HONEYWELL EDP

HARDWARE BULLETIN

SERIES 200

TYPE 281-1 SINGLE-CHANNEL COMMUNICATION CONTROLS

SUBJECT: Equipment Specifications for the Honeywell Type 281-1 Single-Channel Communication Controls.

SPECIAL INSTRUCTIONS: This bulletin supersedes the Honeywell Customer Information Bulletin No. 200-32, dated October 23, 1964. The references used in this text are the Honeywell Series 200 Models 200/1200/2200 Programmers' Reference Manual, File No. 113.0005.0000.00.00, and the Honeywell Series 200 Model 120 Programmers' Reference Manual, Order No. 141.

DATE: April 22, 1966

FILE NO. 112.0005.1100.0-086*

*When ordering this publication please specify Title and Underscored portion of File Number.

8890
5466
Printed in U.S.A.

TABLE OF CONTENTS

		Page
I.	GENERAL DESCRIPTION	1
II.	CENTRAL PROCESSOR INSTRUCTIONS TO THE TYPE 281-1	1
	A. Peripheral Data Transfer (PDT) Instruction	1
	B. Peripheral Control and Branch Instruction	2
III.	PROGRAMMING REFERENCE INFORMATION	4
	A. General	4
	B. Initial Start and Standby	5
	C. Reception of Data	5
	D. Transmission of Data	6
	E. Record Marks Required in Memory	7
	1. Single-Character Mode	7
	2. Message Mode	7
	F. Program-Initiated Disconnect or Remote Motor Start	7

LIST OF TABLES

Table I.	Type 281-1 Communication Controls	3
Table II.	Type 281-1 PCB Control Characters	4

Copyright 1966
Honeywell, Inc.
Electronic Data Processing Division
Wellesley Hills, Massachusetts 02181

THE TYPE 281-1 SINGLE-CHANNEL COMMUNICATION CONTROLS

I. GENERAL DESCRIPTION

The Type 281-1 Communication Controls are designed to link Series 200 central processors to a variety of remote input/output devices characterized by start-stop, asynchronous serial transmission (in the case of the Type 121 Central Processor, operation with the Type 281-1 requires the presence of Feature 1015 or 1016, as described in the Model 120 Programmers' Reference Manual). Such interconnection is accomplished by means of specific common carrier datasets and/or transmission services. Differences in type of line service, transmission speed, and terminal equipment are indicated by a letter suffix on the type number. The available units are listed in Table I, page 3.

Despite the differences suggested by the letter suffixes, all Type 281-1's operate in basically the same fashion with respect to the central processor. In fact, from a programming standpoint, little difference exists in their operation except in the areas of timing and specific transmission codes. This bulletin sets forth general programming information applicable to all Type 281-1's, regardless of letter suffix. Other hardware bulletins detailing specifications for the individual communication controls refer to the information contained herein and establish any areas in which the performance of the individual control differs.

II. CENTRAL PROCESSOR INSTRUCTIONS TO THE TYPE 281-1

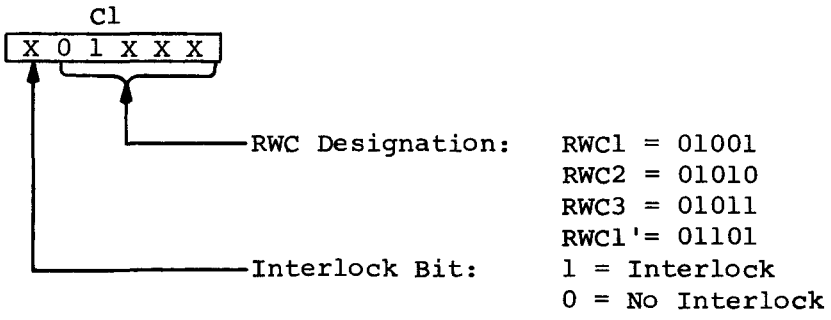
Peripheral Data Transfer (PDT) and Peripheral Control and Branch (PCB) instructions are used to direct the activity of the Type 281-1. These PDT and PCB instructions are described in the Models 200/1200/2200 and Model 120 Programmers' Reference Manuals.

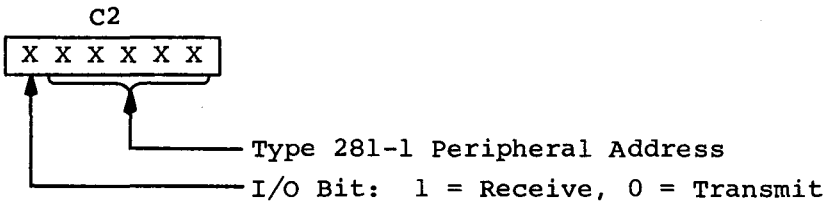
A. Peripheral Data Transfer (PDT) Instruction

Peripheral Data Transfer instructions are used to transfer data between the central processor and the Type 281-1. The format of the PDT instruction is:

Op Code A Address C1 C2

The A address contains the address of the main memory location to or from which data is to be transferred. The significance of control characters C1 and C2 is detailed as follows:





The PDT input instruction (input/output bit = 1) is defined as follows: Move data from the Type 281-1 to memory locations A, A+1,.....A+n, until a record mark is encountered.

The PDT output instruction (input/output bit = 0) is defined thus: Move data to the Type 281-1 from memory locations A, A+1,.....A+n, until a record mark is encountered.

B. Peripheral Control and Branch (PCB) Instruction

The test and control functions performed by the PCB instruction are defined by control character C3. The format of the instruction is:

Op Code A Address C1 C2 C3

In the test PCB instruction, the program branches to the location specified by the A address if the condition tested for is true; otherwise, it continues in sequence. In control PCB instructions, the A address is immaterial.

The significance of control characters C1 and C2 is shown below:

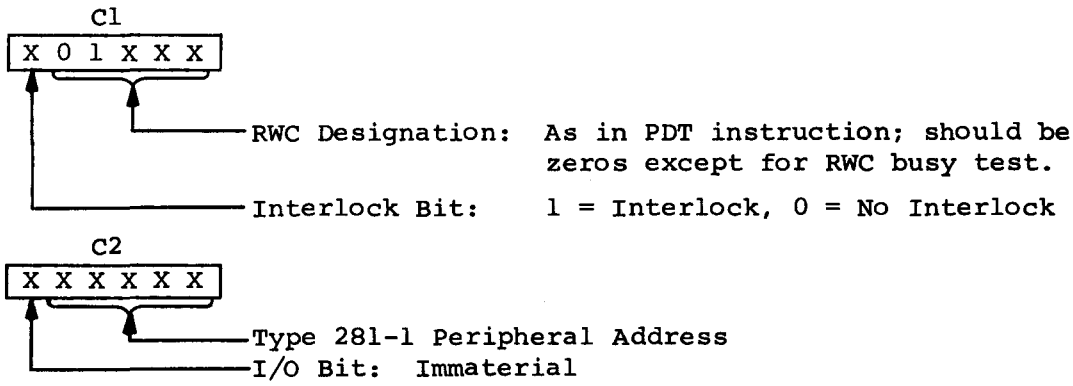


Table I. Type 281-1 Communication Controls

TYPE	SERVICE & LINE	DATASET (2)	SPEED	TERMINALS	NOTES
281-1A	W.U. Telex	Associated W.U. Telex Subscriber Station	66 wpm	W.U. Telex Subscriber Stations	Manual Dial
281-1B	TWX-CE or Tel. Co. DDD	103A	100 wpm	TTY 33 or 35	(1)
281-1C	5-Level Teleprinter	TTY Circuit	60,66,75 or 100 wpm	TTY 15,19, or 28	Private Line
281-1D	Tel.Co. 150-Baud Line or W.U. 180-Baud Line	103F/ 1181.1A	100 wpm	TTY 33 or 35	Private Line
281-1E	TWX-CE or Tel. Co. DDD	103A	14.8 cps	IBM 1050	(1)
281-1G	W.U. Telex	Associated W.U. Telex Subscriber Station	66 wpm	W.U.Telex Subscriber Stations	Automatic Dial
281-1H	Tel.Co. DDD or Voice-Grade Private Line	202C,202D	105 cps	Dataspeed 2	(1)
281-1K	Tel.Co. 150-Baud Line Voice-Grade Private Line, or W.U. 180-Baud Line	Tel. Co. 103F/ W.U. 1181.1	14.8 cps	IBM 1050 or 1030	Private Line
281-1M	Tel.Co. DDD or Voice-Grade Private Line	202C/202D	120 cps	Honeywell Data Station	(1)

NOTE (1)

When the Type 281-1 is connected to the remote terminal via DDD, TWX or TWX-CE, the calls may be originated by manual dialing or automatic computer control and operation is by means of an associated Type 285-5A Communication Adapter Unit plus a Bell Automatic Calling Unit 801A or 801C.

NOTE (2)

Unless otherwise specified, dataset designations refer to Bell DATA-PHONE Datasets or their equivalent.

Unless a test is being performed for RWC busy, the value of the RWC bits in C1 is zero. If one wishes only to test for RWC busy, control characters C2 and C3 are not necessary. The value of the I/O bit is immaterial in PCB instructions addressed to the Type 281-1.

The test and control functions defined by control character C3 are summarized in Table II, below.

Table II. Type 281-1 PCB Control Parameters

Type of Function	Control Character C3 (octal)	Action
Busy Test	10	Branch to A if the Type 281-1 is busy.
Device Error Test	50	Branch to A if an error other than parity (e.g., lost information) occurred.
Output Request	60	Branch to A if the Type 281-1 is in the transmit mode and requesting data for transmission onto the line.
Input Request	61	Branch to A if the Type 281-1 is in the receive mode and requesting the central processor to take received data.
Interrupt	75	Branch to A if the Allow and Interrupt conditions are both set.
Inhibit Interrupt	70	Stops the Type 281-1 from interrupting the central processor.
Allow Interrupt	71	Permits the Type 281-1 to interrupt the central processor.
Reset Interrupt	74	Resets the interrupt condition.
Note that the last four functions have significance only if the program interrupt capability is present.		

III. PROGRAMMING REFERENCE INFORMATION

A. General

The Type 281-1 handles data on either a single-character or a message basis. Since message-mode transmission allows the Type 281-1 to handle more data with less manipulation and fewer program interruptions than single-character operation, message-mode transmission is essential with very high-speed lines and often convenient with lower-speed lines, particularly when communication is sharing computer time with other processing. In either mode, a record

mark in the main memory data storage area is required to terminate data transfer and to release the RWC involved.

Although the program interrupt capability is not required for operation in either mode, its presence (standard in all Series 200 central processors except the Type 201) facilitates concurrent operation of data communication and data processing. In the sections which follow, it is assumed that the system includes the program interrupt capability.

B. Initial Start and Standby Condition

Following application of power to the system, the Type 281-1 must be "initialized" by depressing the INITIALIZE button at the central processor. Unless transmitting or receiving, the Type 281-1 is normally in a "neutral" state (i.e., it permits the program to transmit onto the line but also interrupts the program if a character is received from the line).

If no characters are received from the line for a half-character period, the Type 281-1 interrupts the program with an output request. Thus, if characters are being received at less than a two-thirds line rate - as, for example, during manual keyboard operation - there may be two interrupts per character. Therefore, the use of "Input Request" and "Output Request" PCB instructions before the issuance of corresponding PDT instructions is highly recommended. When an "Input" PDT instruction is attempted while an "Output Request" PCB instruction is in effect or when an "Output" PDT instruction is attempted while an "Input Request" PCB instruction is in effect, the resulting action of the Type 281-1 is unspecified.

In the event that the expected request is not satisfied, program recovery can be accomplished in several ways. If an output request is encountered when the program expects input data, the programmer may reset the interrupt - when available - or simply await a subsequent input request before initiating a PDT instruction. When an input request is present and the program desires to transmit, the program must perform an "Input" PDT instruction to clear the Type 281-1 (the input request probably having been caused by noise on the line), discarding the data received by the central processor. The program must wait until the next output request before transmitting to the Type 281-1.

C. Reception of Data

The Type 281-1 becomes busy when it receives the start bit of the first character from the line. It remains busy until all bits of the character are accumulated. When the first full character is received - provided an "Allow Interrupt" PCB instruction has been executed - a program interrupt occurs. The Allow condition stays set until specifically reset by an Inhibit Interrupt instruction or by depression of the Initialize button at the central processor.

The program must respond to the interrupt with an "Input" PDT instruction to bring this character (and succeeding characters in the block, or message, mode) into the assigned area in main memory. Reception continues until a record mark is encountered in memory; at this point, the read/write channel is released. In the message mode, if more than one character is received, the interrupt occurs only after reception of the first character. Thereafter, the Type 281-1 has continuous access to the central processor by way of the assigned read/write channel until the record mark is encountered.

If no characters are received for half a character period after the record mark has been encountered, the Type 281-1 reverts to not busy and an interrupt requesting output occurs when the Allow function is set. This interrupt - identified by a positive response to the "Output Request" PCB instruction - may be used by the programmer to indicate the end of a received message.

In cases where the received message is shorter than the assigned memory area, the record mark terminating data transfer is not encountered. When the format of fixed-length messages contains a discrete end-of-message character, the receive program should accept the last few characters of the message in character mode, thereby enabling recognition of the terminating character. Variable-length messages normally include a discrete end-of-message character, and the Type 281-1 should be programmed to receive such messages in character mode, enabling program recognition of the end of message.

If reception stops before a record mark is encountered, a 30-second timer is activated. Should the timer be allowed to "time-out" before further data is received, the assigned read/write channel is released, the Device Error function is set, and the Type 281-1 reverts to its normal, not-busy state. An output request causing an interrupt then occurs if the Allow function is set. When the optional 30-second "no-op" disconnect feature is present, the line is released without an output request or interrupt and a new call must be placed.

D. Transmission of Data

Starting from the "initialize" condition (interrupts not allowed), data transmission is initiated by executing an "Allow Interrupt" PCB instruction followed by a "Transmit" PDT instruction to begin transmission of data from the central processor.

Data is transferred from the specified memory location until a record mark is encountered; at this point the read/write channel is released. An interrupt occurs after the last character goes onto the line. A second PDT instruction may then be given to continue data transmission or, if transmission is complete, a "Reset Interrupt" PCB instruction may acknowledge receipt of that interrupt and indicate that no more data is to be sent. In the latter case, an interrupt next occurs if data is received. Alternately, an "Inhibit Interrupt" PCB instruction could prevent any

interrupt from the Type 281-1.

E. Record Marks Required in Memory

1. Single-Character Mode

When data is transmitted in the single-character mode, a record mark must be placed in memory location A+1 to terminate a character. When data is received in this mode, a record mark is required in location A to indicate character termination. At termination, the RWC current location counter contains the address A+1 after either transmission or reception.

2. Message Mode

When data is transmitted in the message - or block - mode, a record mark is required in memory location A+n (where n is the number of characters in the message) to terminate the message transmission. When data is received in this mode, the record mark must be placed in memory location A+(n-1) to terminate the message. At termination, the read/write channel current location counter contains the address A+n after either transmission or reception.

F. Program-Initiated Disconnect or Remote Motor Start

A PDT instruction issued to a single-character field[1] will cause a Type 281-1 operating on switched-service lines to perform a program-initiated interrupt or remote motor start. The PDT instruction requires a C3 control character of 01. The contents of the A field could be the last character to be transmitted[2] in the case of a program-initiated disconnect, or the first character of the message in the case of a remote motor start.

[1]With terminal devices using seven-level and eight-level codes, this field is two Series 200 six-bit characters.

[2]For the Type 281-1A, the A field must contain the character 00.

BRANCH INSTRUCTION
PERIPHERAL CONTROL AND BRANCH INSTRUCTION, 2
CENTRAL PROCESSOR INSTRUCTIONS TO THE TYPE 281-1, 1
CHARACTERS
TYPE 281-1 PCB CONTROL CHARACTERS, 4
COMMUNICATION CONTROLS
TYPE 281-1 COMMUNICATION CONTROLS, 3
CONTROL
" CHARACTERS,
TYPE 281-1 PCB CONTROL CHARACTERS, 4
PERIPHERAL CONTROL AND BRANCH INSTRUCTION, 2
TYPE 281-1 COMMUNICATION CONTROLS, 3
DATA
RECEPTION OF DATA, 5
" TRANSFER,
PERIPHERAL DATA TRANSFER (PDT) INSTRUCTION, 1
TRANSMISSION OF DATA, 6
DESCRIPTION
GENERAL DESCRIPTION, 1
DISCONNECT
PROGRAM-INITIATED DISCONNECT OR REMOTE MOTOR START, 7
GENERAL, 4
" DESCRIPTION, 1
INFORMATION
PROGRAMMING REFERENCE INFORMATION, 4
INITIAL START AND STANDBY, 5
INSTRUCTION
BRANCH INSTRUCTION,
PERIPHERAL CONTROL AND BRANCH INSTRUCTION, 2
CENTRAL PROCESSOR INSTRUCTIONS TO THE TYPE 281-1, 1
PERIPHERAL DATA TRANSFER (PDT) INSTRUCTION, 1
MARKS
RECORD MARKS REQUIRED IN MEMORY, 7
MEMORY
RECORD MARKS REQUIRED IN MEMORY, 7
MESSAGE MODE, 7
MODE
MESSAGE MODE, 7
SINGLE-CHARACTER MODE, 7
MOTOR START
PROGRAM-INITIATED DISCONNECT OR REMOTE MOTOR START, 7
PCB CONTROL CHARACTERS
TYPE 281-1 PCB CONTROL CHARACTERS, 4
PDT
PERIPHERAL DATA TRANSFER (PDT) INSTRUCTION, 1
PERIPHERAL
" CONTROL AND BRANCH INSTRUCTION, 2
" DATA TRANSFER (PDT) INSTRUCTION, 1
PROCESSOR INSTRUCTIONS
CENTRAL PROCESSOR INSTRUCTIONS TO THE TYPE 281-1, 1
PROGRAM-INITIATED DISCONNECT OR REMOTE MOTOR START, 7
PROGRAMMING REFERENCE INFORMATION, 4
RECEPTION OF DATA, 5
RECORD MARKS REQUIRED IN MEMORY, 7
REFERENCE INFORMATION
PROGRAMMING REFERENCE INFORMATION, 4
REMOTE MOTOR START
PROGRAM-INITIATED DISCONNECT OR REMOTE MOTOR START, 7
SINGLE-CHARACTER MODE, 7
STANDBY
INITIAL START AND STANDBY, 5
START
INITIAL START AND STANDBY, 5
REMOTE MOTOR START,
PROGRAM-INITIATED DISCONNECT OR REMOTE MOTOR START, 7
TRANSFER
PERIPHERAL DATA TRANSFER (PDT) INSTRUCTION, 1
TRANSMISSION OF DATA, 6
TYPE 281-1
CENTRAL PROCESSOR INSTRUCTIONS TO THE TYPE 281-1, 1
" COMMUNICATION CONTROLS, 3
" PCB CONTROL CHARACTERS, 4
281-1
" COMMUNICATION CONTROLS,
TYPE 281-1 COMMUNICATION CONTROLS, 3
" PCB CONTROL CHARACTERS,
TYPE 281-1 PCB CONTROL CHARACTERS, 4
TYPE 281-1,
CENTRAL PROCESSOR INSTRUCTIONS TO THE TYPE 281-1, 1

HONEYWELL EDP TECHNICAL PUBLICATIONS
USERS' REMARKS FORM

TITLE: SERIES 200
Type 281-1 Single-Channel
Communication Controls
HARDWARE BULLETIN

DATED: April 22, 1966

FILE NO: 112.0005.1100.0-086

ERRORS NOTED:

Fold

Cut Along Line

SUGGESTIONS FOR IMPROVEMENT:

Fold

FROM: NAME _____ DATE _____

COMPANY _____

TITLE _____

ADDRESS _____

_____

FIRST CLASS
PERMIT NO. 39531
WELLESLEY HILLS
MASS.

BUSINESS REPLY MAIL

No postage stamp necessary if mailed in the United States

POSTAGE WILL BE PAID BY

HONEYWELL
ELECTRONIC DATA PROCESSING DIVISION
60 WALNUT STREET
WELLESLEY HILLS, MASS. 02181

ATT'N: TECHNICAL COMMUNICATIONS DEPARTMENT

Cut Along Line

Honeywell
ELECTRONIC DATA PROCESSING