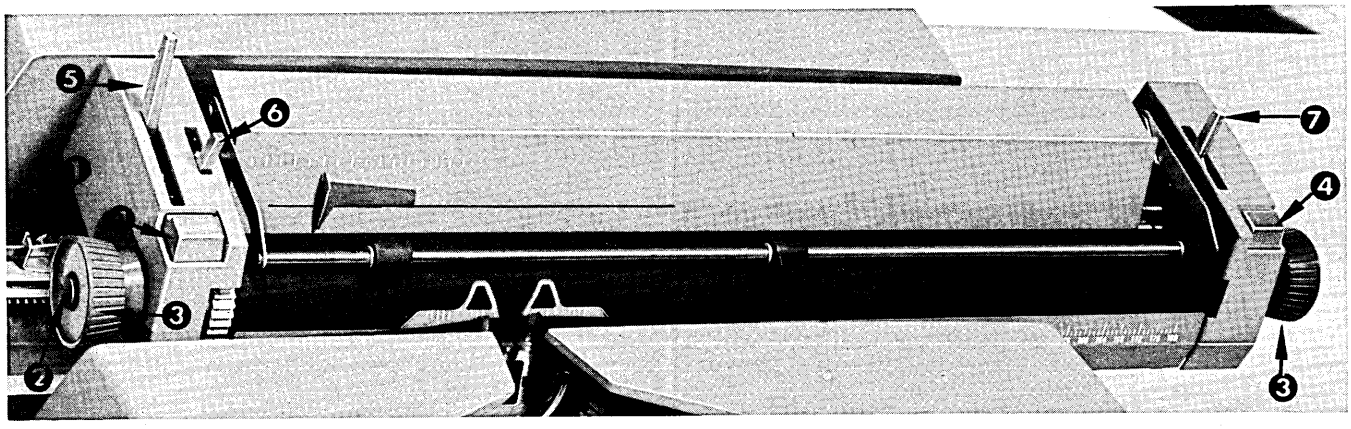
2. During data reception (circuit BB), the bit-time must conform to the rate established for transmission. Parity is not required on incoming characters, but the equivalent of the parity bit is required.

Pagination (indexing to the next page) is accomplished using successive CR (carriage return) codes. This process required a 220-millisecond delay between each CR code.

IDENTIFICATION:

No automatic terminal identification.

CARRIAGE CONTROL



The Model 7100 has the following carriage controls:

1. Margin Release Lever -- Permits the carriage to be moved for typing beyond the margin.
2. Platen Variable Button -- Used to position paper at other than standard line spacing.
3. Platen Knobs -- Turn the platen to allow paper to be inserted, positioned, or removed.
4. Carriage Release Buttons -- Conveniently located on either side, release the carriage for moving by hand. You will not be able to move the carriage unless the power is on.

5. Paper Release Lever -- In forward position, frees the paper for positioning or removal.

6. Line Space Lever -- Adjusts to the selection of single or double line spacing.

7. Multiple Copy Control Lever -- Moves the platen back and forth to compensate for thickness of multiple documents and carbons.

Return of the carriage to the left hand margin, and vertical line spacing are simultaneous interrelated functions of the CR code and/or the carriage return keylever.

In the data reception mode, a delay is required for the Model 7100 during a carriage return/line space operation. The formula is as follows.

Time (milliseconds) =(7 ms x number of spaces) + 220 ms

For example: In a 10-inch line, 7 ms x 100 spaces 700 ms 220 ms 920 ms. Thus, at 10 characters/second, 9 character times (including the carriage return) must be provided before the first character on the next line is received for printing.

Ideally, this is supplied by the transmitting unit delaying the start of the next line for this required time interval. Marking the line during this idle period would result in no action at the terminal end; spacing the line would result in the printing of continuous NUL (null) characters with the COLOR MODE switch in the down position.

b7 →					0	0	0	0	1	1	1	1
b6 →					0	0	1	1	0	0	1	1
b5 →					0	1	0	1	0	1	0	1
BITS	b4	b3	b2	b1	COLUMN → / ROW ↓	0	1	2	3	4	5	6	7
	0	0	0	0	0	NUL	DLE	SP	0	@	P		p
	0	0	0	1	1	SOH	DC1	!	1	A	Q	a	q
	0	0	1	0	2	STX	DC2	"	2	B	R	b	r
	0	0	1	1	3	ETX	DC3	#	3	C	S	c	s
	0	1	0	0	4	EOT	DC4	$	4	D	T	d	t
	0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u
	0	1	1	0	6	ACK	SYN	&	6	F	V	f	v
	0	1	1	1	7	BEL	ETB	'	7	G	W	g	w
	1	0	0	0	8	BS	CAN	(	8	H	X	h	x
	1	0	0	1	9	HT	EM	)	9	I	Y	i	y
	1	0	1	0	10	LF	SUB	*	:	J	Z	j	z
	1	0	1	1	11	VT	ESC	+	;	K	[	k	{
	1	1	0	0	12	FF	FS	,	<	L	\	l	|
	1	1	0	1	13	CR	GS	-	=	M	]	m	}
	1	1	1	0	14	SO	RS	.	>	N	^	n	~
	1	1	1	1	15	SI	US	/	?	O	_	o	DEL

An optional method of providing the delay during carriage return/line indexing may be accomplished using, for the example given above, 8 additional codes. These codes could be LF (line feed), NUL (null), or DEL (delete) -- since these codes do not cause printing with the COLOR MODE switch in the up position. (NOTE: By option at the time of installation, these codes can always be inhibited from printing.)

OPERATING CHARACTERISTICS

The maximum number of characters per line is 135; maximum paper width is 15 inches.

91 characters plus space and carriage return are generated from the keyboard of the Model 7100.

The SHIFT keys operate as follows: Depression of the SHIFT key on either side of the keyboard shifts the Model 7100 to the upper case. When the SHIFT key is released, the terminal reverts to lower case. Depressing and releasing the LOCK key locks the Model 7100 in upper case.

The Model 7100 can be returned to lower case either by depressing the UNLOCK key, or by depressing and releasing either SHIFT key.

All USASCII control codes plus the codes for @, underline, and grave are generated for transmission by holding the CONTROL switch depressed while operating the key engraved with the appropriate character. When transmitting a control character, the terminal prints in red the associated upper case character.

When the CONTROL switch is released, the Model 7100 returns to normal upper case transmission and printing.

During data reception, the control codes, @, underline, and grave do not print unless the COLOR MODE switch is in the down position. In this mode, all of the 91 printing characters print in black on transmission or reception, and all others print the associated upper case character in red during transmission or reception.

With the COLOR MODE switch in the up position, all transmitted text prints in red, and all received text prints in black. (NOTE: In this mode, received control codes, @, underline, and grave do not print.)

During data reception, a CR is recognized as an upper case code. If this is the last code in a message, the Model 7100 will remain in the upper case shift. A space, on the other hand, is interpreted as a lower case code, and if this is the last code in a message, the terminal will remain in the lower case shift.

A key-to-key interlock is provided so that two keys may not be simultaneously depressed.

The BREAK switch, when operated, sends a continuous spacing signal over circuit BA which is normally marked during data reception.

With connection to the telephone line via a 103A2 Data Set, automatic disconnect should not be employed unless it is desired that operation of the BREAK switch should terminate the call. Using the system of hanging up the phone to terminate the call will permit utilizing the BREAK switch feature.

Also, with the 103A2 Data Set, auto-answer may be used, although the power switch on the Model 7100 must be on in order to receive incoming messages.

USASCII - WHAT IS IT?

b7					0	0	0	0	1	1	1	1
b6					0	0	1	1	0	0	1	1
b5					0	1	0	1	0	1	0	1
BITS	b4	b3	b2	b1	COLUMN → / ROW ↓ 0	1	2	3	4	5	6	7
	0	0	0	0	0	NUL	DLE	SP	0	@	P		p
	0	0	0	1	1	SOH	DC1	!	1	A	Q	a	q
	0	0	1	0	2	STX	DC2	"	2	B	R	b	r
	0	0	1	1	3	ETX	DC3	#	3	C	S	c	s
	0	1	0	0	4	EOT	DC4	$	4	D	T	d	t
	0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u
	0	1	1	0	6	ACK	SYN	&	6	F	V	f	v
	0	1	1	1	7	BEL	ETB	'	7	G	W	g	w
	1	0	0	0	8	BS	CAN	(	8	H	X	h	x
	1	0	0	1	9	HT	EM	)	9	I	Y	i	y
	1	0	1	0	10	LF	SUB	*	:	J	Z	j	z
	1	0	1	1	11	VT	ESC	+	;	K	[	k	{
	1	1	0	0	12	FF	FS	,	<	L	\	l	|
	1	1	0	1	13	CR	GS	-	=	M	]	m	}
	1	1	1	0	14	SO	RS	.	>	N	^	n	~
	1	1	1	1	15	SI	US	/	?	O	_	o	DEL

Recently the American Standards Association changed its title to the United States of America Standards Institute. This name-swapping has created a new word that is important to you personally. It is important that you not only recognize the word, but also that you have a basic understanding of the subject it represents.

The word is USASCII. It stands for United States of America Code for Information Interchange. The same code was formerly known as ASCII. It became important to you when Friden introduced the Model 7100 Conversational Terminal. Its importance will continue to increase as the code becomes more and more widely used in the industry, and as the number of USASCII-coded machines by Friden continues to grow.

USASCII has been created to meet the recognized need for a common machine language code to serve as the medium of interchange among the growing army of machines that produce, communicate, process and respond to information in machine coded form. As the standard itself states: "This coded character set is to be for the general interchange of information among information processing systems, communication systems, and associated equipment."

At this point, it is important to note that USASCII is a 7-bit coded character set. That's all. It does not specify any of the other characteristics of the media in which it may be used (such as size and spacing of holes in perforated tape, or the signal level and pulse spacing of electronic transmissions). The implementation of USASCII in various media is discussed later in this release.

The USASCII code contains two types of characters: graphic characters and control characters. Graphic characters are those which represent printed symbols (numbers, letters, and special characters such as dollar sign, comma, etc.). Comparing graphics in USASCII with those in the BCD code traditionally used by Friden, the most obvious difference is that in USASCII, each upper case letter has an entirely different code than its lower case counterpart - whereas in BCD, there is only one code per letter (changing between upper and lower case is accomplished by a separate "shift" code).

Many of the control characters can be grouped by function into four categories: communication controls, format effectors, information separators, and device controls. The following table presents the abbreviation shown on the code chart and the full title of the character.

NUL	Null
SOH	Start of Heading
STX	Start of Text
ETX	End of Text
EOT	End of Transmission
ENQ	Enquiry
ACK	Acknowledge
BEL	Bell (audible or attention signal)
BS	Backspace
HT	Horizontal Tabulation (punched card skip)
LF	Line Feed
VT	Vertical Tabulation
FF	Form Feed
CR	Carriage Return
SO	Shift Out
SI	Shift In
DLE	Data Link Escape
DC 1	Device Control 1
DC 2	Device Control 2
DC 3	Device Control 3
DC 4	Device Control 4 (stop)
NAK	Negative Acknowledge
SYN	Synchronous Idle
ETB	End of Transmission Block
CAN	Cancel
EM	End of Medium
SUB	Substitute
ESC	Escape
FS	File Separator
GS	Group Separator
RS	Record Separator
US	Unit Separator
DEL	Delete

HOW IT WAS DEVELOPED

Work on a standard interchange code was begun by a technical committee of the Electronics Industry Association in 1959. The effort was soon transferred to a committee of the (then) American Standards Association, which established a new subcommittee specifically to develop the code.

Early in 1962, the ASA subcommittee established liaison with its international counterpart, a subcommittee of the International Organization for Standardization (ISO). Somewhat later, liaison was also established with a "working party on a new telegraph alphabet" of the International Telegraph and Telephone Consultative Committee (CCITT). Work on USASCII has continued virtually in parallel with the ISO and CCITT activities since then.

Actually, the evolution of USASCII has not yet ended. Correspondence with the USA Standards Institute indicates that a revision will be published in the near future. However, it seems unlikely that the forthcoming revision will entail any major changes.

SOME DEVELOPMENT CRITERIA

USASCII is the result of a series of compromises of differing technical and economic requirements. Rather than lessen the code's utility, however, these compromises serve to enhance the usefulness of USASCII across a broad base of application areas.

The decision to standardize on a 7-bit code was in essence a compromise between 6 and 8 bits. A 6-bit code, while more readily acceptable to 6-bit computers, could not accommodate the characters and controls deemed necessary for most information interchange. An 8-bit code would of course offer twice the capacity of USASCII and would enhance the use of packed numerics -- two 4-bit numerics in one 8-bit "character". Despite these advantages, those developing the code believed that 256 "standard" characters and controls were not necessary for information interchange, and that the resultant lack of use of a good part of an 8-bit code would be prohibitively wasteful. It was therefore decided that USASCII be a 7-bit code offering sufficient graphics and controls for normal information interchange, while not unnecessarily exceeding the needs of most users.

Beyond this early decision, a number of criteria were applied to the design of the code. In some cases, these criteria conflicted with one another, forcing those designing the code to compromise among them. The appendices of USASCII list 20 original criteria which served as the basis

of the code's development and discuss them in some detail. Here we'll examine some of the major criteria and the means by which they have been satisfied.

1. A very basic criterion was that every character of the code be represented by the same number of bits. As a result, all USASCII characters contain seven bits, ranging from NUL (Null) which is all "zeros" to DEL (Delete) which is all "ones".

2. A major criterion in the code's design was that it be structured to facilitate the derivation of logically related smaller or larger sets. This criterion has been satisfied on several counts.

Insofar as is practical, characters have been grouped in the code table for ease of separation into useful subsets. In addition, columns of characters can be easily identified and separated by examination of only the high order bits. Stripping the three high order bits from the characters in column 3 of the code table leaves a 4-bit numeric subset of USASCII.

To satisfy 6-bit equipment, a 64-character subset of the code can be derived by dropping bit 6 of the 7 USASCII bits. Moreover, the complete upper case alphabet is included within a 5-bit subset of the full code. In a similar vein, the control characters are not interspersed among the graphics but are concentrated in column 0 and 1 of the code table. USASCII has also been designed so that it may readily be integrated into a superset of 256 or more characters.

3. Realizing that 128 characters might not satisfy all application requirements, the committee established the criterion that "escape" functions be provided in the code to permit expansion of the character set beyond the "standard" 128. Such capabilities for code extension do exist within the code in the form of several control functions:

The Shift Out (SO) and Shift In (SI) functions permit extension of the repertoire of USASCII graphics to symbols not assigned in the code proper.

The Escape (ESC) function is intended primarily for the extension of the control repertoire to include control functions (other than communication controls) not in the standard set.

Similarly, Data Link Escape (DLE) permits the extension of the control repertoire to include other "nonstandard" communication control functions. All of the above controls enhance the utility of the code by recognizing and providing for its possible existence in environments which require a broader graphic and/or control set than that contained within its 128 characters.

4. Collating sequence was of particular concern in the assignment of the USASCII graphics. The order of the graphics has been structured to provide within classes of characters a "natural" collating order which can be determined by a comparison of the codes assigned to the graphics. In this regard, the special graphics (punctuations, arithmetic operators, etc.), numerals and alphabet are defined as distinct "classes of characters". In addition, Space (SP) and the information separators, File Separator (FS), Group Separator (GS), Record Separator (RS) and Unit Separator (US) collate ahead of the graphics to permit the logical sequencing of information.

5. USASCII meets the criterion that the code set contain the graphic characters of the principal programming languages. It provides all the COBOL and FORTRAN graphics. Special pains have been taken to accommodate the needs of other languages.

6. Finally, the code meets the character pairing requirements of typewriter-like devices (such as the FRIDEN Model 7100 Conversational Terminal). That is, wherever practical, there is but a one-bit difference in the bit configuration of characters commonly paired on typewriter keytops. For example, the upper case "C" is coded as 1000011 and the lower case "c" as 1100011.

This criterion could not always be observed since it sometimes came in conflict with other basic principles of code design, such as those of collating sequence and requirements for a dense graphic subset.

The preceding are but a few of the principal criteria established for the design of USASCII. Their satisfaction has been an important factor in obtaining approval of the code and will bear even more on its ultimate implementation.

IMPLEMENTING USASCII IN MEDIA

The benefits visualized from USASCII will not be fully realized until it is implemented in a standard form in the three major media -- paper tape, magnetic tape and punched cards. Work on standard implementations of USASCII has been underway for almost as long as the code development work itself, and has proven to be a difficult task. The difficulties arise from the fact that the work is developmental in nature and from the effects the new standard implementations would have on existing representations of codes in media. Despite these problems much progress has been made.

There exists an approved USA Standard Perforated Paper Tape Code for Information Interchange which implements the code in perforated tape. The standard specifies the arrangement of the seven USASCII bits and an even parity bit on 8-track paper tape, but does not specify the physical characteristics of the tape, which is the subject of another standard.

In April of 1967, the cognizant committee submitted the proposed USA Standard Recorded Magnetic Tape to USASI for processing as a USA Standard. The proposal provides a standard format for the recording of USASCII on 9-track 800-character-per-inch magnetic tape. Concurrent with this action, the committee withdrew the previously approved standard for 9-track, 200-cpi magnetic tape from USASI in order to bring the 200-cpi standard into direct conformity with the 800-cpi proposal insofar as the recording of USASCII on the tape is concerned.

If the 800-cpi and the revised 200-cpi proposed standards are approved as USA Standards, a significant step will have been taken towards achieving the benefits of a standard machine language code.

Work on a standard representation of the USASCII characters in punched cards appears well on its way to completion. The approach being taken in this effort is to incorporate the commonly used Hollerith hole patterns for numerals, and a single case alphabet in the 128 hole patterns assigned to the USASCII characters. It is hoped that this will provide the link between the great number of Hollerith card applications which have developed over the years and the USASCII environment of the future.

USASCII TODAY

A code intended to serve the needs of a great number of application areas cannot make everyone happy all of the time. The fact is, however, that the sometimes conflicting requirements of information processing, data transmission and keyboard design have been resolved to the satisfaction of the diverse interests represented in the committee developing USASCII. In its present form, USASCII represents a significant contribution to the effort of bringing standardization to bear on the problems of information interchange.