

Bell System Data Communications

TECHNICAL REFERENCE

•
Data Auxiliary Set 801C

(Automatic Calling Unit)

Interface Specification

•
September 1965
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DATA AND TELETYPEWRITER PLANNING ENGINEER

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PREFACE

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

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

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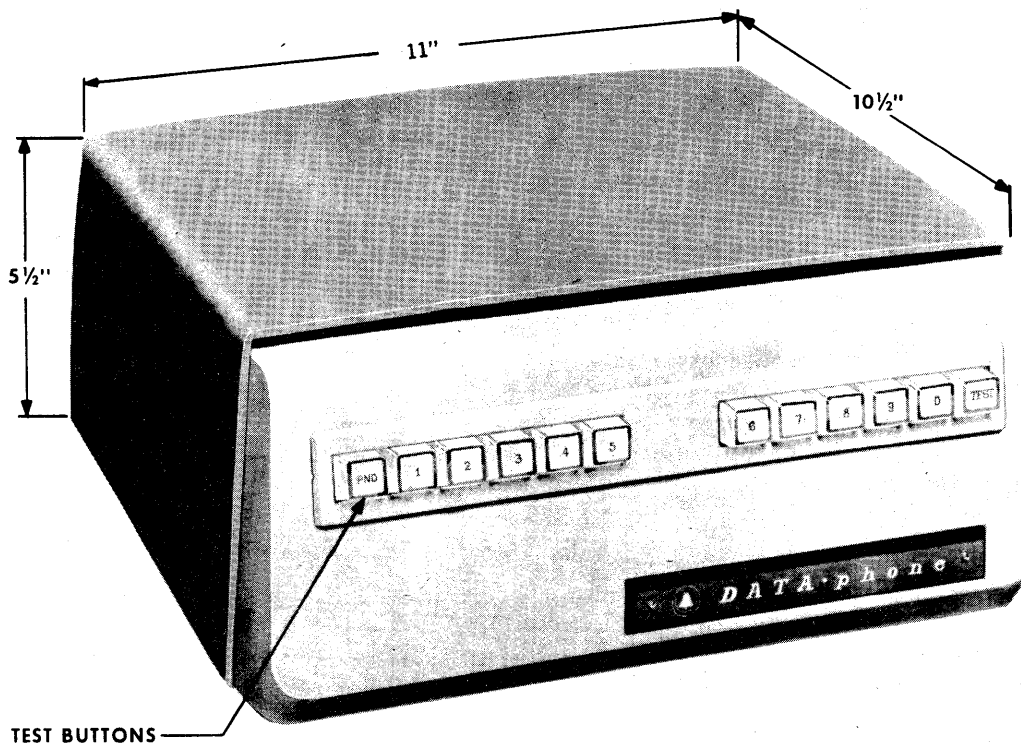


FIG. 1
DATA AUXILIARY SET 801C - FRONT VIEW

1. INTRODUCTION

The Data Auxiliary Set 801C Automatic Calling Unit (ACU) permits a customer-owned business machine, such as a computer, to originate DATA-PHONE calls automatically in areas where TOUCH-TONE[®] dialing is available. Instructions and the number to be dialed are passed between the customer's machine and the ACU in the form of binary electrical signals. Digits to be dialed are presented to the ACU one at a time, in four-lead-binary form. As each digit of the telephone number is dialed, the ACU requests the next digit from the business machine until dialing has been completed. A more detailed description of ACU operation and of the interface signal characteristics will be found later in this technical reference.

2. TOUCH-TONE DIALING

2.1 WHAT IT IS

At a rapidly increasing number of locations in the United States and Canada, a service known as TOUCH-TONE[®] Calling or Dialing is

being introduced. Subscribers to this service are provided with telephone sets having ten or more push buttons, instead of the familiar round finger-wheel, for dialing their calls. Calls are placed more quickly and with less effort by merely depressing the buttons in the desired sequence.

2.2 HOW IT WORKS

As each button is depressed, a simple but reliable electronic circuit within the dial mechanism sends out a pair of different tones. Each button is assigned two tones which are unique to itself and which cannot be mistaken as coming from any other button. At the telephone office, the tones are detected and decoded to tell the switching equipment what number was dialed. Two tones were chosen, instead of only one, so that components of speech or noise would not be interpreted, mistakenly, as a dialed number. In terms of dialing speed, the average number can be sent on a TOUCH-TONE[®] telephone in about one tenth of the time it would take using the older rotary dial.

3. DATA AUXILIARY SET 801C

3.10 Models Available

There are two models of Data Auxiliary Set 801C1 these are coded 801C1 and 801C2. These sets differ only in the manner in which the ACU is told to connect the telephone line to the data set after dialing is completed.

3.11 The 801C1 must receive the end-of-number (EON) code from the business machine after the telephone number has been dialed in order to transfer to the data mode. This set has no circuitry to enable it to detect the answer signal from the called data station. Failure to give the end-of-number code will prevent data reception or transmission.

3.12 The 801C2 will respond to the end-of-number code, if desired, but also has the necessary additional circuitry to detect and respond to the answer tone sent out by the called station. Although the 801C2 has a slightly higher monthly charge than the 801C1, its answer detection circuitry makes it much more desirable for most applications.

3.2 HOW TO CHOOSE THE CORRECT MODEL

On any communication channel, there is a certain amount of noise. This noise may be in the form of pure tones, unintelligible "crosstalk" due to coupling between adjacent circuits, "white" noise (hiss), impulse noise (clicks and pops), and so on. How much of each type of noise one may expect is a function of the particular channel in use and the particular time at which it is being used.

3.21 DATA-PHONE data set receivers are designed with the ability to respond to very weak data signals and also the ability to make themselves less sensitive as the received data signal becomes stronger. If no data signal is being received, the data set will be operating at maximum sensitivity. Under these conditions it is not unusual for channel noise (sometimes called line noise) to produce spurious data signals on the Received Data lead of the data set.

3.22 When the 801C has control of the telephone line (as it does during dialing and while waiting for an answer tone from the called station), the data set is isolated from the line and is immune to channel noise. The ACU answer detector circuitry is sharply tuned and also must receive an answer signal for a period of time longer than the duration of most noise signals. This combination greatly reduces the

chance of obtaining spurious data prior to data transmission.

3.23 The answer-detection feature (801C2 only) is recommended for use with all data sets now available, including those with "hand shaking" capabilities. Some future data sets may have reliable means to detect the answer signal of the called station, but for the present, the detector circuit of the 801C2 is preferred.

<u>List of Data Sets Which Should Be Called by an 801C2</u>			
103A	201A3	401H	602A
	201A4	402C	
	202C	402D	
	202D		

Note: This is a list of those data sets having an answer tone that can be recognized by the 801C2 (as of August 1965), e.g., the 401H probably would be called by a 401J-801C2 installation.

3.24 If the end-of-number mode of operation is used, the business machine must be capable of ignoring any erroneous data which may be received between the time dialing ends and the time the called data set answers. The ability to ignore probably implies some coding of the transmitted data to indicate to the business machine the beginning of data transmission. This is left to the business machine designer so that he can achieve the most efficient system for his purpose. Unless the business machine is capable of recognizing the start of legitimate data the 801C1 (end-of-number operation) should be used only in those few instances where the called data set does not send out an answer tone.

3.3 BASIC THEORY OF OPERATION

The 801C ACU can be thought of as composed of four main sections which are: 1. the Interface circuitry, 2. the Telephone Line circuitry, 3. the Answer Detection circuitry, 4. the Test circuitry. Although no one of these sections can be completely separated from the others, it will simplify the description if they are thought of as separate entities.

3.31 Interface Circuitry

These provide for the interchange of information between the business machine and the ACU and for the necessary controls and timing within the ACU.

The timing circuits make certain that each group of tones is sent toward the telephone central office long enough to be sure it is recognized but not so long as to waste time. They provide "time-out" features to tell the customer's equipment when no proper answer has been received from the called party, after an appropriate waiting interval (Abandon Call and Retry or ACR signal). They also prevent a call from being attempted so soon after a previous call that the telephone switching equipment does not recognize the new call.

3.32 Telephone Line Circuitry

This block contains the necessary devices to switch the telephone line from the associated data set to the ACU during dialing periods. It also contains the TOUCH-TONE® generators to forward the desired number information to the telephone central office and a circuit to detect and to notify the business machine whenever the telephone line is in use (Data Line Occupied or DLO signal).

3.33 Answer Detection Circuitry

3.330 When a call is placed to a data set arranged to automatically answer an incoming call, a number of things occur in a specific sequence. At first, the called data set is sent the same signal as that which causes a regular telephone to ring. This signal is detected by the data set which electrically goes "off-hook" in much the same way as picking up the telephone receiver. After a delay of the order of 1-1/2 seconds to make certain everything is ready, the answering data set sends a high tone back toward the calling station. This tone normally continues for about 3-1/2 seconds (the actual duration can vary somewhat) and, after a short, silent interval of few tens of milliseconds, the called data set transfers into the data mode and data transmission can take place.

3.331 After dialing is completed, the answer detection circuitry of the ACU monitors the line until the tone is received. For most called data sets, the ACU will transfer the line back to its associated data set shortly after the end of the tone is detected. For data sets in the 100 series, however, (those data sets with "hand-shaking" capabilities) transfer occurs just after the beginning of the answerback tone in order that normal data set hand shaking can take place when the ACU transfers the calling station to the data mode. Whether the ACU transfers to data at the beginning or the end of the received tone depends on the option connected

at the time the ACU is installed. The various options which may be selected will be described later.

3.34 Test Circuitry

This block contains the necessary circuitry to assure that the ACU is operating properly. It consists of the 12 push buttons located on the front of the ACU and the necessary circuitry. Detailed operating procedures of the test features are described later.

3.35 Operating Requirements and Limits

- a. Power - To be supplied by the user.
Voltage - 117 volt RMS $\pm 10\%$
Frequency - 60 ± 1 cps
Power - 13 w
Connector - 3-wire "U" ground receptacle. This receptacle must be on a circuit that is not controlled by a switch.
- b. Size - Width 11 inches
Depth 10-1/2 inches plus rear clearance for cables.
Height 5-1/2 inches
- c. Weight - 16 pounds
- d. Temperature - +40°F to +120°F
- e. Humidity - 20% to 95%, relative

Note: A sudden drop in temperature or rise in humidity such that condensation occurs on the 801C circuitry can cause faulty operation.

4. INTERFACE-OPERATION AND USE

4.1 CONNECTORS AND CONNECTION

Connection between the ACU and any business machine is made by means of a 25 pin connector mounted on the rear of the ACU. To make connection, the customer must supply the necessary cable (preferably not to exceed 50 feet in length to limit cable capacitance to about 2500 pfd) and the male connector. As the connector, we suggest the DB-19604-432 plug, manufactured by both Cannon* and Cinch+, associated with the DB-51226-1 hood manufactured by Cinch. The hood and connector combination provides, among other features, a positive screw-in retaining arrangement to keep the interface securely connected. A more complete description of this assembly may be found in the Bell System Data Communication Technical Reference "Data Set Interface Connectors."

*ITT - Cannon Electric, Div. IT & T Corp., 3208 Humbolt St., Los Angeles, Calif. 90031

+Cinch Manufacturing Co., 1026 S. Homan Ave., Chicago, Ill. 60624

4.2 ELECTRICAL CHARACTERISTICS

Electrical characteristics of the ACU interface follow the recommendations of the Electronic Industries Association for digital data sets as described in their published specification RS-232A. The following tables detail the electrical characteristics of each interface lead.

4.21a Control Leads from Business Machine

CRQ, DPR

“ON” condition, leads - respond to +3 volts to +25 volts.
- present not less than 3000 ohm load to interface

“OFF” condition, leads - respond to -3 volts to -25 volts.
- present not less than 3000 ohm load to interface.

When interface plug is disconnected, internal voltage on leads is between 0 and ±2.0 volts.

In TEST mode, leads are internally disconnected (infinite impedance to Signal Ground).

4.21b Data Leads from Business Machine

NB1, NB2, NB4, NB8

“1” condition, leads - respond to -3 volts to -25 volts.
- present not less than 3000 ohm load to interface.

“0” condition, leads - respond to +3 volts to +25 volts,
- present not less than 3000 ohm load to interface.

When the interface plug is disconnected, internal voltage on these leads is between 0 and ±2.0 volts.

In the TEST mode leads are internally disconnected (infinite impedance to Signal Ground).

4.22 Control Leads to Business Machine

<u>LEAD</u>	<u>ON</u>		<u>OFF</u>		<u>TEST</u>	
	<u>Volts</u>		<u>Volts</u>		<u>Volts</u>	
*Load (ohms)	Min. 3000	Max. OC	Min. 3000	Max. OC	Min. 3000	Max. OC
PND	+5	+25	-5	-25	-5	-25
DLO	+5	+25	-5	-25	+5	+25
DSS	+5	+25	-5	-25	Note 1	
ACR	+5	+25	-5	-25	Note 2	
PWI	+5	+25	0 (greater than 300 ohm impedance to Signal Ground)		Not Affected by TEST	

*OC means open circuit, i.e., a load of infinite impedance.

Note 1: In the TEST mode, while dialing is under way, this lead will be in the OFF condition. However, when the end-of-number code is given to the ACU or (in the 801C2 only) an answer is received from the called station, DSS will turn ON and stay ON until the TEST call times out.

Note 2: During the TEST mode this lead will be in the normal OFF condition. However, at the end of the TEST interval, as the ACU is returning to its idle condition, this lead will turn ON momentarily and then OFF again.

4.23 Miscellaneous Notes

The voltage range of -3 to 0 to +3 must always be considered as undefined in order to avoid any ambiguity or false signaling. All signals are referred to the Signal Ground lead. The business machine shall respond only to the signal voltage level and should be insensitive to rise time, fall time, overshoot, etc.

4.3 INTERFACE LEAD DESCRIPTION

Thirteen of the 25 available interface connections are used. The actual connector pin assignments are listed in Table A.

4.31 The following interface leads are operated by the business machine to signal the ACU.

a. Call Request (CRQ)

Signals on this lead are generated by the business machine to request the ACU to originate a call.

The ON condition indicates a request to originate a call and must be maintained

during the complete call origination period (i.e., prior to DSS (Data Set Status) coming ON) in order to hold the communication channel "off-hook." The OFF condition indicates that the business machine has completed its use of the automatic calling equipment. This lead must be turned OFF between calls (or call attempts) and shall not be turned ON unless DLO (Data Line Occupied) is OFF. See also Paragraphs 5.41 and 5.42.

b. Digit Leads (NB1, NB2, NB4, NB8)

Parallel binary signals on these circuits are generated by the business machine. The information presented on these leads may either be transmitted (e.g., as the called number) or used locally as a control signal (end-of-number).

Digit	Digit Lead Coding			
	NB ⁸	NB ⁴	NB ²	NB ¹
Value	2 ³	2 ²	2 ¹	2 ⁰
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1
EON	1	1	0	0

c. Digit Present (DPR)

Signals on this lead are generated by the business machine to indicate that the ACU may now read the code combination presented on the Digit Leads NB1, NB2, NB4, NB8.

The ON condition indicates that the business machine has set the states of the digit leads for the next digit. DPR (Digit Present) must be turned ON after PND (Present Next Digit) comes ON and remain ON until PND (Present Next Digit) goes OFF. Then DPR (Digit Present) must be turned OFF and held OFF until PND (Present Next Digit) comes ON again. The states of the digit leads must not change when DPR (Digit Present) is ON.

After the ACU has accepted the last digit and turned PND (Present Next Digit) OFF, DPR (Digit Present) must be held OFF when PND (Present Next Digit) comes back ON.

4.32 The following interface leads are operated by the ACU to signal the business machine.

a. Present Next Digit (PND)

Signals on this lead are generated by the ACU to control the presentation of digits on the digit leads. During dialing, the ON condition indicates that the ACU is ready to accept the next digit indicated on leads NB1, NB2, NB4, and NB8.

The OFF condition indicates that the business machine must turn OFF DPR (Digit Present) and set the states of the digit leads for the next digit. PND (Present Next Digit) will not again be changed to the ON condition as long as DPR (Digit Present) is still ON.

PND (Present Next Digit) will come ON and remain ON after the business machine turns DPR (Digit Present) OFF following presentation of the last code combination on the digit leads.

PND (Present Next Digit) will be ON throughout the data transmission interval on a call placed by the ACU. PND (Present Next Digit) will be OFF throughout all calls placed manually and during all incoming calls.

b. Power Indication (PWI)

Signals on this lead are generated by the ACU to indicate that power is available within the ACU.

The ON condition indicates that power is available in the ACU. The OFF condition, and impedance to Signal Ground (SGD) greater than 300 ohms, indicates that the automatic calling equipment is inoperative because of loss of power. This circuit should not be interpreted to indicate power status in any other equipment.

c. Data Line Occupied (DLO)

Signals on this lead are generated by the ACU to indicate that the communication channel is in use for automatic calling, data

communication, voice communication, or testing of the automatic calling or data communication equipment.

The ON condition indicates that the communication channel is in use.

The OFF condition indicates that the business machine may originate a call provided that PWI (Power Indication) is ON.

d. Data Set Status (DSS)

Signals on this lead are generated by the ACU to indicate the status of the local data communication equipment.

The ON condition indicates that the telephone line is connected to the data set to be used for data communication and that the data set is in the data mode.

e. Abandon Call and Retry (ACR)

Signals on this lead are used to indicate that a pre-set time has elapsed since the last change of state of PND (Present Next Digit).

The ON indication is a suggestion to the business machine to abandon the call and try again later if the connection has not yet been completed. The ACU does not abandon the call when this lead is turned ON.

4.33 Also included are Signal Ground, Frame Ground, and positive and negative power leads.

a. Signal Ground (SGD)

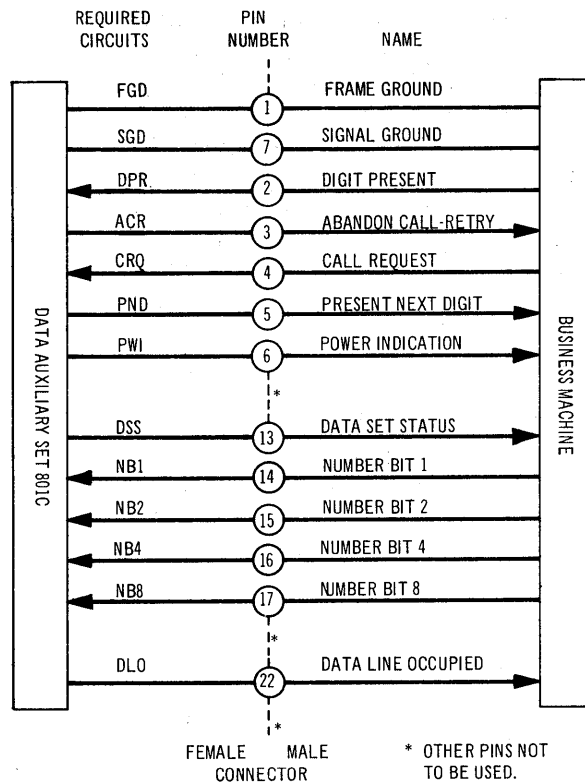
Provides a common ground reference for interface circuits. It is connected to the frame of the ACU.

b. Frame Ground (FGD)

This lead is furnished to provide an electrical bond between the frames of the ACU and the business machine. This lead should not be used as a ground for the associated business machine. The frames of both the ACU and the associated business machine should be separately connected to a common external ground.

c. Positive Power (+P) and Negative Power (-P)

These circuits are furnished to provide power for possible future testing arrangements by the Telephone Company only. They must not be used by the business machine.



DATA AUXILIARY SET 801C
INTERFACE CONNECTOR PIN ASSIGNMENTS

5.0 DETAILED OPERATION

5.10 Originating a Call Automatically (See Figure 5)

To originate a call, the business machine presents a call request signal to the ACU by turning ON the CRQ (Call Request) lead. If the telephone line is not in use, the ACU takes the line from the data set and signals the telephone central office that a call is waiting. When the telephone central office is ready to accept the call, it signals the ACU to proceed.

5.11 The ACU now arranges to "Hold" the telephone line in much the same way as a telephone which is in use. Since the telephone line is now in use, the DLO (Data Line Occupied) lead turns ON. (If DLO (Data Line Occupied) was on before CRQ (Call Request) was presented, the ACU would not respond since the line was already in use.) With everything ready, the PND (Present Next Digit) lead now comes ON, telling the business machine that the ACU is ready to receive the first digit to be dialed.

5.12 Once the business machine detects PND (Present Next Digit) ON, it should present the first digit to be dialed on the four digit leads (NB1, NB2, NB4 and NB8). Digit information is presented to the ACU in binary-coded-decimal (BCD) form with the NB1 lead having a value of 1 (2^0), NB2 a value of 2 (2^1), etc. (See 5.11b.) When the digit leads have been set, the DPR (Digit Present) lead must be turned ON to tell the ACU to dial the first digit.

5.13 After the digit has been dialed, PND (Present Next Digit) is turned OFF. At this time, the business machine should turn DPR (Digit Present) OFF and wait for the next PND (Present Next Digit) ON. If, for some reason, DPR (Digit Present) is not turned OFF, PND (Present Next Digit) will not come back ON. Any delay in turning OFF DPR (Digit Present) after PND (Present Next Digit) OFF will simply slow down the dialing rate and increase the time required to place a call. When PND (Present Next Digit) turns ON after the first digit has been dialed, the second digit may be set on the digit leads, DPR (Digit Present) may be turned ON and so on as for the first digit. This sequence of PND (Present Next Digit) ON, set digit leads, DPR (Digit Present) ON, PND (Present Next Digit) OFF, DPR (Digit Present) OFF is repeated for each digit to be dialed. After the complete number has been dialed, PND (Present Next Digit) will again turn ON. At this point, either of two actions may be taken:

EITHER

5.13a Detect Answer Mode (801C2 Only)

With PND (Present Next Digit) ON the business machine must hold DPR (Digit Present) OFF. When the called data station answers, it sends out the high tone mentioned in 3.33, which is recognized by the ACU as a legitimate answer. At this time, the ACU gives the line back to the data set and signals the data set to enter the data mode (ready to send or receive data). DSS (Data Set Status) will turn ON indicating that the data set is in the data mode.

OR

5.13b End-of-Number (EON) Mode

A binary 12 is set on the digit leads by the business machine and DPR is turned ON. The ACU recognizes the End-of-Number code, immediately gives the telephone line back to the data set, and signals the data set to enter the

data mode (ready to send or receive data). When PND (Present Next Digit) goes OFF, DPR (Digit Present) must be turned OFF and left OFF. DSS (Data Set Status) will turn ON indicating that the data set is in the data mode. The called data set will probably not have answered yet and the business machine must be able to recognize when data is received.

5.2 ABANDON CALL AND RETRY (ACR)

5.20 Central offices are normally arranged to "time-out" and ignore further dialing by the subscriber if too much time elapses between digits (20 to 60 seconds or so depending on the office). A few calls may be made where the wrong number is dialed. The called station, or all paths to it, may be busy occasionally. For a variety of reasons, there may be a few calls which are not completed to the called station. To help prevent inordinately long and useless waiting periods on such calls, the ACR (Abandon Call and Retry) timing circuitry has been incorporated.

5.21 The ACR (Abandon Call and Retry) timer starts whenever CRQ (Call Request) is turned ON. The time-out interval may be set for a minimum period of 7, 10, 15, 25 or 40 seconds by means of a screwdriver operated switch (see Figure 3). For most telephone switched network operations, a period of 25 or 40 seconds is recommended to allow sufficient time for the call to go to completion.

5.22 When the timer is running, it resets to zero and starts over every time PND (Present Next Digit) goes OFF. Any time the business machine, the ACU or the telephone network takes more than the preset timing interval from the last PND (Present Next Digit) OFF, the ACR (Abandon Call and Retry) lead will turn ON. The ACR (Abandon Call and Retry) lead is intended to tell the business machine when too much time has passed with no apparent action. Please note that any decision to act on ACR (Abandon Call and Retry) lead information is left to the business machine which may act upon or ignore the signal. Action is not taken within the ACU when ACR (Abandon Call and Retry) goes ON.

5.3 ABANDON CALL AND RETRY (ACR) OPTIONS

5.31 An installer option at the time of installation either stops the ACR (Abandon Call and Retry) timer as the data set enters the data

mode (this is the normal option) or lets the timer run until CRQ (Call Request) is turned OFF. In the latter condition, ACR (Abandon Call and Retry) will time-out and turn ON during data transmission and will stay ON until CRQ (Call Request) is turned OFF.

5.32 The option to let the timer run ("Do Not Stop ACR timer when DSS goes ON") is provided for customer convenience when the ACU is used in the End-of-Number mode. The timer resets when PND (Present Next Digit) goes OFF as the ACU recognizes End-of-Number code on the digit leads. Since the business machine must now recognize when the called station has answered, the ACR (Abandon Call and Retry) lead gives an indication when the preset time has passed, and avoids the need for a special timer in the business machine.

5.4 TERMINATING A CALL AUTOMATICALLY

5.40 An installer option permits a call, originated as outlined above, to be terminated in either of two ways: by turning Call Request (CRQ) OFF or via the data set. Before a description of these options, a few comments about terminating calls may be of interest.

When a DATA-PHONE call is terminated automatically by the ACU, or by the data set, or terminated manually by hanging up the telephone in the TALK mode, only the near end of the call is positively terminated (this is also true of any normal telephone call). If the business machine or operator at the remote station does not positively direct it to do so, the remote station may or may not terminate depending on the particular telephone office and equipment to which it is connected. If the remote station does not terminate at the end of a call, the next call made to that station will frequently obtain a busy signal.

The business machine manufacturer must design into his equipment the capability to tell the remote end when to terminate the call (by means of an end-of-transmission code sent at the end of the transmitted data, for example). All DATA-PHONE data sets are designed to terminate their end of a call when their Data Terminal Ready (DC) interface lead is turned OFF or the Remote Release (RR) interface lead is open circuited (the Remote Release arrangement applies to data sets of early design).

5.41 With Call Request (CRQ) Control

The option normally provided is that of Call Request (CRQ) control. CRQ (Call Request) is turned ON to originate the call and then must be held ON until the call is to be terminated. Turning OFF CRQ (Call Request) at any time during the dialing or data transmission intervals will end the call and cause the line to hang up or go "on-hook." When data transmission is completed, the business machine, after signaling the called end to hang up by means of the transmitted data signal, terminates the call locally by merely turning OFF CRQ (Call Request). At this point, once DLO (Data Line Occupied) goes OFF, the data set and ACU are ready for the next call. To obtain this method of operation request the option "Terminate Call, after DSS goes ON, via CRQ."

5.42 With Data Set Control

If the Call Request (CRQ) option is not selected, the call is terminated in a somewhat different manner. CRQ (Call Request) is turned ON to originate the call and must be held ON until dialing is completed and the data set enters the data mode (i.e., until DSS (Data Set Status) turns ON). The call will be terminated during the dialing period if CRQ (Call Request) is turned OFF. Once DSS (Data Set Status) is ON, however, control is given to the data set and the condition of CRQ (Call Request) will not affect operation in any way. To terminate the call, when data transmission is completed, the data set is "hung up" in its normal manner. Please Note that CRQ (Call Request) must be turned OFF at some time between DSS (Data Set Status) turning ON and the data set hanging up. At this point, once DLO (Data Line Occupied) goes OFF, both the data set and ACU are ready for the next call. To obtain this method of operation request the option "Terminate Call, after DSS goes ON, via Data Set."

5.43 Manually Originated Calls

Calls may be originated in the normal way using the telephone portion of the data set associated with the ACU. During the interval that the telephone is off-hook, the ACU is prevented from attempting to originate a call. At the same time, the DLO (Data Line Occupied) lead will be turned ON indicating that the line is in use. PND (Present Next Digit) will be OFF during this call. After manual origination, if the data set is manually transferred to the data mode, the DSS (Data Set Status) lead will also turn ON.

Any calls not originated by the ACU cannot be terminated by the ACU. A manually originated call must be terminated either by reverting to TALK and hanging up or by hanging up electrically through the data set interface. When the call has terminated, DSS (Data Set Status) and DLO (Data Line Occupied) turn OFF and the data set and ACU are ready for the next call.

5.44 Incoming Calls

When the data set and business machine are arranged to automatically answer incoming calls, the ACU will not interfere. DLO (Data Line Occupied) will turn ON to indicate that the line is in use, and the ACU will not respond to a subsequent CRQ (Call Request) ON. As the data set answers the call and goes into the data mode, the DSS (Data Set Status) lead turns ON. Throughout the data transmission interval, PND (Present Next Digit) will remain OFF.

An incoming call cannot be terminated through the ACU. Call termination must be accomplished through the data set.

5.5 TIMING

Figure 4 presents a chart of time intervals between changes of state of the interface leads. The top line represents the idle condition of the data station when a call may be placed. The lowest position on the chart is equivalent to the top line.

6. TEST FEATURES

6.0 GENERAL

6.01 The ACU is equipped with twelve push buttons on its front cover which can be used to make test calls. These buttons allow the ACU to be tested without external test equipment at any time the line is not in use.

6.02 Only when the line and ACU are not in use can a test be made. A call in progress cannot be interrupted by the test buttons. PLEASE NOTE THAT A CALL PLACED BY USING THE TEST BUTTONS WILL TIME OUT AND TERMINATE. THE TEST BUTTONS SHOULD NOT BE USED TO PLACE A DATA-PHONE CALL (see Para. 6.4).

6.1 OPERATION

6.01 To place a call, the TEST button is pressed and held until it lights indicating that the ACU is in the test mode. From this point until the test is completed, or purposely stopped, CRQ (Call Request), DPR (Digit Present) and the four digit leads are internally disconnected from the ACU interface (the leads are open circuited) to prevent interference from the associated business machine. DLO (Data Line Occupied) is turned ON and PND (Present Next Digit) is turned OFF.

6.11 When the PND (Present Next Digit) button lights and/or a dial tone is heard from within the ACU housing, the desired number may be dialed. Please note that the PND (Present Next Digit) interface lead is held OFF during the test interval. The button corresponding to the first digit to be dialed may now be pressed and held down until the PND (Present Next Digit) light goes out. The button may then be released and, after a very short interval, the PND (Present Next Digit) lamp will light again. The button corresponding to the second digit may now be pressed and held down until the PND light again goes out. This procedure may be followed until all digits have been dialed.

6.2 Answer Detection Test Mode (801C2 Only)

After the last digit has been dialed, PND (Present Next Digit) will again light. When the called data station answers and returns the expected tone, the PND (Present Next Digit) lamp will go out and stay out but the TEST light will still be on. This final turn off of PND (Present Next Digit) indicates that the answer detection circuitry of the ACU has operated properly. After a further interval, the TEST light will go out and the ACU will return to its idle condition.

6.3 END-OF-NUMBER TEST MODE

Where End-of-Number operation is desired (and wherever the 801C1 is used) a slightly different test procedure is followed. After the last digit of the number has been dialed and PND (Present Next Digit) button is again lighted, the 8 and the 4 buttons should both be pressed at the same time to produce an End-of-Number signal (if one is depressed slightly ahead of the other, no harm is done). When the PND (Present Next Digit) light turns off, both buttons should be released. The PND (Present Next

Digit) light should now remain off, indicating that the data set has entered the data mode. After an interval of about 40 seconds, the TEST light will turn off indicating the end of the test.

6.4 NO DATA TRANSMISSION IN TEST MODE

The test mode is not intended to permit data transmission. When it is in the test mode, the ACU cannot be controlled by the business machine. This lack of control occurs because the interface leads are transferred (inside the ACU) from the business machine to the test circuitry to permit a test call to be placed. If it were possible to remain in the test mode in order to complete a data call after dialing, it would also be possible to accidentally depress the TEST button, cause the ACU to enter the TEST

mode, and prevent any further calls from being made by the business machine. For this reason, the ACU has been designed to automatically drop out of the test mode about 40 seconds after the last PND (Present Next Digit) change and return to normal operation. The 40 second TEST mode time-out does not provide sufficient time for data transmission after the called station has answered.

6.6 TERMINATING A TEST CALL

All test calls will time-out and terminate about 40 seconds after the last turn OFF of the PND (Present Next Digit) light. If at any time it is desired to end a test call quickly, the PND (Present Next Digit) button may be depressed. The TEST light will go out immediately indicating that the ACU is now in its normal mode and ready for service.

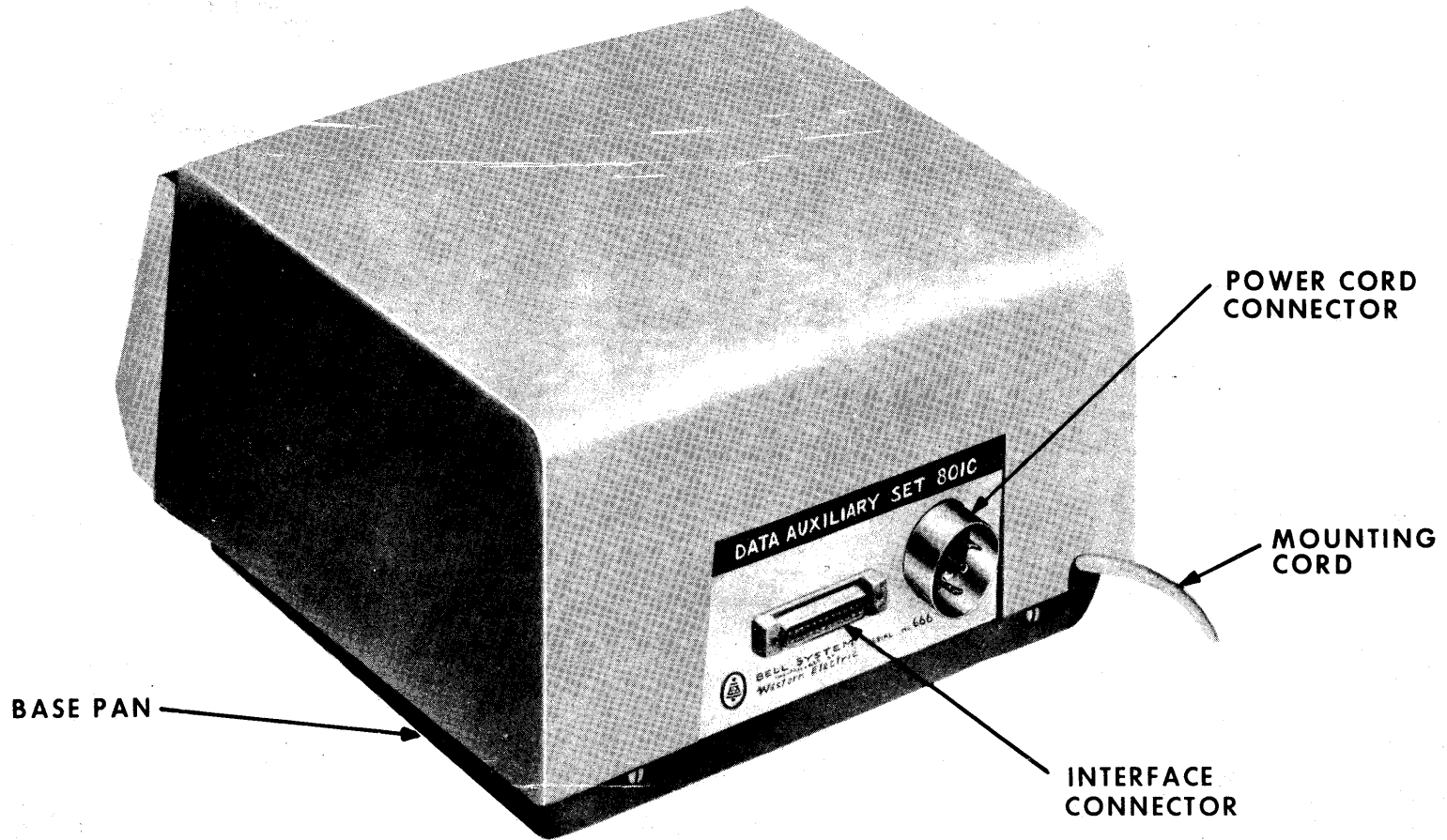


FIG. 2
DATA AUXILIARY SET 801C - REAR VIEW

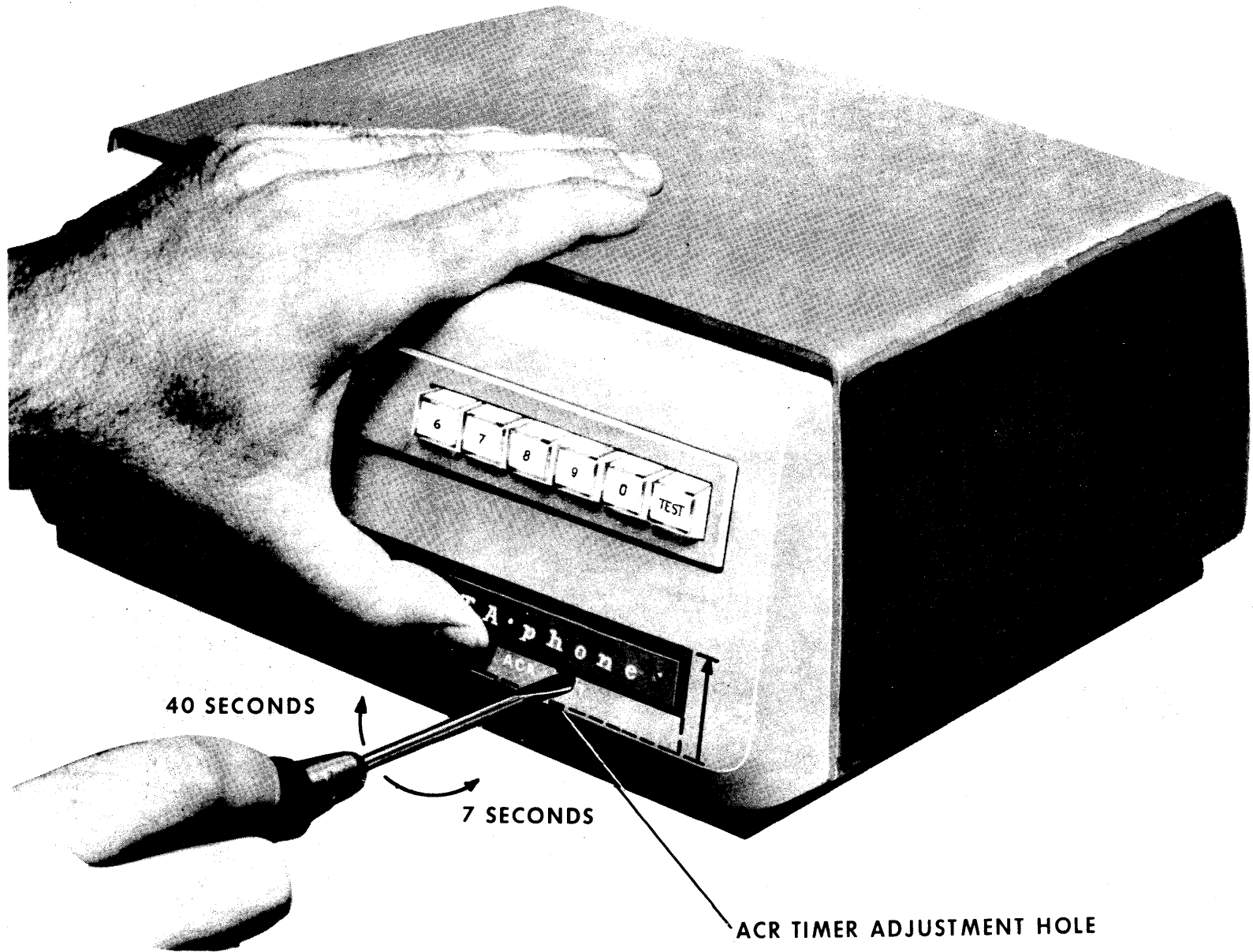


FIG. 3

DATA AUXILIARY SET 801C - ACR TIME ADJUSTMENT

Legend

- ↑ Lead ON
- ↓ Lead OFF
- ↔ Option
- ms millisecond
- △ Customer Controlled Time

Note 1 - CRQ must be turned OFF after DSS↑ and before data set terminates call.

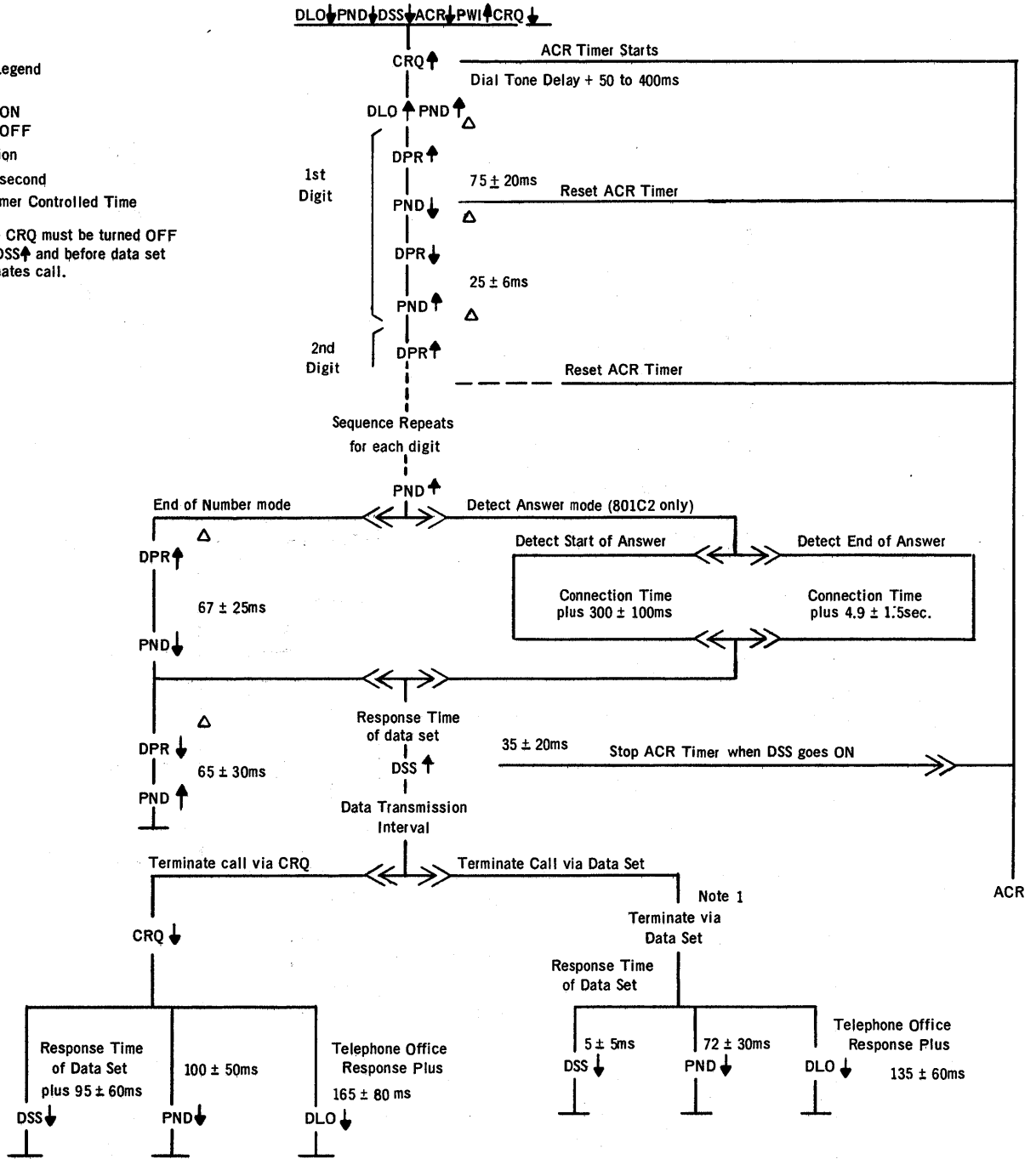


Fig. 4 - Data Auxiliary Set 801C - Interface Lead Timing Diagram

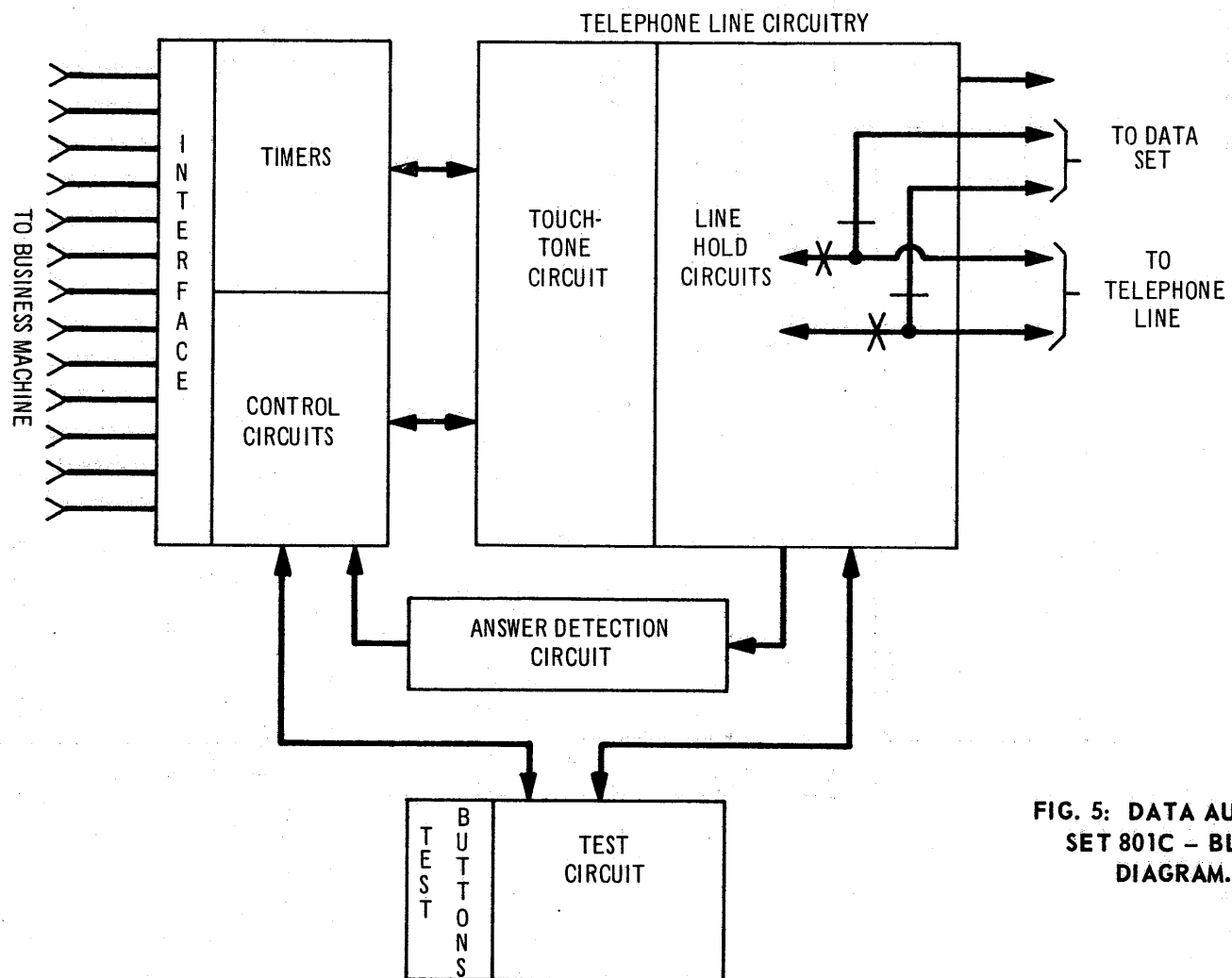


FIG. 5: DATA AUXILIARY SET 801C - BLOCK DIAGRAM.