HONEYWELL EDP

SOFTWARE MANUAL

MOD 1 (TR)

BRT PUNCH C

GENERAL SYSTEM: SERIES 200/OPERATING SYSTEM-MOD 1 (TAPE RESIDENT)

SUBJECT: The Conversion of Object Programs from BRT Records to Punched Cards for Execution under Card Loader-Monitor B.

SPECIAL INSTRUCTIONS: This manual supersedes the software bulletin BRT Punch C dated October 29, 1965. The portions of this publication which contain new information and changes are indicated on page ii.

INCLUDES UPDATING MATERIALS PUBLISHED AS ADDENDUM NO. 1 ON JULY 25, 1966 AND AS ADDENDUM NO. 2 ON APRIL 20, 1967.

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NEW AND CHANGED INFORMATION

Additions made to this edition of the manual incorporate programming and operating procedures for BRT PUNCH C on the Model 120. These additions appear in the following places:

Page	Paragraph
3-2	4 (section 2.b)
3-4	Note under Method #3.

Changes in this edition of the manual reflect BRT Punch C's operation on a computer which uses a Type 214-2 or 224-2 Card Reader/Punch. These changes are indicated below:

Page	Item
1-2	Table 1-1
3-5	Columns 27-29
3-6	Columns 33-35

An explanatory note on the use of RWC's during interrupt processing has been added under column 8 on page 3-5.

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INTRODUCTION

GENERAL DESCRIPTION OF BRT PUNCH C

The Mod 1 Operating System for the Series 200 includes monitor systems for magnetic tape, random access drum, and punched-card environments. The Card Loader-Monitor B program loads and starts object programs on punched cards (refer to the Card Loader-Monitor B manual, Order No. 154). Cards processed by Card Loader-Monitor B are punched in the format of an Easycoder C or D binary run tape (BRT), as opposed to the format of Easycoder A self-loading cards. Cards punched in BRT format for execution under Card Loader-Monitor B are available as an output of Easycoder Assemblers B, C, and D and Fortran Compiler D.

In some situations, although a program was originally assembled onto a BRT it may be advantageous to run that program from cards. For example, running under Card Loader-Monitor B makes all tape drives available to the object program. The BRT Punch C program converts BRT object programs to cards punched in BRT format. Any program designed to run under Tape Loader-Monitor C may thus be processed by BRT Punch C and run under Card Loader-Monitor B.

Up to six BRT's may supply input programs to be punched on cards. BRT Punch C is capable of searching any of the six BRT's for any program. Hence, programs may be selected for punching in any order, regardless of their positions in the input files.

The operation of BRT Punch C is controlled by a director file, which is read from either cards or a card-image magnetic tape. Each director card usually controls processing of one segment, or loading unit (see Section II). However, an option is provided whereby an entire program consisting of contiguous segments on a BRT is processed under control of a single director card. Processing on a program basis reduces the number of director cards required to punch a multisegment program.

Output of BRT Punch C is a BRT-format card deck, suitable for loading and execution under Card Loader-Monitor B. Under an output option, however, BRT Punch C may be directed to produce a card-image tape for subsequent conversion to BRT-format cards.

Figure 1-1 is a functional diagram of BRT punch C. The program may be loaded from any medium by the appropriate Mod-1 monitor. However, since BRT Punch C manipulates binary

run tapes, this bulletin describes only the case in which the program itself is loaded from a BRT by Tape Loader-Monitor C (see Tape Loader-Monitor C, Order No. 221). Note that the same BRT may contain the program BRT Punch C and the loading units it processes.

EQUIPMENT REQUIREMENTS

Minimum Equipment Required

BRT Punch C requires 12,288 characters of memory and the Advanced Programming instructions (standard on Models 1200, 2200, and 4200). The minimum configuration of peripheral equipment depends on the input and output media used for converted programs and the director file, as enumerated in Table 1-1.

Table 1-1. Minimum Peripheral Equipment Required for BRT Punch C

	Tape Drives (204 B)	Card Reader	Card Punch
Director file on cards Output on cards (See Note below)	1	yes	yes
Director file on card-image tape Output on cards	2	no	yes
Director file on cards Output on card-image tape	2	yes	no
Director file on card-image tape Output on card-image tape	3	no	no

Note: If the computer has a Type 214-2 or 224-2 Card Reader/Punch used as both the card reading and card punching equipment, either the director file or the output must be a card-image tape. The Card Reader/Punch can be specified for the director file or the output, but not both.

Additional Equipment Usable

All configurations may include up to five additional tape drives for BRT input and may use the console typewriter (type 220) for message output.

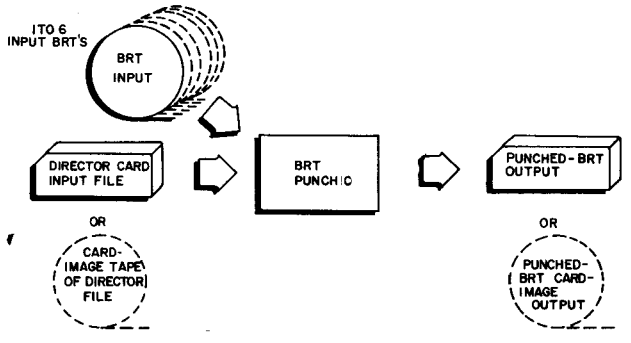


Figure 1-1. Functional Diagram of BRT Punch C

SECTION II
BRT TAPE AND CARD FORMATS

COMPONENTS OF A BRT FILE

Every BRT file, whether a binary run tape or BRT-format cards, begins with a header label record (1HDRΔ) and ends with a trailer label record (1EOFΔ). In addition to these two records, a binary run tape contains a tape bootstrap routine immediately following the header label record and two end-of-reserved-information records (1ERIΔ) immediately following the trailer label record. Binary run tapes produced by Easycoder Assembly C or D, Fortran Compiler D, or the COBOL Compilers D and H contain Tape Loader-Monitor C immediately following the tape bootstrap routine. Binary run tapes produced under Update and Select C do not necessarily contain the Loader-Monitor.

Most of the information in a BRT file is the actual program file of machine-language programs. The program file is composed of loading units or segments. Each segment consists of records. The first record in a segment is the header record, which is usually, though not necessarily, followed by one or more nonheader records. Every record begins with identification and control information. The remainder of each record is loading data — machine code to be loaded, interspersed with characters which control the loading operation. The organizational levels of a BRT program file are discussed below and illustrated schematically in Figure 2-1.

Loading Unit (Segment)

A loading unit is that portion of coding which is loaded as a result of a single call to the loader and which is executed independently of other portions of coding. For a segmented program, i.e., a program which is divided into segments by the Easycoder SEG and EX statements, each segment corresponds to a loading unit. For a nonsegmented program, the entire program constitutes a single loading unit, or segment.

Loading Unit Records

The first record of every loading unit is the segment header record, whose control field contains identifying information for the loading unit (segment), including the record banner character. The loading unit may contain additional (nonheader) records, whose control fields contain only the banner character and a minimum of control information. The formats of the various control fields on both segment header and nonheader records are illustrated and explained below for each type of record.

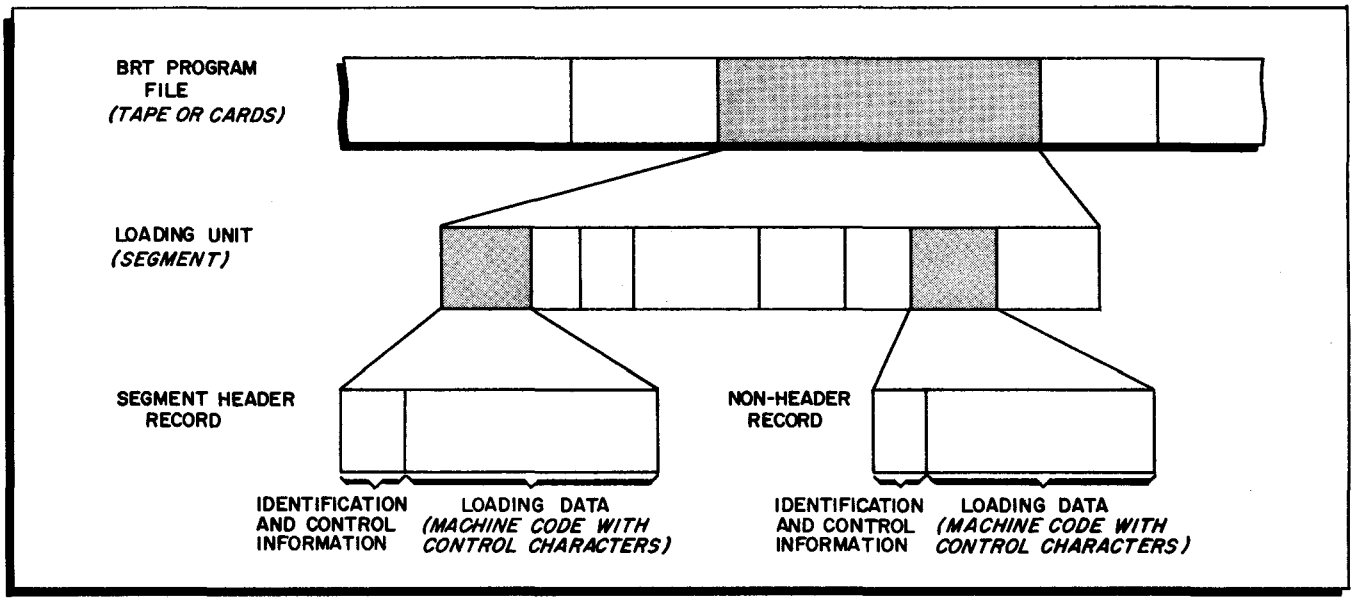


Figure 2-1. Organizational Levels of a BRT Program File (Schematic)

Immediately following the identification and control field on both segment header and non-header records is the loading data. Loading data consists of strings of machine-code characters interspersed with loading control characters. The loading control characters, which are generated by assembly, control the following loader functions:

1. Reading a record.
2. Loading memory.
3. Punctuating memory.
4. Clearing memory.
5. Terminating loading.

Loading control characters are listed and explained in Table 2-1. The loading data portion of each record has the following characteristics:

1. It begins with a control character;
2. Every record except the last record of a loading unit terminates with the control character octal 77;
3. The last record of a loading unit terminates with control character octal 61, followed by a three-character address;
4. The "nnnn" digits of control characters 1 through 3 in Table 2-1 are never 0000.

One important respect in which binary run tape records differ from BRT-format card records is the length of the records themselves. Binary run tape records may vary in length up to a maximum of 250 characters; the length of BRT-format card records is necessarily limited to 80 characters.

Table 2-1. Loading Control Characters

Control Character			Meaning
No.	Octal	Binary	
1	Variable from 01 to 17	00nnnn	Interpret the nnnn digits as a binary number. Move the following nnnn characters to successive locations, placing the leftmost character in the location specified by the current setting of the distribution counter (in X6). Clear punctuation in locations into which the characters are moved. Advance the distribution counter by nnnn.
2	Variable from 21 to 37	01nnnn	Perform same functions as control character No. 1, and set a word mark in the leftmost character location loaded.
3	Variable from 41 to 57	10nnnn	Perform same functions as control character No. 1, and set an item mark in the leftmost character location loaded.
4	60	110000	Place the following three characters into the distribution counter. (The next string will be loaded with its leftmost character at this address.)
5	61	110001	Terminate loading. Interpret the following three characters as the normal starting location for the unit just loaded.
6	62	110010	Clear an area of memory, using the following seven characters to identify the area to be cleared and the character with which to clear it. (Characters 1 through 3 are interpreted as the lowest address of the area to be cleared; characters 4 through 6 are interpreted as the highest address; and character seven is transferred to every location in the cleared area with punctuation marks cleared.)
7	63	110011	Set a word mark in the location whose address is one less than the current setting of the distribution counter.
8	64	110100	Set an item mark in the location whose address is one less than the current setting of the distribution counter.
9	77	111111	Read the next record.

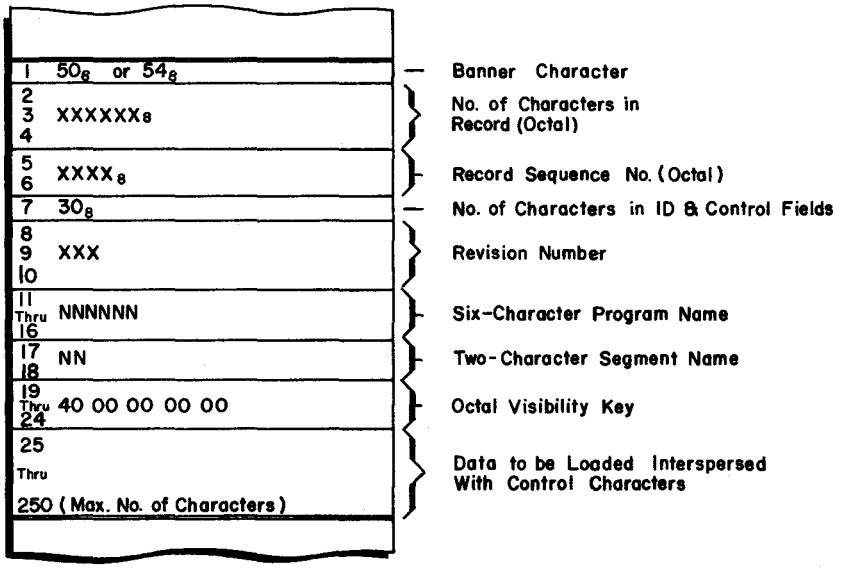
FORMAT OF BINARY RUN TAPE RECORDS

The segment header and non-header records of a binary run tape which is converted to punched-card format by BRT Punch C are described below.

BRT Segment Header Record

Character 1: Is the octal banner character, which identifies the record type:

- 54 - segment header record which is also the last record of a loading unit.
- 50 - segment header record which is not the last record of a loading unit.



Characters 2-4: Denote in octal the number of characters in the record.

Characters 5-6: Are the record sequence number, which specifies in octal the number of backspaces to position tape for reading the previous segment header record.

Character 7: Is 30_8, the number of characters in the identification and control portion of the record.

Characters 8-10: Are the three-character revision number (normally decimal) assigned by the programmer in his symbolic program.

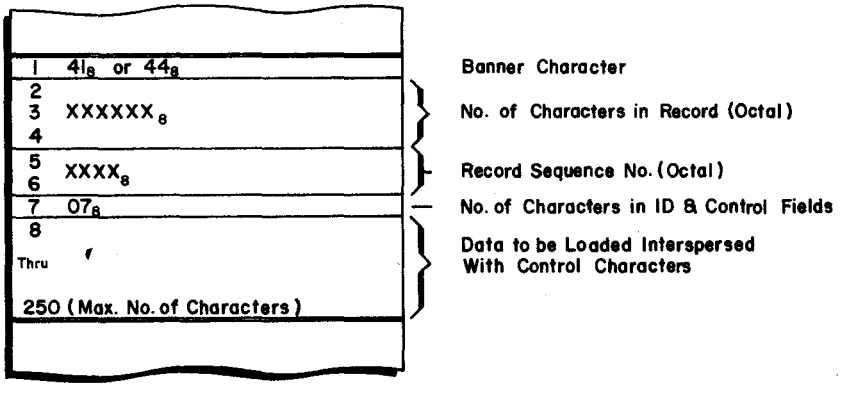
Characters 11-16: Are the programmer-assigned, six-character program name.

Characters 17-18: Are the programmer-assigned, two-character segment name.

Characters 19-24: Are the six-character visibility key (octal) assigned by the programmer and used by the loader, under certain conditions, when searching for a loading unit. (It may be used to correlate two or more loading units as a system subset to be run together or to distinguish between different versions of the same program.)

Characters 25-m: Are loading data. The maximum value of m is 250.

BRT Non-Header Record



Character 1: Is the octal banner character, which identifies the record type:
- 44 - non-header record which is also the last record of a loading unit.
- 41 - non-header record which is not the last record of a loading unit.

Characters 2-4: Denote in octal the number of characters in the record.

Characters 5-6: Are the record sequence number, which specifies in octal the number of backspaces to position tape for reading the previous segment header record.

Character 7: Is 07_8, the number of characters in the identification and control portion of the record.

Characters 8-m: Are loading data. The maximum value of m is 250.

FORMAT OF BRT PUNCHED-CARD RECORDS

In describing punched-card formats, "record" is synonymous with "card" or "card image on magnetic tape." A "column" in a punched card is equivalent to a "character" in a card-image tape record.

Punched-BRT Header Label Record

The header label record identifies the output of BRT Punch C as a BRT-format deck to be loaded by Card Loader-Monitor B. The format of the card is illustrated in Figure 2-2 and described below.

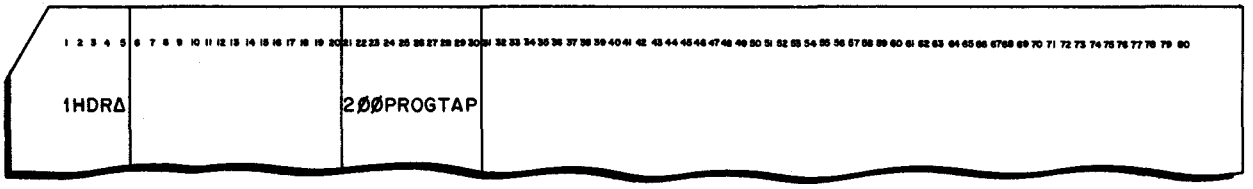


Figure 2-2. Punched-BRT Header Label Record

Columns 1-5: Contain 1HDRΔ

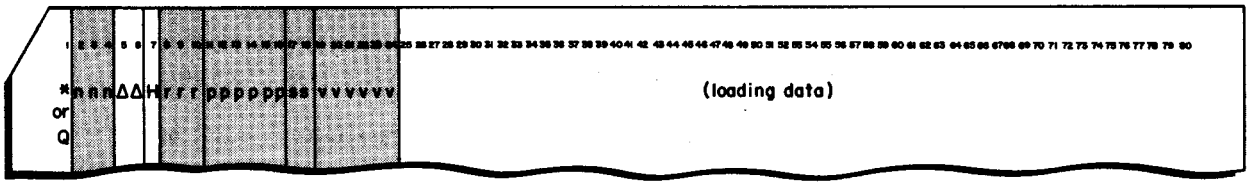
Columns 6-20: Blank

Columns 21-30: Contain 200PROGTAP

Columns 31-80: Blank

Punched-BRT Segment Header Record

The segment header record is illustrated in Figure 2-3 and described below.



NOTE: Shaded columns represent variable information punched by BRT Punch C. Unshaded columns are literally punched as shown.

Figure 2-3. Punched-BRT Segment Header Record

Column 1: Contains a banner character which identifies the record type:
* (54_8) - segment header record which is also the last record of a loading unit.
Q (50_8) - segment header record which is not the last record of a loading unit.

Columns 2-4: Contain a decimal card sequence number, generated by BRT Punch C. The card sequence number is for the programmer's convenience; it is not examined by Card Loader-Monitor B. Card sequence numbers are generated beginning with 001 each time an action director is processed (see Section III). Hence, if a multisegment program is processed on a segment basis, each segment will begin with card sequence number 001. If a multisegment program is processed on a program basis, only one action director is present. Then only the first segment will begin with card sequence number 001 and cards of successive segments will continue to be numbered serially.

Columns 5-6: Blank.

Column 7: Contains the letter H (30_8), which is the alphanumeric equivalent of the octal number of characters in the identification and control portion of the record.

Columns 8-10: Contain the three-character revision number, normally decimal, assigned by the programmer in his symbolic program.

Columns 11-16: Contain the programmer-assigned, six-character program name.

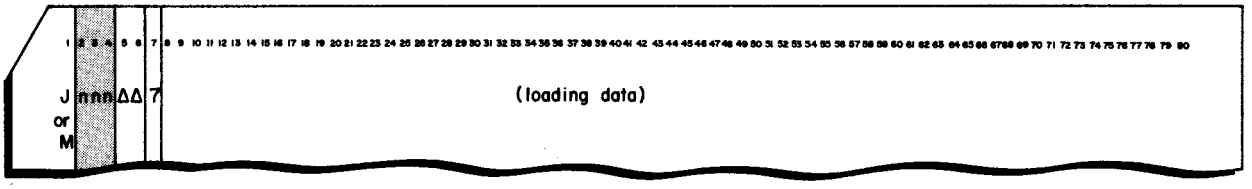
Columns 17-18: Contain the programmer-assigned, two-character segment name.

Columns 19-24: Contain the alphanumeric equivalent of the octal visibility code assigned by the programmer. This field is not used by Card Loader-Monitor B.

Columns 25-m: Contain loading data. Column m is not necessarily column 80 of the card, since each punched-BRT record (card) must contain an integral number of loading data strings. If the entire segment is contained on a single card (banner character *), column m may contain a blank (15_8). Recall from Table 2-1 that a loading unit terminates with the control character 61_8, followed by the unit's starting address. Therefore a segment header record which is also the last record of a loading unit contains the punch / (61_8) in column m-3, and, if the starting address for the segment ends with 15_8, could contain a blank in column m. As listed in Table 2-1, if the segment header record is not the last record of a loading unit (banner character Q), column m contains a 0, 8, 7 multipunch (77_8).

Punched-BRT Non-Header Record

The non-header record is illustrated in Figure 2-4 and described below.



NOTE: Shaded columns represent variable information punched by BRT Punch C. Unshaded columns are literally punched as shown.

Figure 2-4. Punched-BRT Non-Header Record

Column 1: Contains a banner character which identifies the record type:
M (44_8) - non-header record which is also the last record of a loading unit.
J (41_8) - non-header record which is not the last record of a loading unit.

Columns 2-4: Contain a decimal card sequence number, generated by BRT Punch C. The card sequence number is for the programmer's convenience; it is not examined by Card Loader-Monitor B. Card sequence numbers are generated beginning with 001 each time an action director is processed (see Section III). Hence, if a multisegment program is processed on a segment basis, each segment will begin with card sequence number 001. If a multisegment program is processed on a program basis, only one action director is present. Then only the first segment will begin with card sequence number 001 and cards of successive segments will continue to be numbered serially.

Columns 5-6: Blank.

Column 7: Contains a 7, which is the number of characters in the identification and control portion of the record.

Columns 8-m: Contain loading data. Column m is not necessarily column 80 of the card. If the card is the last record of a segment (banner character M), column m may contain a blank. If the card is not the last record of a segment (banner character J), column m contains a 0, 8, 7 multipunch (77_8).

Punch-BRT Trailer Label Record

The trailer label record identifies the end of a BRT-format deck to be loaded by Card Loader-Monitor B. The format of the card is illustrated in Figure 2-5 and described below.

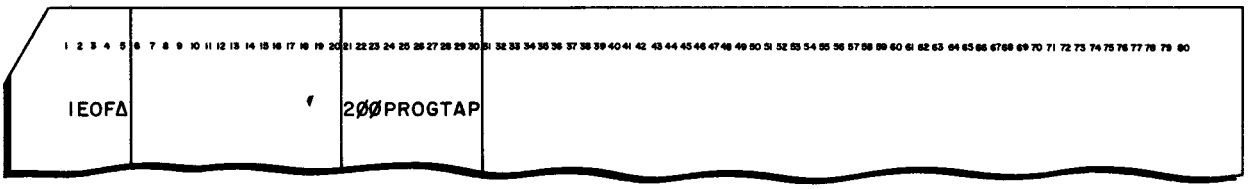


Figure 2-5. Punched-BRT Trailer Label Record

Columns 1-5: Contain 1EOFΔ

Columns 6-20: Blank

Columns 21-30: Contain 200PROGTAP

Columns 31-80: Blank

Output Medium Considerations

If the output of BRT Punch C is punched on-line, an additional card must be inserted by the programmer immediately following the trailer label record. This card should contain the punches 1ERIΔ in columns 1-5. The purpose of this card is to signify the end of the file to Card Loader-Monitor B.

If the output of BRT Punch C is a card-image tape for off-line conversion, two card images are written in addition to the records generated by BRT Punch C. The card-image label record is written before the header label record on tape. The card-image label record is illustrated in Figure 2-6 and described below.

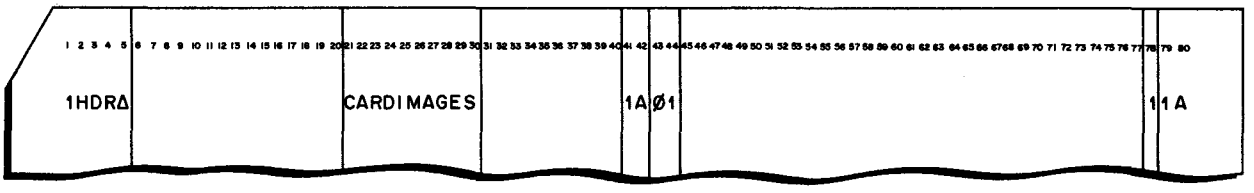


Figure 2-6. Card-Image Label Record for Off-Line Tapes

Columns 1-5: Contain 1HDRΔ

Columns 6-20: Blank

Columns 21-30: Contain CARDIMAGES

Columns 31-40: Blank

Columns 41-42: Contain 1A

Columns 43-44: Contain 01

Columns 45-77: Blank

Column 78: Contains 1

Columns 79-80: Contain 1A

The end-of-recorded-information record is written after the trailer label record on tape. The end-of-recorded-information record is illustrated in Figure 2-7 and described below.

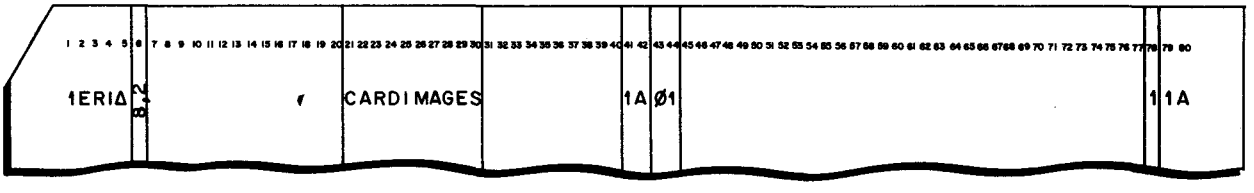


Figure 2-7. End-of-Recorded-Information Record for Off-Line Tapes

Columns 1-5:	Contain 1ERIΔ
Column 6:	Contains an 8, 2 multipunch
Columns 7-20:	Blank
Columns 21-30:	Contain CARDIMAGES
Columns 31-40:	Blank
Columns 14-42:	Contain 1A
Columns 43-44:	Contain 01
Columns 45-77:	Blank
Column 78:	Contains 1
Columns 79-80:	Contain 1A

SECTION III
CONTROLLING BRT PUNCH C: THE INPUT FILE

The Equipment Configuration Descriptor (ECD) card and the director file make up the input file. As specified on the ECD card described later in this section, the director file may be read from cards or from card images on magnetic tape. The descriptions of the input file cards in this section apply equally to card images on magnetic tape.

ORGANIZATION OF THE DIRECTOR FILE

The director file is illustrated in Figure 3-1. Note that the Equipment Configuration Descriptor card, if used, precedes the director file. Both are described below.

There are two functions of BRT Punch C: positioning an input BRT at the end of a specified loading unit, and converting a specified unit to punched cards. Action director cards request the appropriate function, identify the BRT and loading unit to be processed, and specify whether the action code applies to a single segment or to the entire program. The director file trailer card follows the last action director. At least two blank cards must follow the trailer card.

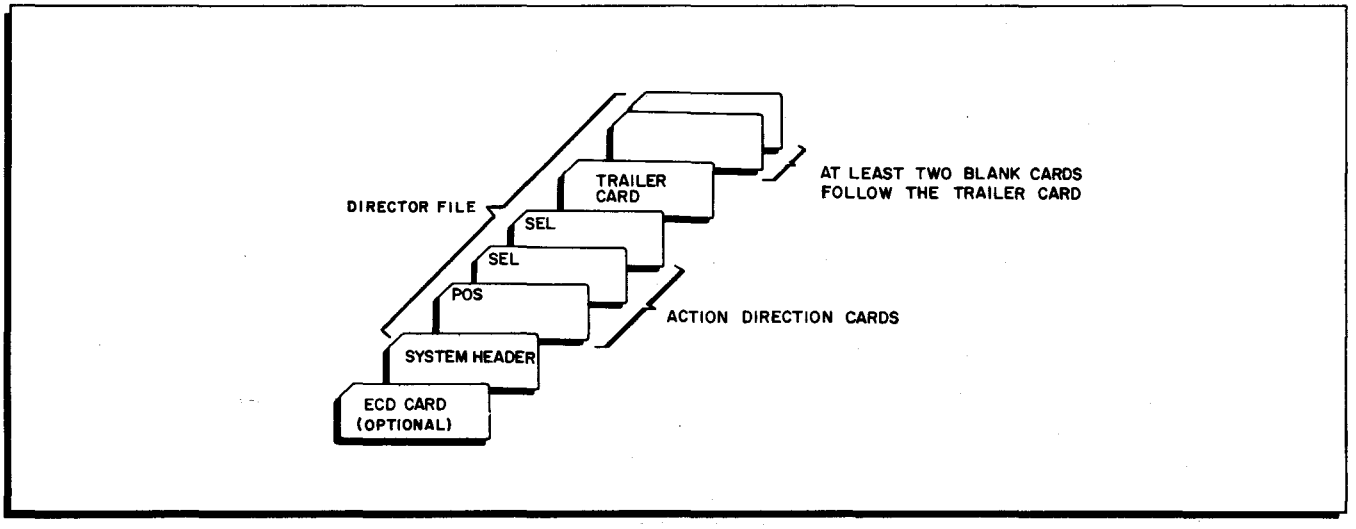


Figure 3-1. Input File

EQUIPMENT CONFIGURATION DESCRIPTOR

The Equipment Configuration Descriptor specifies, among other things, the input and output devices and the number of memory locations to be used for a system program.

BRT Punch C, like all system programs, contains 10 standard equipment configurations assembled within itself. Each standard configuration is identified by a number from 0 through 9. Based on the equipment he wishes to make available, the user may specify one of these numbers and so obtain a smooth flow between system programs without the necessity of constructing his own ECD card each time.

In cases of unusual run sequences or where limited equipment is available, configuration numbers may be specified for each program on an individual basis. If the desired configuration has not been included among the standard equipment configurations, a full, user-constructed, Equipment Configuration Descriptor card may be used.

The standard configurations supplied may be changed at each installation by reassembling the system program (see Appendix A). It should be noted that specification of memory size is independent of the standard configurations (see below).

Methods of Specifying the Configuration

A four-character area, called the ECD field, has been set aside within the Loader communication area to contain information pertaining to the Equipment Configuration Descriptor for the run. This field, locations 227_8 - 232_8, contains either of the following:

1. A standard equipment configuration number which will be used for all system program runs including BRT Punch C (method #1).
2. A device address. The system program will read one record from that device. (There is no anticipatory read — one and only one record will be read.) This record must be an Equipment Configuration Descriptor image and may specify either:
   a. A standard configuration number (method #2).

   or

   b. A full ECD (method #3). This is the only method that may be used when operating BRT Punch C on the Model 120.

METHOD #1 — STANDARD ECD NUMBER RESIDING IN TAPE OR CARD LOADER-MONITOR

Locations 227_8 through 232_8 (ECD field) of the Loader communication area contain:

Δ	X	Δ t	Δ t

NOTE: If only one standard configuration number can be used by all the system programs, no ECD cards are required. The Tape or Card Loader-Monitor can be assembled so that locations 227_8 through 232_8 contain the desired values as described in Table 3-1.

Table 3-1. ECD Field with Standard ECD Number

Character Number	Location (Octal)	Contents
1	227	Blank (Δ)
2	230	Standard configuration number (X)
3-4	231-232	Highest memory bank (octal) available to the system program (tt). If these characters are blank, the memory size included in the standard configuration is used.

Table 3-2 shows the standard configurations for BRT Punch C. Since punching from one BRT directly to the card punch is by far the most commonly used operating mode, it has been assigned all the standard configuration numbers. As a result, if any one standard configuration number can be used for the other system programs, it can be used for BRT Punch C.

The highest memory bank used by the standard configurations is bank 02_8, or 12K characters. The standard configurations employ the following peripheral control addresses (octal).

Device	Address
Tape control unit	00
Card reader	41
Card punch	01
Control panel	00

Table 3-2. Standard Configuration Numbers for BRT Punch C

Configuration Number	Minimum Number of Tapes	Run Description	Tape 0	Tape 2	Card Reader	Card Punch	Printer
0-9	2	Punch from 1 BRT	PT	Input BRT	Director deck	BLD	Not used

NOTES: 1. Only tapes 0 and 2 are used.

2. PT = Program tape (containing BRT Punch C program).

3. Input BRT = BRT which is being punched.

4. BLD = Binary load deck (the punched output of BRT Punch C).

METHOD #2 — STANDARD ECD NUMBER OBTAINED FROM ECD IMAGE

NOTE: Should no one standard equipment configuration number be suitable for operating the other system programs, method #2 may be used.

Locations 227_8 and 232_8 (ECD field) of the Loader communication area contain:

J	J	0	R

(Normal)

Table 3-3. ECD Field to Obtain ECD Image from Input Device

Character Number	Locations (Octal)	Contents
1	227	Device type (J)
2-3	230-231	Control unit and device (J0)
4	232	Read/write channel (R)

NOTE: Under this method, the standard code of JJ0R assembled in locations 227_8 through 232_8 means that the ECD image will be read from a card reader having a peripheral address of 41 via read/write channel 1. The contents of these locations may be changed by reassembling the Loader-Monitor or by manual entry from the console.

The Equipment Configuration Descriptor image read in must be constructed as shown in Table 3-4.

Table 3-4. Standard ECD Image

Character	Contents	Explanation
5	0-9	The standard configuration which corresponds to this number will be used. If this column is blank, the image is assumed to be a full ECD image (see method #3).
6	E	Identifies an Equipment Configuration Descriptor.
19-20	tt or ΔΔ	tt is the highest memory bank (octal) available to system program. If these characters are blank, the memory size included in the standard configuration is used.

METHOD #3 — FULL EQUIPMENT CONFIGURATION DESCRIPTOR AS ECD IMAGE

The format of the full Equipment Configuration Descriptor is described below and illustrated in Figure 3-2. Note that column 5 must be blank to distinguish this from an Equipment Configuration Descriptor specifying a standard equipment configuration.

NOTE: A full ECD image is required if BRT Punch C is being operated on a Model 120. On all other models, a full ECD image is required only if it is desired to specfiy an equipment configuration that is not included among the standard configurations. Should it become common practice to use non-standard configurations, the standard configurations should be reassembled to reflect this operating environment (see Appendix A).

Columns 1-5: Not used

Column 6: Contains the letter E, which identifies the ECD card

Column 7: Not used

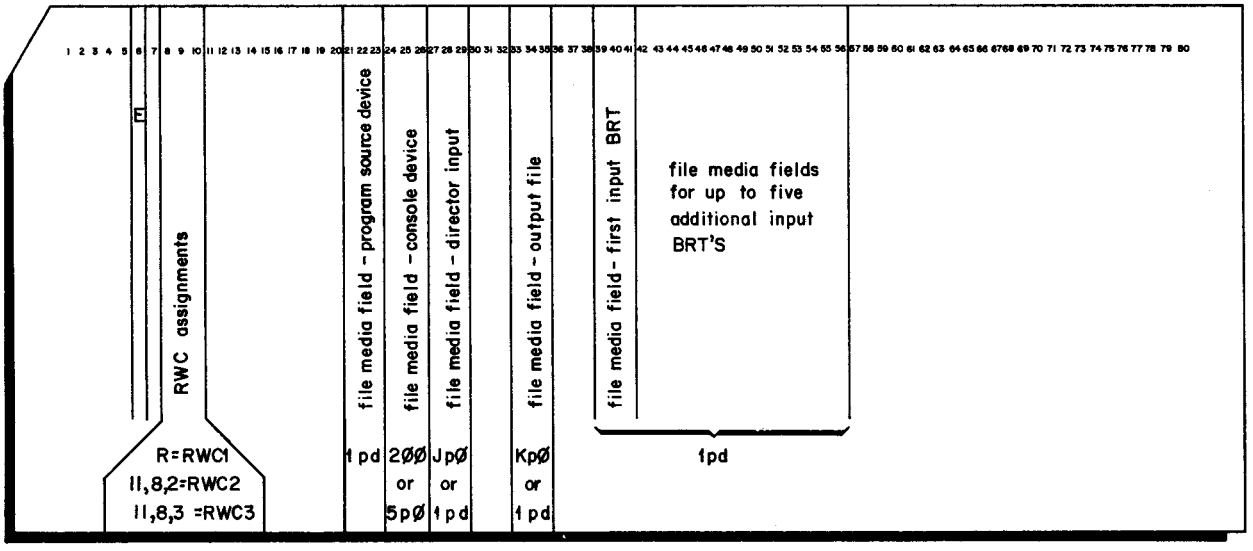


Figure 3-2. Full ECD Card for BRT Punch C

Column 8: Contains the RWC designation for BRT input, punched in the following code.

R (51_8) = RWC1
11, 8, 2 (52_8) = RWC2
11, 8, 3 (53_8) = RWC3

NOTE: When BRT Punch C is run as a background program in conjunction with Interrupt Control D, one RWC must be reserved for the foreground program. For a processor with three RWC's, the same RWC code should appear in two columns. The third RWC will be free for the foreground program.

Column 9: Contains the RWC designation for the conversion output, punched in the same code as for column 8.

Column 10: Contains the RWC designation for the director file input, punched in the same code as for column 8.

Columns 11-20: Not used.

Columns 21-80: Contain the file media fields, which designate the equipment configurations to be used. The file media fields are made up of three columns each. These three columns, in turn, contain three characters which completely specify the device to be used. The contents of each of the fields is listed in Table 3-5.

Table 3-5. Format for BRT Punch C File Media Fields

Columns	Designate	First Character Device Type[1]	Second Character Peripheral Address[2]	Third Character Tape Drive[3]
21-23	Program tape	1	p	d
24-26	Console device	2 or 5	0 or p	0
27-29	Card reading device[4]	J, R, or 1	p	0 or d
30-32	Not used			
33-35	Card output device[4]	K, S, or 1	p	0 or d
36-38	Not used			
39-41	First input BRT	1	p	d
42-44	Second input BRT	1	p	d
45-47	Third input BRT	1	p	d
48-50	Fourth input BRT	1	p	d
51-53	Fifth input BRT	1	p	d
54-56	Sixth input BRT	1	p	d
57-80	Not used			

[1]The first character specifies the device. The symbol for each device is as follows:

Symbol	Octal Code	Device
Δ	15	File absent
0	00	Unspecified
1	01	Type 204B Magnetic Tape Unit
2	02	Control panel
5	05	Type 220 Console
J	41	Type 227 Card Reader
K	42	Type 227 Card Punch
R	51	Type 123 Card Reader attached to Model 120 integrated control unit (or Type 214-2, 224-2 Card Reader/Punch attached to Model 120 integrated control unit and used only as a card reader).
S	62	Type 214-1 Card Punch attached to Model 120 integrated control unit (or Type 214-2, 224-2 Card Reader/Punch attached to Model 120 integrated control unit and used only as a punch)

[2]The second character specifies the peripheral control address and the input/output sector to which the peripheral control is connected. This is control character C2 of the PDT instruction. The six bits of this character ($V_6 V_5 V_4 V_3 V_2 V_1$) are used as follows.

a. Bit V_6 is the I/O bit. For tape files, this bit is set by BRT Punch C; for all other files, this bit must be set correctly in the character as it is punched in the card.

Table 3-5 (cont). Format for BRT Punch C File Media Fields

b. Bits V_5V_4 specify the I/O sector. These bits are 00 to indicate the first I/O sector and 10 to indicate the second I/O sector. I/O sector bits are meaningful only if the machine configuration includes Feature 1115 (Second Input/Output Sector for the Type 2201 Central Processor).

c. Bits $V_3V_2V_1$ specify the peripheral control address. If this character specifies an address in the second I/O sector, a second I/O sector RWC will be activated. This second I/O sector RWC is the counterpart of the first I/O sector RWC that appeared in the applicable RWC column of the ECD. (RWC's 1, 2, and 3 have as their second I/O sector counterparts RWC's 4, 5, and 6 respectively.) As an example, given a machine configuration having Feature 1115, assume that a programmer decides to assign the first input BRT to the second I/O sector. Bits V_5V_4 of the second character of the applicable file media field must contain 10 and bits $V_3V_2V_1$ must be a valid second I/O sector peripheral control address. The RWC value that BRT Punch C assigns to read the first input BRT would then be modified to reflect a second I/O sector RWC; e.g., if RWC2 was specified, then RWC5 will be activated.

[3] The third character specifies the number of the tape drive to be used. This is the low-order octal digit of control character C3 of the PDT machine instruction. For devices other than tape drives, this character is usually 0.

[4] If the card reading and card punching equipment is a combination Type 214-2 or 224-2 Card Reader/Punch either the card input device or the card output device must be specified as a Type 204B Magnetic Tape.

Sample Full ECD Card

A sample ECD card is illustrated in Figure 3-3 for a run in which the following occurs:

1. Positional BRT number 1 contains both input to BRT Punch C and the program itself. This tape is mounted on drive 0 of tape control 40_8.
2. A second input BRT is mounted on drive 1.
3. The BRT's use RWC1.
4. The director deck is read from the card reader, which uses RWC2. The address of the card reader control is 41_8.
5. The BRT-format card deck is punched using RWC3. The address of the card punch control is 01_8.

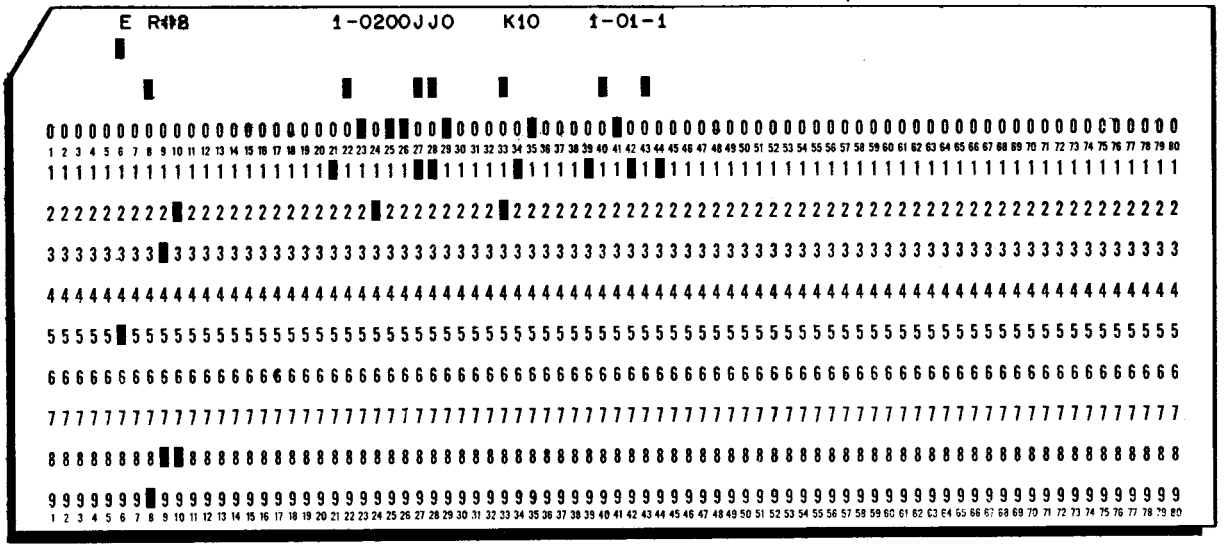


Figure 3-3. Sample Full ECD Card

SYSTEM HEADER CARD

The system header card is punched as described below and illustrated in Figure 3-4.

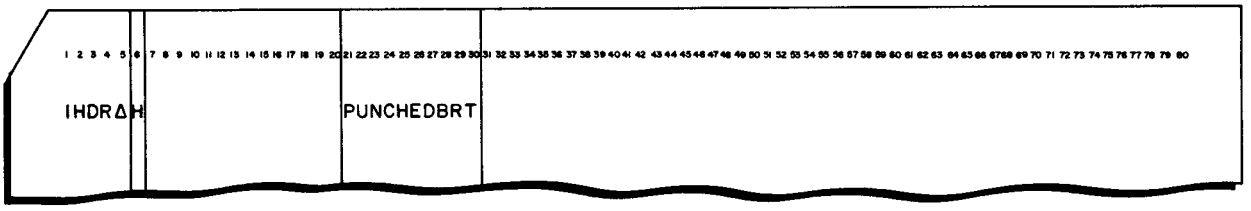


Figure 3-4. System Header Card for BRT Punch C

Columns 1-5: Contain 1HDRΔ

Column 6: Contains the letter H

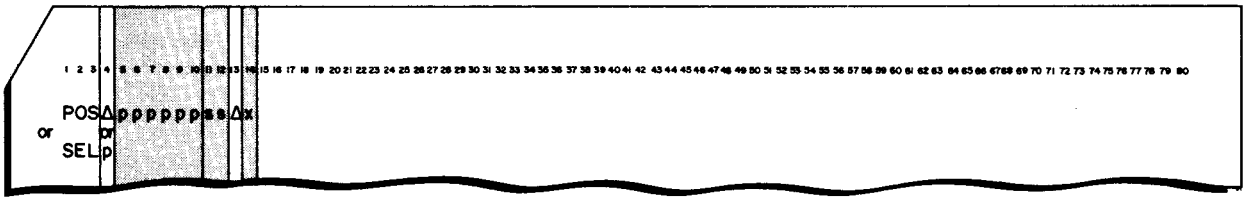
Columns 7-20: Not Used

Columns 21-30: Contain PUNCHEDBRT

Columns 31-80: Not Used

ACTION DIRECTOR CARD

The format and functions of the action director card are described below and illustrated in Figure 3-5.



NOTE: Shaded columns are punched with variable information. Unshaded columns are punched literally as shown.

Figure 3-5. Action Director Card

Columns 1-3: Contain the action code:

POS - POSition

SEL - SELect

The POSition action code causes the BRT to be positioned at the end of the loading unit named in columns 5-12 of the action director card. As will be apparent in the continuing description of the action director card, BRT Punch C identifies loading units by program and segment names only. Hence loading units with the same program and segment names but different visibilities (i.e., different versions of the same loading unit) are equivalent to BRT Punch C. The POSition director enables the input BRT to be positioned past an unwanted loading unit, so that a desired loading unit of the same name may be converted to cards. One POSition director is required for each of the identically named units to be bypassed. Note that when the POSition director is used, it is important for the programmer to know the order of identically named units on the BRT. In order to bypass identi-

cally named programs which immediately follow each other on the BRT, columns 4 and 11-12 of the POSition director must contain a blank and the name of the final segment to be bypassed, respectively (see below). The examples below illustrate the use of the POSition director.

The SELect action code causes the loading unit named in columns 5-12 of the action director to be converted from BRT records to BRT-format cards.

Column 4: Contains a blank if a single segment is to be processed; contains the letter P if an entire program is to be processed. This option allows a multisegment program to be processed as the result of one action director card.

NOTE: The prerequisite for processing on a program basis is that all the segments of a program are contiguous on the BRT. If the segments of a program are not contiguous, they must be processed on an individual basis.

The examples below illustrate processing on both a program and segment basis.

Columns 5-10: Contain the program name, left-justified.

Columns 11-12: Contain the segment name, if column 4 is blank. The segment name must also be left-justified. These columns are not used if column 4 contains a P.

Column 13: Not Used

Column 14: Contains the positional number of the BRT on which the loading unit named in this action director is located. The positional number may range from 1 to 6, as described in the section on the ECD card.

Columns 15-80: Not Used

Examples of the Use of Action Directors

EXAMPLE 1 (FIGURE 3-6)

The first input BRT contains three programs named INTGRL, each composed of segments S1 and S2. The first program has visibility A, the second visibility B, and the third visibility C. Convert the program named INTGRL with visbility C to punched cards.

EXAMPLE 2 (FIGURE 3-7)

The first input BRT contains three loading units. The first unit is segment S1 of TESTER, a two-segment program. The second unit is segment S2 of TESTER, having visibility A. The third unit is another version of segment S2, having visibility B. Punch on BRT-format cards a version of program TESTER comprising segment S1 and the segment S2 which has visibility B.

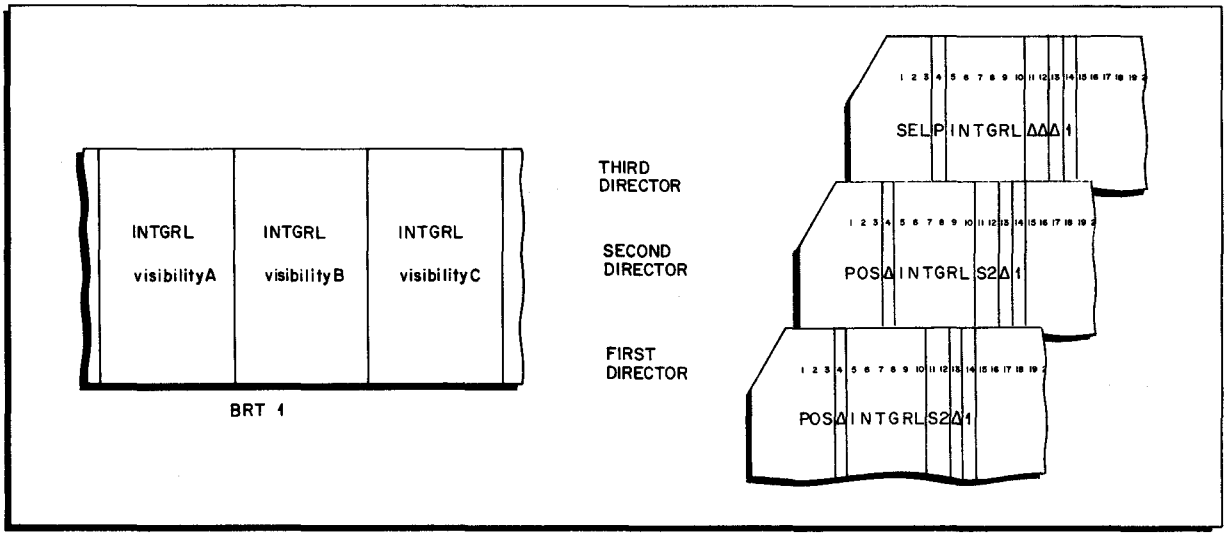


Figure 3-6. Use of Action Directors — Example 1

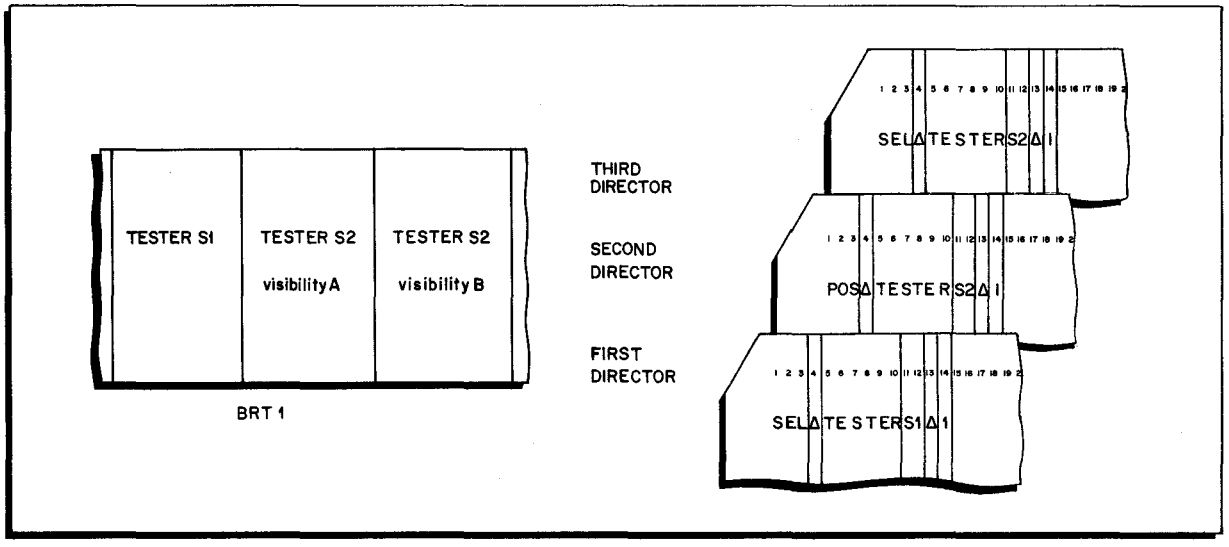


Figure 3-7. Use of Action Directors — Example 2

DIRECTOR FILE TRAILER CARD

The director file must end with a trailer card, punched 1EOFΔ in columns 1-5. The trailer card is illustrated in Figure 3-8.

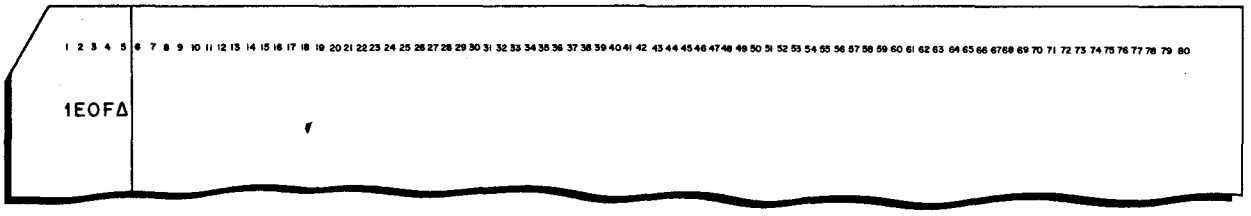


Figure 3-8. Director File Trailer Card

SECTION IV
OPERATING PROCEDURES

The BRT Punch C program, which has the loading unit name AAAPUNCH, can be loaded from (1) a binary card deck using Card Loader-Monitor B, (2) a binary run tape (BRT) using either Tape Loader-Monitor C or Floating Tape Loader-Monitor C, or (3) a drum storage unit using Drum Monitor C. Both the card and tape loading methods are described in this section. The procedures to be followed when using the drum can be found in the bulletin PLUS Drum Monitor, DSI-408.

LOADING WITH CARD LOADER-MONITOR B

The procedures for setting up the various peripheral devices are described below. Note that in all cases the devices must be set up according to the values specified on the Equipment Configuration Descriptor.

1. Mount the BRT containing the program(s) to be punched on logical tape drive 2 if using a standard Equipment Configuration Descriptor or on the drive(s) indicated by the full ECD card ("protect" status). If a punch-image magnetic tape is desired as output, another tape must be mounted on the appropriate drive and in "permit" status.
2. Place the self-loading deck containing Card Loader-Monitor B into the card reader. Place the BRT Punch C program and any input cards into the card reader immediately after the Loader-Monitor.
3. Initialize the card reader and card punch.
4. Press the INITIALIZE button. (This action causes the resetting and/or clearing of the central processor registers necessary for the operation.)

Following these initial setup procedures, the Loader-Monitor is bootstrapped and used to load BRT Punch C, as described in the software manual Card Loader-Monitor B, Order No. 154.

LOADING WITH TAPE LOADER-MONITOR C OR FLOATING TAPE LOADER-MONITOR C

If Tape Loader-Monitor C or Floating Tape Loader-Monitor C is used, it is located on a binary run tape (BRT). The procedures for setting up the various peripheral devices are described below. Note that in all cases the devices must be set up according to the values specified by the Equipment Configuration Descriptor.

1. Mount the program tape (PT) on the tape drive designated as logical 0 ("protect").
2. Mount the BRT containing the program(s) to be punched on logical tape drive 2 ("protect") if using a standard Equipment Configuration Descriptor.

If using a full ECD, mount it on the drive(s) as indicated by the Equipment Configuration Descriptor.

NOTE: If a punch-image magnetic tape is desired as output, another tape must be mounted on the appropriate drive and in "permit" status.

3. If cards are to be read, they should be placed in the card reader at this time. The card reader and the card punch should be initialized.

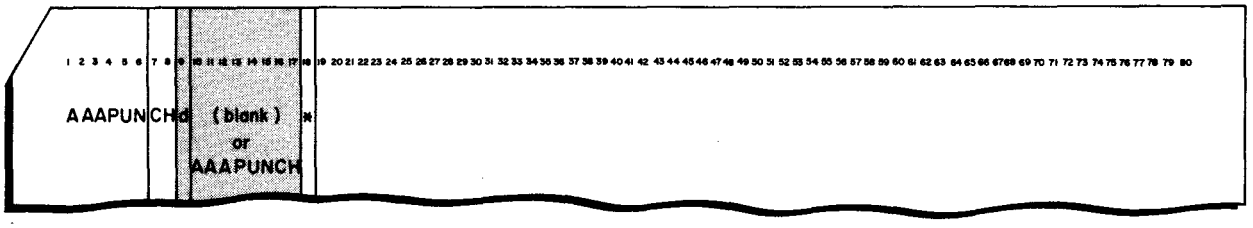
   If the Console Call information has been punched on a card (as described below), this card should be placed in the card reader immediately preceding the Equipment Configuration Descriptor card. If an ECD card is not used, the Console Call card should immediately precede the system header card.

4. Press the INITIALIZE button. (This action causes the resetting and/or clearing of the central processor registers necessary for the operations.)

Following these initial setup procedures, the Loader-Monitor is bootstrapped and used to load BRT Punch C, as described in the manuals Tape Loader-Monitor C, Order No. 221 and Floating Tape Loader-Monitor C and Interrupt Control D, Order No. 005.

Console Call Card

The BRT Punch C Console Call Card is described below and illustrated in Figure 4-1. Note that the contents of this card may optionally be entered from the control panel or console typewriter.



NOTE: Shaded columns are punched with variable information. Unshaded columns are punched literally as shown.

Figure 4-1. Console Call Card for BRT Punch C

Columns 1-6: Contain the program name - AAAPUN

Columns 7-8: Contain the segment name - CH

Column 9: Contains the logical number of the drive on which the BRT containing the program is mounted (usually drive 0).

Columns 10-17: May contain the program and segment names (AAAPUNCH) to cause a halt after BRT Punch C is loaded. Otherwise, these columns are blank.

Column 18: Contains an asterisk to identify the Console Call card.

Columns 19-80: Not Used

ERROR CONDITIONS

For all halts, the B-address register (which indicates the reason for the halt) should be displayed first. In some cases, the A-address register contains supplementary information. The BRT Punch C error conditions are listed in Table 4-1.

If the BRT Punch C program is using the control panel, the following conditions occur:

1. BRT Punch C halts.
2. Displaying the B address gives the reason for the halt.
3. If the run is to be continued, the RUN button is pressed.

If the BRT Punch C program is using the console typewriter, the following conditions occur:

1. The console warning bell rings.
2. The error message is typed.
3. The TYPE light is illuminated.
4. BRT Punch C stalls.
5. If the run is to be continued, the G key is pressed.

Table 4-1. BRT Punch C Error Conditions

Contents of B-Address Register	Console Typewriter Message	Cause and Action
07025	: NO E CARD ⌑	The card image that has been specified as the ECD does not contain an E in character 6. 1. If the ECD is to be entered through the input device specified in the ECD field of the Loader communication area, ascertain that the desired ECD is in the input device and continue the run. 2. If the ECD is not to be entered through the input device specified in the ECD field of the Loader communication area, the ECD field (locations 227 - 232_8) may be changed to: a. Accept the ECD from a different device or b. Select one of the ten standard equipment configurations Continue the run.
04201	: ILLEGAL ACTION ⌑	The action code on an action director card is invalid. 1. If the director file is on cards, correct the card and refeed, continuing the run. 2. If the director file is a card image tape, continue the run to bypass the director.

Table 4-1 (cont). BRT Punch C Error Conditions

Contents of B-Address Register	Console Typewriter Message	Cause and Action
04202	: ILLEGAL ECD ␣	On the ECD card, either (1) the same file media field (control unit and drive number) has been specified for an input BRT and the directors; (2) the same file media field has been specified for an input BRT and the output tape; or (3) one or more file media fields are missing. Supply a correct ECD or enter new ECD control parameters in locations $227\text{-}232_8$ to select one of the ten standard equipment configurations. Continue the run.
04204	: ILLEGAL FMF DESIGNATOR ␣	The positional BRT number in column 14 of an action director is invalid. 1. If the director file is on cards, correct the card and refeed. Continue the run. 2. If the director file is on a card-image tape, continue the run to bypass this director.
04005	: PROG ppppppss NOT FOUND ␣ pppppp = program name ss = segment name	The unit requested to be processed is not on BRT specified by current director. Continue the run to bypass this director.
0401d	: TAPE d NOT A BRT ␣	The tape on logical drive number "d" is not a BRT. Replace the tape with a valid BRT and continue the run.
0cu1d	: RD ER cu d ␣	If "cu" is the number of a tape control, an uncorrectable read error has occurred on tape "d" of that control. 1. If "cu" and "d" represent a BRT input tape, continue the run to retry the read. If the error remains uncorrectable, remove the directors referencing control unit "cu," drive "d" from the director file and restart the run. 2. If "cu" and "d" represent a card-image director file tape, continue the run to retry the read. If the error remains uncorrectable, recreate the tape and restart the run.
0cu11	: RD ER cu 1 ␣	If "cu" is the control unit number for the card reader, a hole-count error has occurred. Reload the director deck, beginning with the ejected card. Continue the run.
0cu12	: RD ER cu 2 ␣	If "cu" is the control unit number for the card reader, an illegal punch has been detected.

Table 4-1 (cont). BRT Punch C Error Conditions

Contents of B-Address Register	Console Typewriter Message	Cause and Action
0cu12 (cont)	: RD ER cu 2 ⊓	Correct the ejected card and reload the director deck beginning with the corrected card. Continue the run.
0cu2d	: WR ER cu d ⊓	If "cu" is the number of a tape control unit, an uncorrectable write error has occurred on tape "d" of that control unit. Continue the run to retry the write.
0cu21	: WR ER cu 1 ⊓	If "cu" is the number of the card punch control unit, a hole count error has been detected during punching. Discard the ejected cards and restart the punch. Continue the run.

APPENDIX A

PROCEDURE FOR CHANGING STANDARD EQUIPMENT CONFIGURATIONS

The standard equipment configurations have been designed to accommodate the majority of users. However, it is understood that there will be occasions when it becomes desirable to change them. For example, they must be changed to allow BRT Punch C to accept a card-image input tape or to type messages on the console.

Each of the ten standard configurations is represented in a segment of BRT Punch C by an 80-character ECD area. The contents of this area correspond exactly to the ECD card image described in Section II as method #3 (full ECD). The leftmost character of each ECD area is tagged ECDn, where n is the number of the standard configuration corresponding to that ECD image. Figure A-1 illustrates the ECD areas for all ten standard BRT Punch C configurations.

1. To allow BRT Punch C, or any system program, to use a console typewriter, change the console device field of each ECD area to:

   DC @ 5u0 @ CONSOLE DEVICE

   where u is the address of the typewriter control.

2. To allow input to be read from a card-image input tape, change the Card Input Device field to:

   DC @ 1u0 @ CARD INPUT DEVICE

   where u is the address of the tape control.

EASYCODER
CODING FORM

PROBLEM _____ PROGRAMMER _____ DATE _____ PAGE ____ OF ____

CARD NUMBER (1 2 3 4 5)	TYPE (6)	MARK (7)	LOCATION (8–14)	OPERATION CODE (15–20)	OPERANDS (21–62)	(63–80)
1			ΔECD7	DC	@ΔΔΔΔΔEΔ@	
2				DC	#3C515253 RWC ASSIGNMENT	
3				DC	@ΔΔΔΔΔØØΔ@	
4				DC	@ØØ2@ HIGHEST BANK AVAILABLE	
5				DC	@1ØØ@ LOADING DEVICE	
6				DC	@2ØØ@ CONSOLE DEVICE	
7				DC	@JJØ@ CARD INPUT DEVICE	
8				DC	@ΔΔΔ@ NOT USED	
9				DC	@K1Ø@ CARD OUTPUT DEVICE	
10				DC	@ΔΔΔ@ FILE 1: NOT USED	
11				DC	@1Ø7@ FILE 2: INPUT BRT	
12				DC	@ΔΔΔ@ FILE 3: NOT USED	
13				DC	@ΔΔΔ@ FILE 4: NOT USED	
14				DC	@ΔΔΔ@ FILE 5: NOT USED	
15				DC	@ΔΔΔΔ FILE 6: NOT USED	
16				DC	@ΔΔΔΔ FILE 7: NOT USED	
17				DC	@ΔΔΔ@ FILE 8: NOT USED	
18				RESV, 2Ø		
19			L	DCW #1CØØ		

Figure A-1. Coding for BRT Punch C Standard Configurations 0-9

HONEYWELL EDP TECHNICAL PUBLICATIONS
USERS' REMARKS FORM

TITLE: SERIES 200
BRT PUNCH C
SOFTWARE MANUAL

DATED: JUNE, 1966

FILE NO: 123.3505.001C.1-020

ERRORS NOTED:

Fold

SUGGESTIONS FOR IMPROVEMENT:

Fold

FROM: NAME _____ DATE _____

COMPANY _____

TITLE _____

ADDRESS _____

_____

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