

Bell System Data Communications

TECHNICAL REFERENCE MANUAL

•
Data Auxiliary Set 801A

(Automatic Calling Unit)

Interface Specification

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March 1964
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DATA AND TELETYPEWRITER PLANNING ENGINEER

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P R E F A C E

This specification is specifically intended for designers of business machine equipment to be used with Bell System Data Auxiliary Sets 801A in DATA-PHONE and similar services.

If additional details on the interface and its operation are needed, please contact:

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DATA AUXILIARY SET 801 A - INTERFACE SPECIFICATION

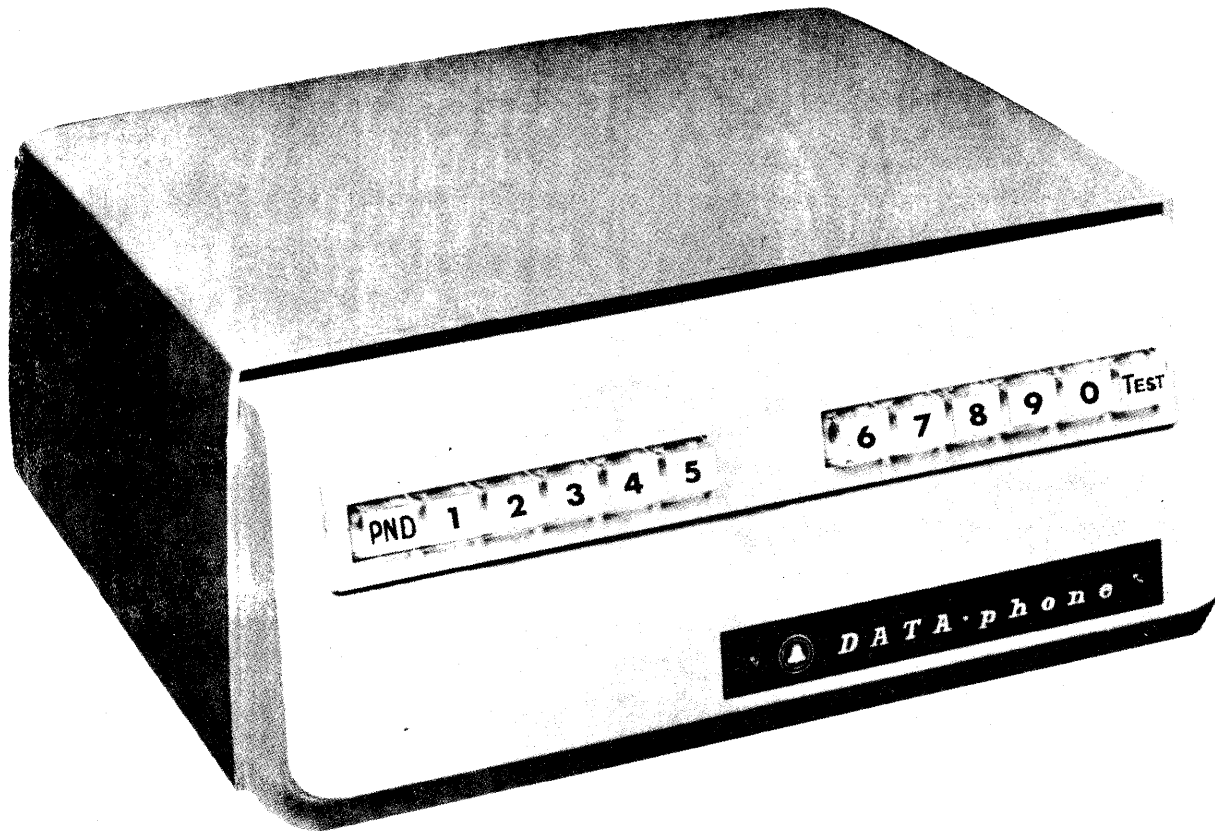


FIG. 1

INTRODUCTION

This interface specification describes the Data Auxiliary Set 801A for Automatic Calling. It is a dc dial pulse Automatic Calling Unit (ACU) which has been developed to permit a business machine to call any telephone number in the switched telephone network and transfer the circuit to the associated data set for the automatic transmission of data. The telephone number which is stored in the business machine is passed to the ACU in the form of parallel 4 bit binary signals. The ACU under control of the business machine will perform all of the functions usually performed by an attendant in originating a data call.

Briefly, the ACU operates as follows: In response to an order from a business machine, the ACU gives an "off-hook" indication to the telephone central office. After detecting the dial "go ahead" signal from the central office, the ACU passes the telephone number digit by digit to the central office. Upon completion of dialing,

the ACU waits for the call to be answered. When the called station answers, the ACU detects the answer signal and transfers the telephone line to the data set so that data transmission can be achieved in the usual fashion. (Under an optional method of operation, the business machine presents an "End of Number" code to the ACU which then transfers the telephone line to the data set.) No fixed number of digits is required except that needed to establish the particular data call. This number could vary anywhere from one up to a dozen or more as required for the particular situation. At the completion of data transmission, the business machine terminates the call.

The 801A ACU requires that a "ground start" telephone line be provided by the telephone company because the ACU grounds the "ring" side of the line to signal off-hook and detects ground on the "tip" side as the dial go-ahead indication. (An ordinary telephone line signals off-hook by shorting the ring to the tip.)

All of the newer Bell System data sets are being designed to operate with the ACU.

The ACU is available in four versions coded as follows:

- 801A1 – EIA Standard RS232A voltage interface plus capability of detecting answer signal.
- 801A2 – Interface on contact closure basis plus capability of detecting answer signal.
- 801A3 – Contact interface without answer signal detector. (The answer signal detector may not be needed where the associated data set "shakes hands" with the distant data set. Currently, the only data sets that can profitably utilize the "End of Number" mode of operation are some of those in the 100 series.)
- 801A4 – EIA Standard RS232A voltage interface without answer signal detector. (See above)

INTERFACE

In the EIA interface versions (801A1 and 801A4) all voltages and impedances meet or exceed the minimums of the Electronics Industries Association Standard RS232A. Copies of this Standard are available from:

Electronics Industries Association
Engineering Department
11 West 42nd Street
New York 36, N.Y.

Polarities more positive than +3 volts and more negative than -3 volts are produced by the ACU. A negative polarity represents a binary one or OFF; a positive polarity represents a binary zero or ON.

In the contact interface versions (801A2 and 801A3) a contact closure to signal ground represents a binary one or ON; an open represents a binary zero or OFF.

The connections between the ACU and the business machine equipment are established by means of a 25 pin connector. The socket on the

ACU is a Cinch or Cannon receptacle per DB-19604-433. The business machine equipment should have a cable not longer than 50 feet equipped with a Cinch or Cannon plug per DB-19604-432 plus a DB-51226-1 hood (Cinch only) or the equivalent. Circuit terminations are as follows:

PIN	LEAD DESIGNATION	ABBREVIATION
1	Frame Ground	FGD
2	Digit Present	DPR
3	Abandon Call & Retry	ACR
4	Call Request	CRQ
5	Present Next Digit	PND
6	Power-Indication	PWI
7	Signal Ground	SGD
8	Not Used	
9	Reserved	
10	Reserved	
11	Not Used	
12	Not Used	
13	Data Set Status	DSS
14	Digit Leads	NB1
15		NB2
16		NB4
17		NB8
18	Reserved	
19	Reserved	
20	Reserved	
21	Reserved	
22	Data Line Occupied	DLO
23	Reserved	
24	Not Used	
25	Reserved	

Signals from the business machine are received by the ACU on the following leads:

a. CRQ (Call Request)

The ON condition indicates that the business machine is initiating a call.

b. DIGIT LEADS (NB1, NB2, NB4, NB8)

Signals are presented by the business machine on the four leads in parallel giving a 4-bit binary representation of the digit to be dialed. NB8 is the most significant bit in the binary coded digit.

c. DPR (Digit Present)

The ON condition indicates that the states of the digit leads may be read by the ACU.

Signals to the business machine from the ACU are presented on the following leads:

a. PND (Present Next Digit)

The ON condition indicates that the ACU is ready to receive a digit from the business machine.

b. PWI (Power Indication)

The power indication lead is ON whenever power is available within the ACU. The ACU should be considered inoperative if the PWI lead is OFF.

c. DSS (Data Set Status)

This circuit is ON whenever the data set is in the data mode.

d. DLO (Data Line Occupied)

An ON indication is given whenever the the telephone line associated with the ACU is in use. This is an indication that the ACU will ignore any request for service presented at a time when this lead is already ON. The lead will also be ON when the ACU is in the test mode.

e. ACR (Abandon Call and Retry)

This circuit is associated with a timer that times out whenever a preset interval has elapsed between successive events in the calling procedure. When this lead comes ON it indicates that an event has not occurred within the desired time.

Also included are signal ground and frame ground circuits.

a. SGD (Signal Ground)

Provides a common ground reference for interchange circuits. It is connected to the frame of the ACU.

b. FGD (Frame Ground)

This circuit is furnished to provide an electrical bond between the frames of

the ACU and the business machine. The frames of both the ACU and the associated business machine should be connected to a common external ground.

DETAILED OPERATION

In response to CRQ (Call Request) ON the ACU transfers the telephone line from the data set and signals off-hook to the central office by grounding the ring side of the line. This assumes that the ACU was in the idle state with power turned on and that the lead to the associated data set, which normally permits a data call, is turned ON (for example, Data Terminal Ready lead turned on in Data Sets with EIA RS232A interface). The central office responds by grounding the tip side of the line just before applying dial tone. The ACU detects the tip ground as a dial go-ahead indication, turns DLO (Data Line Occupied) ON and turns PND (Present Next Digit) ON to request the first digit of the telephone number.

The ACU receives the telephone number from the business machine in four-bit binary form on the four digit leads and requests one digit of the telephone number at a time by controlling the PND (Present Next Digit) lead. The business machine indicates when the digit leads are to be read by the ACU by controlling the DPR (Digit Present) lead. The procedure for passing the digits from the business machine to the ACU is:

The ACU turns ON the PND (Present Next Digit) lead when it is ready to receive a digit. After setting the states of the digit leads, the business machine turns ON the DPR (Digit Present) lead. The ACU translates the binary code and delivers the digit to the central office. The ACU turns OFF PND and then the business machine turns OFF DPR (Digit Present) and waits for the next digit request from the ACU. The states of the digit leads may be changed whenever DPR is OFF. This sequence is repeated until all digits in the telephone number have been delivered to the central office.

Each time PND goes off, it will remain off for a minimum of 600 milliseconds. The business machine should turn DPR off immediately after PND goes off. (If DPR is held

on for more than 600 milliseconds after PND goes off, PND will not come on again until immediately after DPR goes off).

Following the presentation of the last digit, or the "End of Number" code, the business machine must turn off DPR and hold it off for the remainder of the call.

After dialing is completed, the ACU waits for an answer signal to be returned from the called station. When the answer signal is detected, the ACU returns the telephone line to the data set and turns DSS (Data Set Status) ON when the data set goes into the data mode. Under an optional method of operation, the ACU returns the line to the data set when the business machine presents an "End of Number" code (one's on NB8 and NB4) on the digit leads and turns DPR ON. This latter method of operation would be used were the data sets themselves are arranged to detect an answer signal from the far end to "handshake."

The ACU is normally arranged to allow the business machine to terminate the call by dropping the service request to the ACU (by turning off CRQ). CRQ must then be held off until DLO goes off. In this case, the ACU opens the central office loop and holds it open until the data set drops off (goes on-hook). This method of termination can be strapped out so that the business machine may drop the service request after the connection has been established (as indicated by DSS on) without terminating the call. The business machine must then terminate the call through the data set in the manner prescribed for the particular data set (for example, turning off the Data Terminal Ready lead in data sets with EIA RS232A interface). The business machine must also turn CRQ off (if it isn't already off) and hold it off until the ACU turns DLO off. This latter method of terminating a call is obtained by requesting the telephone company for "Z" option.

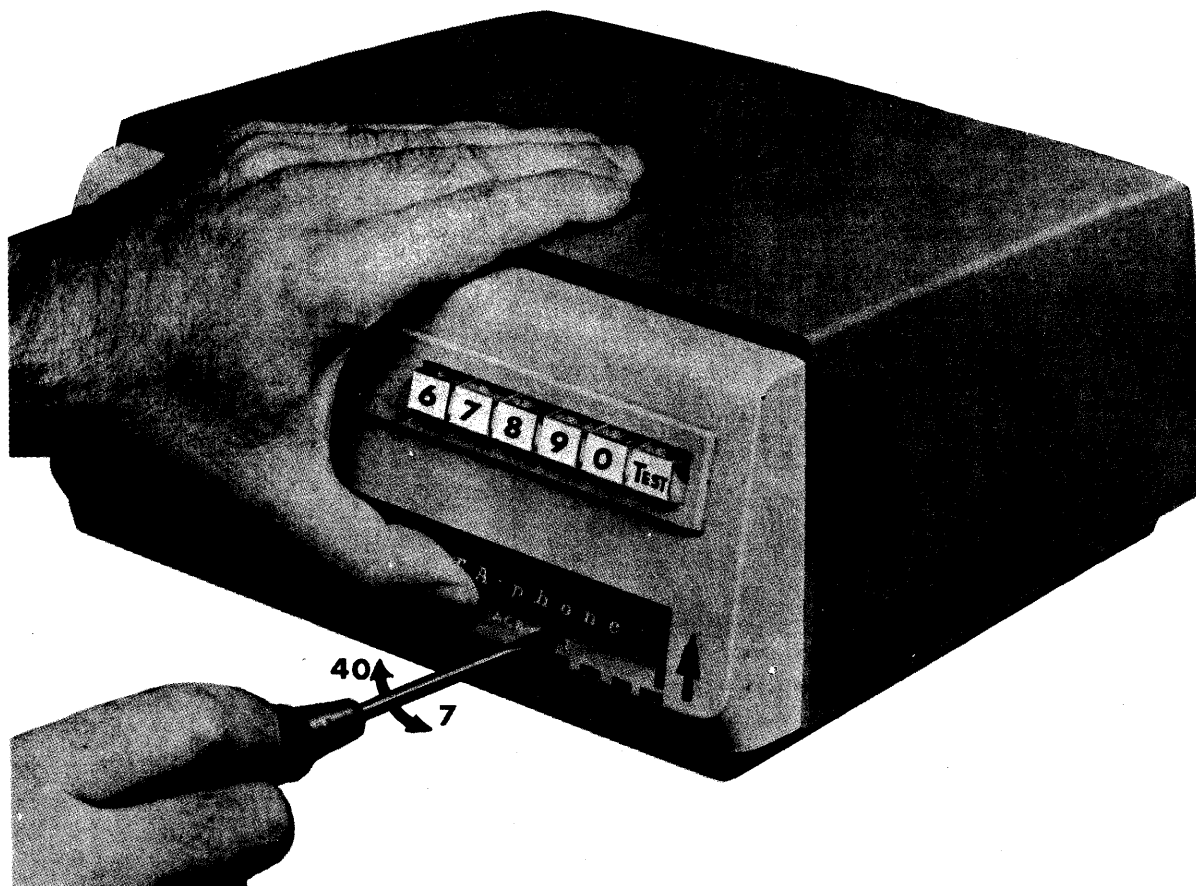


FIG. 2

GENERAL

The ACU is equipped with an adjustable timer with settings of 7, 10, 15, 25, and 40 seconds. Adjustments are made by the customer with a screw driver on a selector switch which is made accessible by sliding the DATA-PHONE nameplate upward (Fig. 2). The timer is designated ACR (Abandon Call and Retry) and turns ON the ACR lead to the customer if an event in the calling procedure does not occur in the selected time. It is the means by which the business machine is notified that wrong numbers are reached or "busy" conditions are encountered. It is expected that normally the business machine will terminate the call in this event as described in the preceding paragraph. The adjustment feature is provided so that the customer can select the shortest timing interval after getting some experience with his own calls. Normally, short calls within an exchange area take less time to set up than calls through several switching centers. The ACR timer is normally strapped so that it will stop timing when the data set goes into the data mode. This arrangement is used when answer detection is used. However, if the end-of-number feature is used, the business machine would probably want the ACR timer to continue running after the data set goes into the data mode to indicate when an answer should have been received. This latter arrangement where the timer continues to run can be obtained by requesting the telephone company to remove "Y" option.

The 801A1 and the 801A4 supply and receive interchange circuit signals having the electrical characteristics specified in EIA Standard RS232A. The 801A2 and the 801A3 supply and receive contact closures to signal ground.

The ACU requires a ground start line in order to detect a dial go-ahead indication. The ACU will normally give the off-hook indication to the central office whenever the associated telephone goes off-hook. Should the ACU be inoperative (e.g. due to power failure), it will be unable to provide this off-hook indication and the telephone set will also be inoperative until power is restored. Where needed, the telephone company will provide a push button on the data set (or control unit) to initiate the ground start signal and thus make the telephone set usable under the power-off condition.

The End of Number mode of operation will normally be used where the associated data sets at each end of the circuit are designed to "shake hands" with each other. Thus it is unnecessary for the ACU to detect the answer signal from the far end. It is expected that data sets in the 100 series will be the only ones where this EON mode can be profitably employed.

TEST ARRANGEMENT

A test arrangement is provided in the ACU to simulate the operation of the business machine in originating a call. It consists of twelve non-locking push buttons - TEST, PND (Present Next Digit) and digits 0 through 9 (See Fig. 1). When the TEST button is pushed, the leads to the business machine interface are isolated from the business machine and connected to the test circuit, except for the DLO (Data Line Occupied) lead. The telephone line is transferred to the ACU, the off-hook signal is given to the central office and the dial "go-ahead" signal from the central office is detected and DLO is turned ON. Dial tone will be heard by means of a small loudspeaker mounted behind the front panel for the purpose of monitoring the progress of test calls. A lamp under the PND (Present Next Digit) button is lighted to indicate that the person performing the test may press the button corresponding to the digit of the telephone number to be dialed. The depressed digit button sets the states of the four digit leads and turns DPR (Digit Present) ON. When the PND (Present Next Digit) lamp goes out, the digit button should be released. When the PND lamp relights, the next digit button may be pushed. This sequence continues until the telephone number has been dialed. The ACU releases the telephone line after detecting the answer tone from the far end. This tone may be heard coming from the small loudspeaker very briefly just before the line is dropped. If the test call is to a station which is not equipped to transmit the answer back tone, the call will be dropped by time-out of the ACR (Abandon Call and Retry) relay. In the latter case, the fact that the correct station has been reached can be ascertained by listening for a voice answer (or other identification signal in the loudspeaker). The telephone line can be dropped during the test mode at any time by pushing the PND button.

Connections set up using the test arrangement can not be used to transmit data. If it is desired to originate a data call manually, the dial on the associated telephone handset should be used.

PHYSICAL ARRANGEMENT

The ACU will operate over a temperature range of 40°F to 120°F and a relative humidity range of 20% to 95%.

The ACU requires approximately 10 watts of 117 volts, 60 cycle AC power from a local outlet. It measures approximately 5½" high × 11" wide × 11" deep and weighs about 16 pounds.

The ACU is contained in a two-tone gray

housing as shown in Figure 1. Two cords are furnished with the ACU. A 10 foot power cord with a ground conductor is used to connect to a 117 volts AC single phase 3-wire receptacle and a 5½ foot cord is used for connections to the telephone line and data set.

The connections between the ACU and the business machine equipment are established by means of a 25 pin connector. The socket on the ACU is a Cinch or Cannon receptacle per DB-19604-433. The business machine equipment should have a cable not longer than 50 feet equipped with a Cinch or Cannon plug per DB-19604-432 plus a DB-51226-1 hood (Cinch only) or equivalents. The business machine will normally be equipped with another cable and interface connector for connection to the associated data set.