

TECHNICAL BULLETIN

BENDIX G-15 COMPUTER

**ACCESSORY PR-2
PHOTO-ELECTRIC READER**

ACCESSORY PR-2
FOR THE
BENDIX G-15 COMPUTER

Introduction

Accessory PR-2 is an additional photo-electric reader that permits any external numeric code, punched on five, six, seven, or eight channel tape, to be read into the G-15 computer. Movement of the tape is uni-directional at a rate of 400 characters per second.

The external code may contain control characters and positive or negative numerical values. The PR-2 transforms the external code by means of a matrix which is formed by ten plug-in units. Jumper wires on the plug-in units are connected in such a manner as to form the external code. The matrix transforms the external code into the standard internal G-15 code, four bits per digit, and enters the transformed information into the computer.

Functional Detail

As many as sixteen different information characters may be read from tape; hence, the digits from 0 through 9 and six other characters may be read into the memory.

Control characters may signify the end of a numerical value or that tape reading is to halt immediately. The control characters are : Minus Sign (-), End of Number (tab or carriage return), Stop, and an input control character called Transfer 23 to 19 (Reload).

The Stop code is the only control character essential to the operation of the PR-2. No special or additional spacing need exist on the tape before or after a Stop code. Stop codes may be punched at intervals selected by the user, provided there are at least six characters between them.

Information is read into Line 19 in the computer in the normal manner described under "Read-in Control" in the G-15 Operating Manual. The input data enters Line 23. When a character signifying a Minus sign is read from tape, the sign is stored in the input sign register in the computer. When an End of

Number character is read, the sign is transferred from the input sign register to the sign position of the input word in Line 23. The absence of a minus sign is interpreted to be a plus sign. Note that the End of Number character corresponds to a typewriter carriage return or tab. After four words or less of input a control signal, called Transfer 23 to 19, causes the contents of Line 23 to be copied into Line 19.

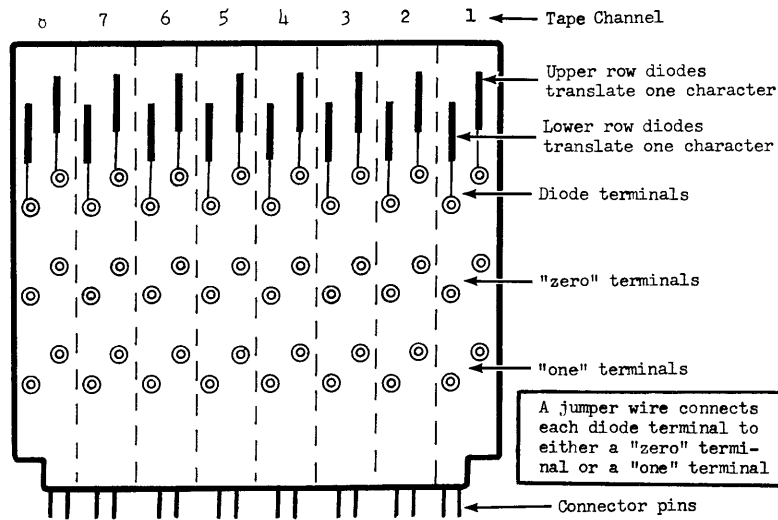
This latter signal may be on the tape or may be internally generated in the computer. If the Transfer 23 to 19 signal is internally generated, the PR-2 is said to be operating in the "Automatic Mode". If the Transfer 23 to 19 signal is punched on the tape, the PR-2 is said to be operating in the "Standard Mode".

Matrix

The code-translating matrix is on 10 small plug-in units. A plug-in unit has 16 diodes arranged in two rows of eight. Each diode in a row corresponds to one of the eight tape channels. A row of eight diodes translates from tape a specific character of the external code. As there are 10 plug-in units and each unit has two rows of diodes, 20 external characters are translated into 20 codes for the G-15. The G-15 characters are:

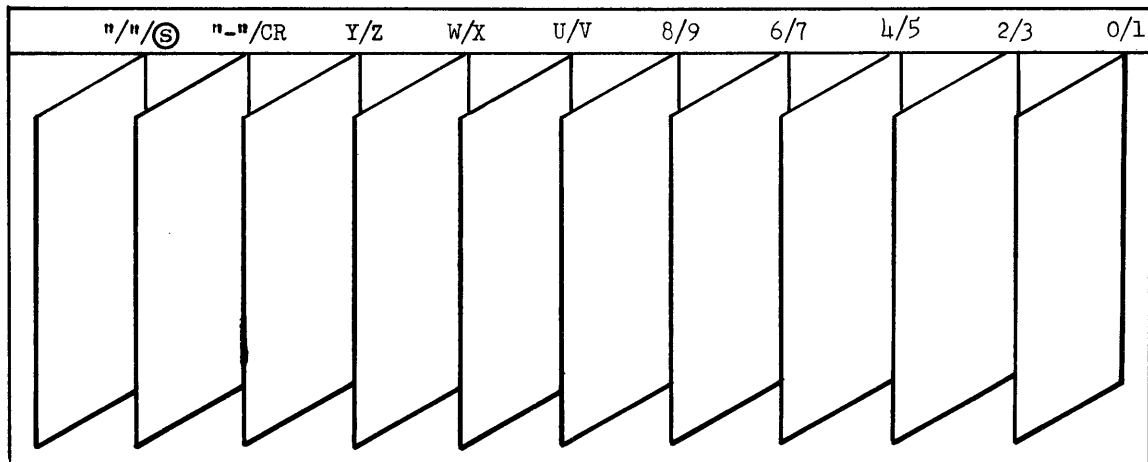
0	u (10 in decimal)
1	v (11 in decimal)
2	w (12 in decimal)
3	x (13 in decimal)
4	y (14 in decimal)
5	z (15 in decimal)
6	End of Number (tab or carriage return)
7	Stop Code (Ⓢ)
8	Transfer 23 to 19 (reload)
9	Minus Sign

There are two groups of terminals called "zero" and "one" terminals. Each terminal group consists of two rows of eight terminals, one for each diode, as shown in Figure 1.



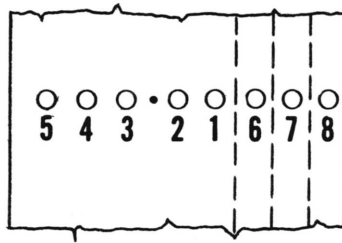
Plug-in Unit
Figure 1

By inserting jumper wires, two character codes from tape are translated into two internal G-15 codes for each plug-in unit. The two internal G-15 codes which correspond to the position of each plug-in unit are printed above the plug-in connector in the PR-2 as shown in Figure 2.



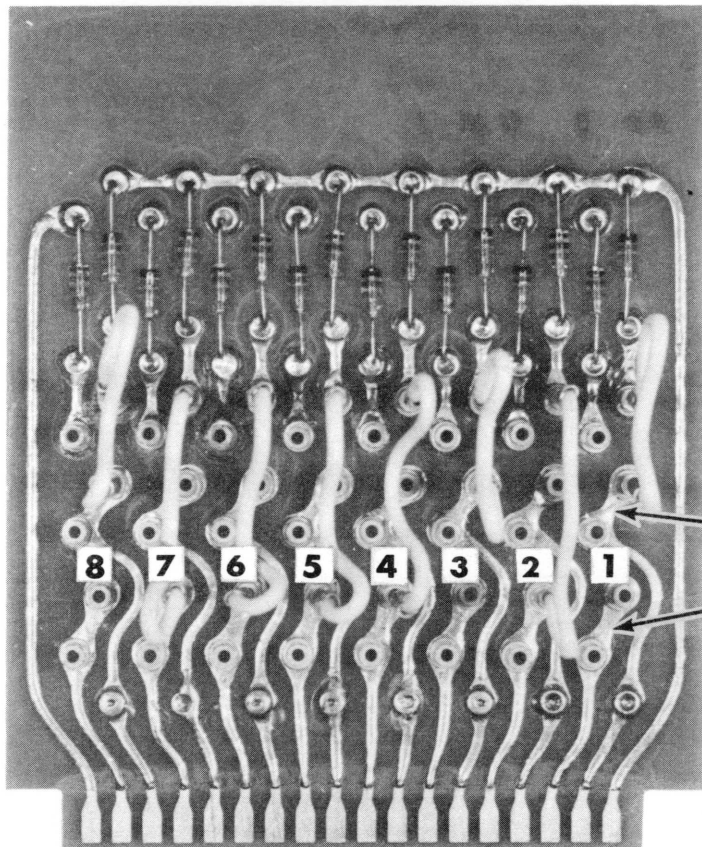
PR-2 Plug-in Units and Corresponding G-15 Codes
Figure 2

This edge
of tape
toward PR-2



Numbering of Channels On 5, 6, 7 or 8 Level Tape

Matrix Plug-in Unit



"Zero" Terminals

"One" Terminals

The plug-in unit shows the eight diodes connected to the "zero" and "one" terminals for the external code 01111010 representing the number 3.

Figure 3

For each channel to be read from tape, a jumper wire is connected from a diode terminal to either the corresponding "zero" or "one" terminal. The "zero" or "one" terminal is determined by the external code. For example, if the external code for the digit "3" is 01111010, the first, third and eighth diode terminals from the right would be connected to the "zero" terminals as the bits in these positions are zero. Similarly, the other five diode terminals would be connected to the "one" terminals. Figure 3 shows a plug-in unit wired for this code.

Automatic Mode

The command which causes the PR-2 to read tape in the automatic mode is:

<u>Command</u>	<u>Code</u>
Read Paper Tape	L ₅ N 5 12 31

The command should not be placed in address u7.

When the command is given, the computer automatically clears Line 23 and inserts a marker bit in the least significant bit position in Line 23. As information enters Line 23, the marker bit moves toward the most significant bit position.

After 4 groups of 7 digits (28 digits) enter Line 23, the marker bit is recognized and the computer automatically generates a Transfer 23 to 19 code. The four groups of numbers may or may not be separated by an End of Number character. After the transfer, Line 23 is cleared and the marker bit again enters the least significant bit position.

To calculate the number of bits entered into the computer, add together four bits for each information character plus one bit for each End of Number character.

Observe these rules in punching tape: The number of digits per number is 7; zeros must be punched in unused digit positions.

Each 7-digit number may or may not be followed by an End of Number character. However, if used, the End of Number character must be used after every 7-digit number.

For information stored in the G-15 memory there must be consecutive Stop codes for every 108 seven-digit numbers read.

(108 x 7 = 756 digits)

Standard Mode

The command which causes the PR-2 to read tape in the standard mode is:

<u>Command</u>	<u>Code</u>
Read Paper Tape	T N 1 12 31

The standard mode input operation is exactly like input to the G-15 through the standard photo-reader; the Transfer 23 to 19 signals are read from tape. The G-15 does not automatically generate the Transfer 23 to 19 code in the standard mode. When the Transfer 23 to 19 code is read, the contents of Line 23 are copied into Line 19.

There must be at least 26 characters on tape between any pair of these codes; a Transfer 23 to 19 signal normally occurs when or before 116 bits of information have been entered into the computer.

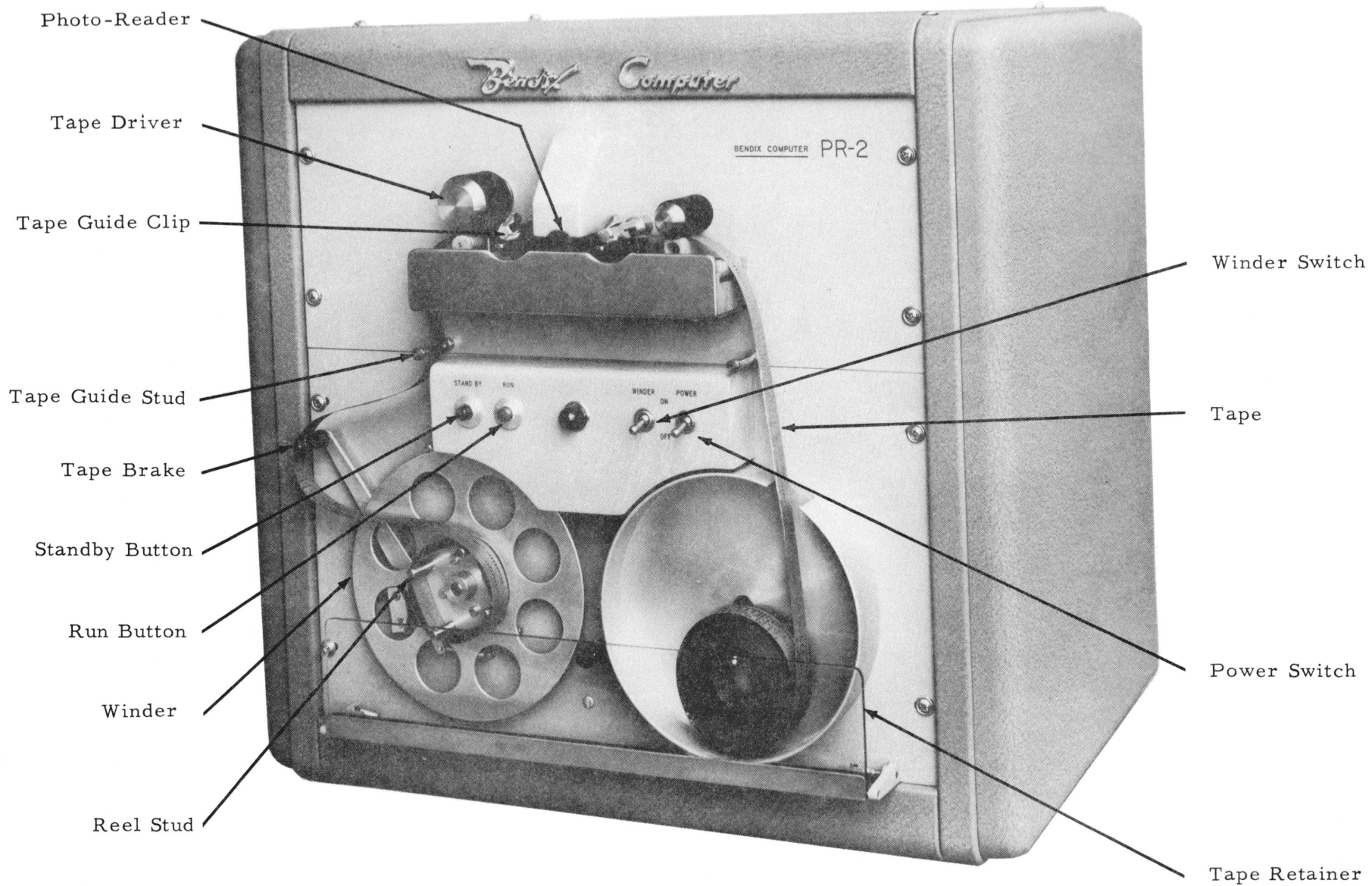
In the standard mode, a Stop code has an additional effect. The tape halts immediately and the contents of Line 23 are copied into Line 19. Stop codes may occur as often as desired provided there are at least 6 characters between stop codes.

Timing

In writing a program that uses either of the PR-2 commands, allow at least four drum revolutions delay after a tape reading has halted before re-executing the command.

Physical Description

The PR-2 is designed to be used without reels. Tape winding and unwinding equipment capable of handling 500 feet of tape



PR-2 Front Panel
Figure 4

is associated with the accessory. The winder and unwinder are designed to handle a reel-less roll of tape from a standard winder such as is found on National Cash Register, Clary Cash Register, or Friden Flexowriter equipment.

The PR-2 is 22 inches high, 24 inches wide and 19 inches deep. It weighs about 120 lbs.

Installation

Connect the PR-2 cable to the receptacle at the rear of the G-15 computer labelled 'Punched Tape'. Power for the PR-2 is supplied from the G-15.

Operating Instructions

To turn on the PR-2:

1. Put the Power switch in the ON position.
2. Insert tape to be read in the reader and thread through the winder as shown in Figure 4. The two clips on either side of the photo-reader permit the operator to easily slide the tape under the photo-reader.
3. Wait for at least 60 seconds after the Power switch is turned ON. Then press the Run button. The tape is now firmly held in place.

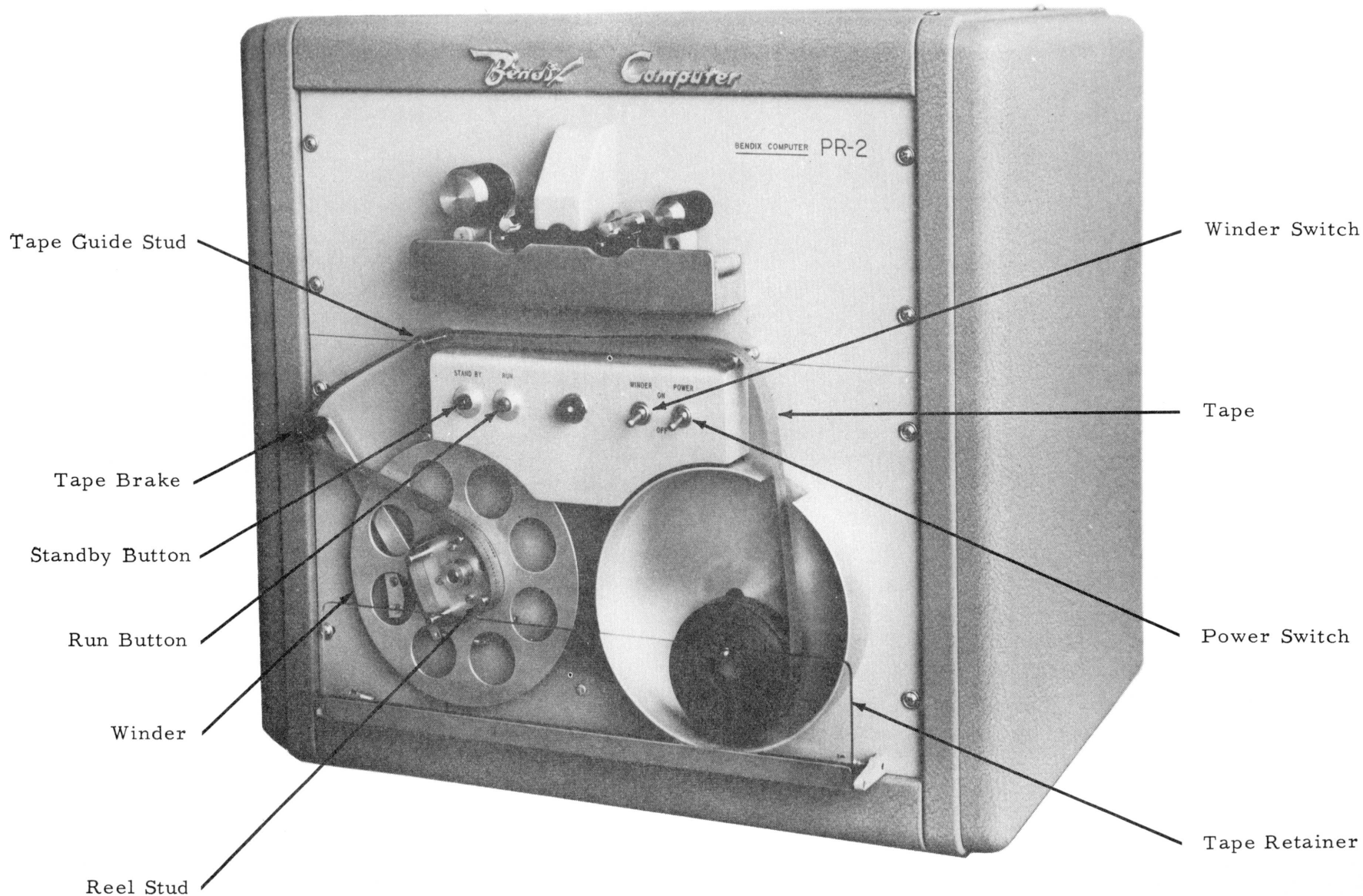
To insert tape in the reader or remove tape from it, press the Standby button.

To use large rolls of tape:

1. Put the tape roll in the container and run the tape through the photo-reader, around the tape brake and around the reel studs of the tape reel.
2. Put the Winder switch in the ON position.

To rewind the tape:

1. Remove the roll of tape from the reel.
2. Put the tape in the tape holder and over the tape guide studs as illustrated in Figure 5.
3. Press the run button and put the Winder switch ON.



PR-2 Front Panel
Figure 5

To turn off the PR-2:

1. Press the Standby button.
2. Put the Power Switch in the off position.

The PR-2 need not be disconnected from the G-15 computer.



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