# DATA AUXILIARY SETS 801C3 AND 801C4

# TEST PROCEDURES

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## 1. GENERAL

**1.01** The Data Auxiliary Sets 801C3 and 801C4 are referred to in this section as Automatic Calling Units (ACUs).

**1.02** This section is reissued to provide information for maintenance test procedures on Data Auxiliary Sets 801C3 and 801C4 using a 914B Data Test Set (DTS). Since this is a general revision, arrows ordinarily used to indicate changes have been omitted.

**1.03** The location of the eight circuit packs used in the data auxiliary set is shown in Fig. 1. Table A gives the designation of the circuit packs and lists the circuits provided by each circuit pack.

*Note:* The Data Auxiliary Set 801C3 does not contain the circuit packs CP AS9 and CP AS27 shown by Fig. 1. The addition of these circuit packs converts an 801C3 to an 801C4 model.

**1.04** When the ACU is equipped with a 12-combination TOUCH-TONE® transmitter, circuit pack CP AS28 has been replaced with CP AS64. Refer to Fig. 1 for the designation and location of the ACU circuit packs.

**1.05** If trouble is encountered while testing the ACU, refer to Table B and Fig. 1 to determine the location of the circuit pack that might be causing the malfunction. When replacement circuit packs are available, a known good circuit pack should be substituted and the ACU retested to determine if the trouble has been eliminated. For information on the replacement of circuit packs, refer to the section entitled Data Auxiliary Sets 801C3 and 801C4—Maintenance (598-012-301).


***If trouble is located in either the CP CT1 or CP BM2 cards, the ACU should be replaced as these two units are not plug-in cards and therefore they are not replaceable in the field.***

TABLE A

| CIRCUIT PACK DESIGNATION | CIRCUITS PROVIDED BY CIRCUIT PACK |
|---|---|
| CP AS9* | Limiter detector |
| CP AS12 | ACR timer and monitor amplifier |
| CP AS26 | Line coupler and tip monitor |
| CP AS27* | Tuned circuits |
| CP AS28 | 10-combination TOUCH-TONE transmitter and control circuit |
| CP AS64 | 12-combination TOUCH-TONE transmitter and control circuit |
| CP AS29 | Timers |
| CP BM2 | Receiver and miscellaneous components |
| CP CT1 | Relays |

* 801C4 only

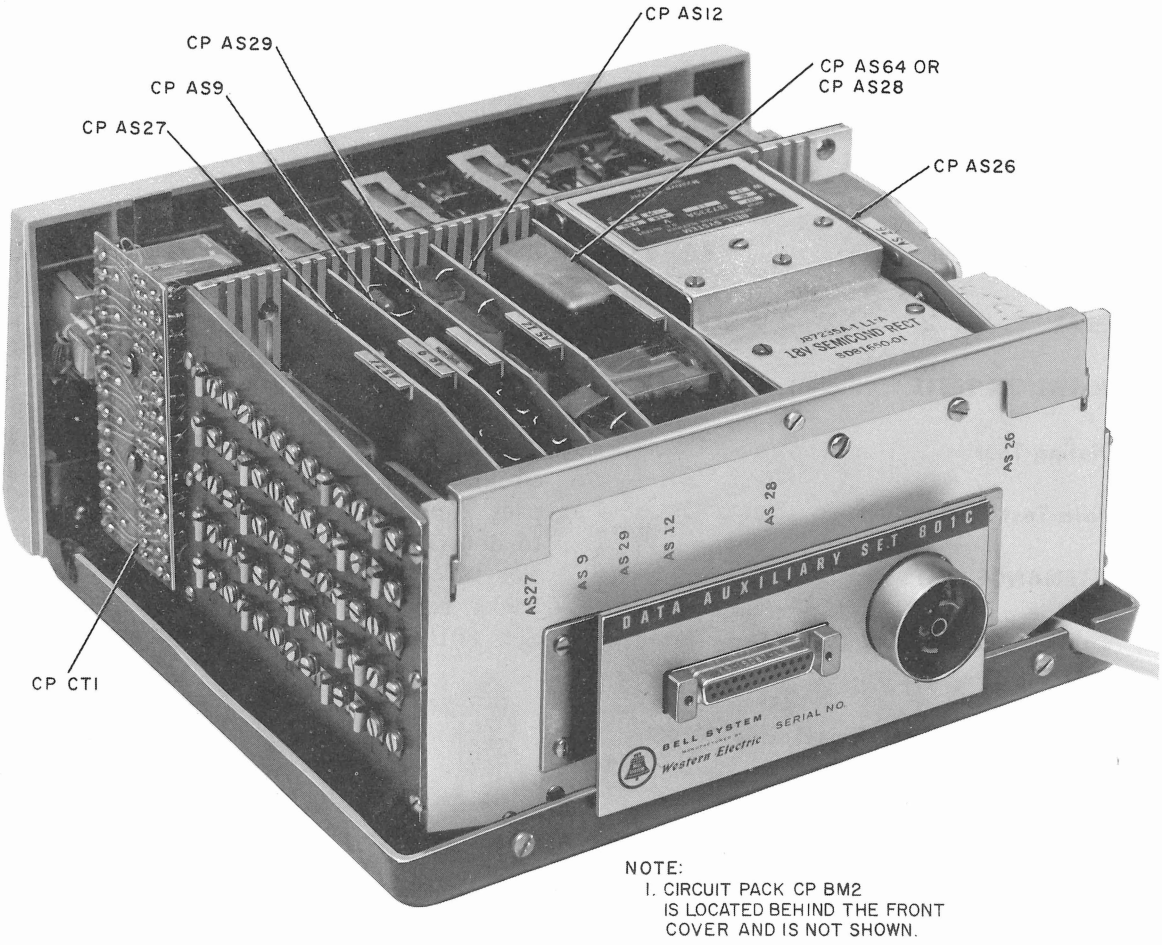


**Fig. 1—Data Auxiliary Set 801C3 and 801C4—Covers Removed Showing Circuit Pack Locations**

**1.06** If a noise condition exists and grounding problems are a possibility, an impulse noise test using a 901 Data Test Set or a 914B Data Test Set should be made as shown in Fig. 2 and Fig. 3.

**1.07** Take proper steps to ensure that the customer is not billed for test calls. See Section entitled Crediting Charges on Test Calls (010-250-001).

**1.08** A letter ***a***, ***b***, ***c***, or ***d*** added to a step number in this section indicates an action which may or may not be required depending on type of data auxiliary set and the options installed. The condition under which a lettered step or a series of lettered steps should be made is given in the Procedure column, and all steps governed by the same condition are designated by the same letter within a test. Where a condition does not apply, all steps designated by that letter should be omitted.

**1.09** DAS 801C3 and 801C4 series 5 and later have an additional ACR timer switch position at the extreme clockwise position. In this position, the speaker may be used for monitoring call progress during a normal data call.

## 2. INSTALLATION TESTS

**2.01** The following test procedure should be performed at the time of installation to verify that the data auxiliary set is operating properly. When data station trouble is experienced, this test may be used to verify that the ACU is operating properly and is not the cause of trouble. No test equipment is required for these tests.

### A. Dialing Test

**2.02** The purpose of this test is to verify that the dialing and transfer circuitry of the ACU function properly.

## TABLE B

## TROUBLE LOCATION

| TEST PROCEDURE PARAGRAPH WHERE FAILURE OCCURRED | CIRCUIT PACKS TO BE SUSPECTED OF CAUSING TROUBLE (SEE NOTE) |
|---|---|
| 2.03<br>Step 1 | AS9 (loop start only), AS12, AS26, AS27 (loop start only), and CT1 |
| 2.03<br>Steps 2 through 5 | AS26, AS28, or AS64 (depending on which of these units is used), AS29 and CT1 |
| 2.04<br>Step 2 | AS9 (loop start only), AS12, AS26, AS27 (loop start only), and CT1 |
| 2.04<br>Steps 3 through 5 | AS26, AS28, AS64 (depending on which of these units is used), AS29 and CT1 |
| 2.04<br>Step 8a | AS28, BM2 |
| 2.04<br>Step 9b | AS9 (801C4), AS12, AS27 (801C4) |
| 3.03<br>Step 12 | AS9 (loop start only), AS12, AS26, AS27 (loop start only), and CT1 |
| 3.03<br>Steps 13, 17 | AS26, AS28, or AS64 (depending on which of these units is used), AS29 and CT1 |
| 3.03<br>Steps 23 through 26 | AS12 |

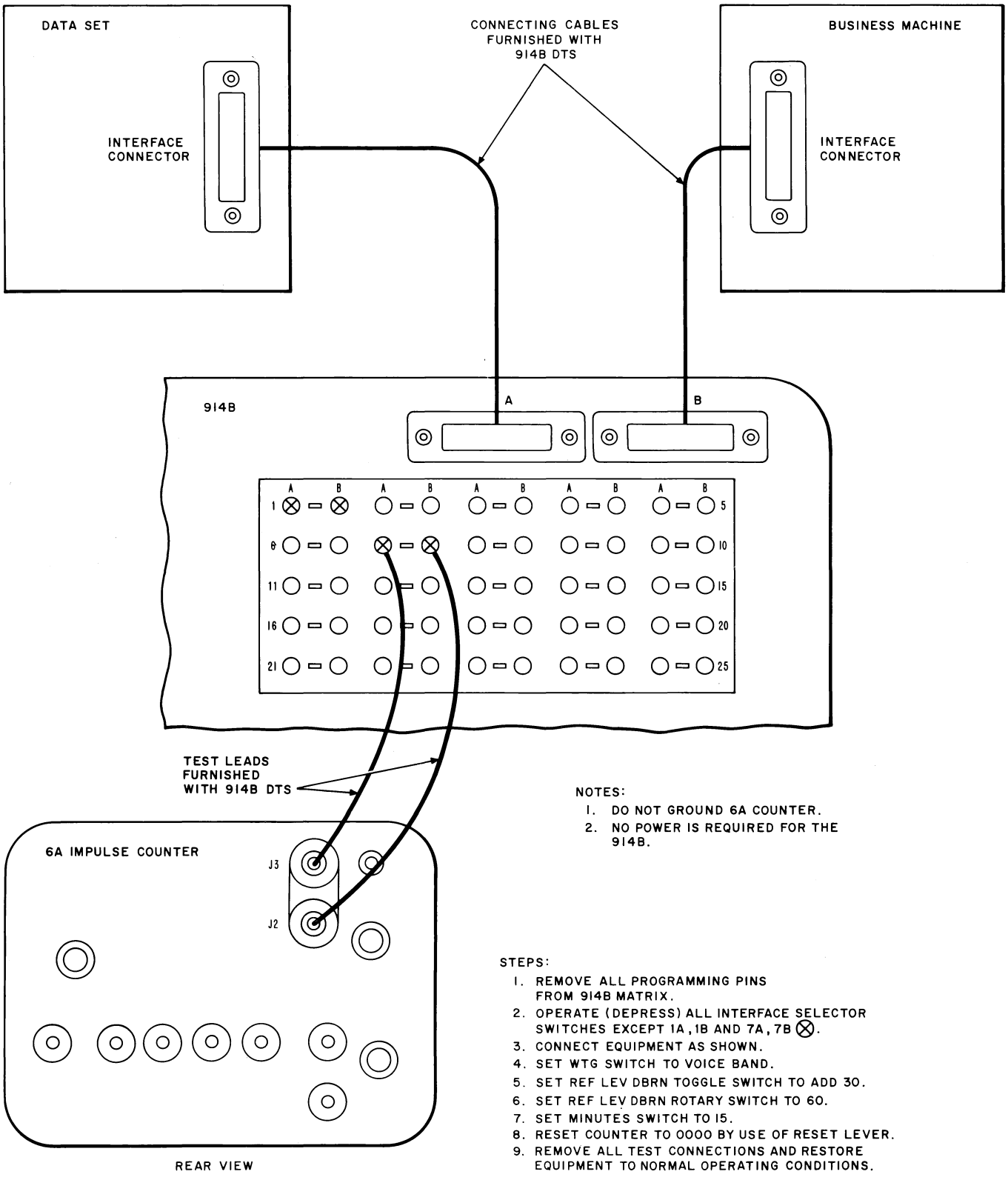


**Fig. 2—Power Ground Noise Test Using 6A Impulse Counter and 914B Data Test Set**

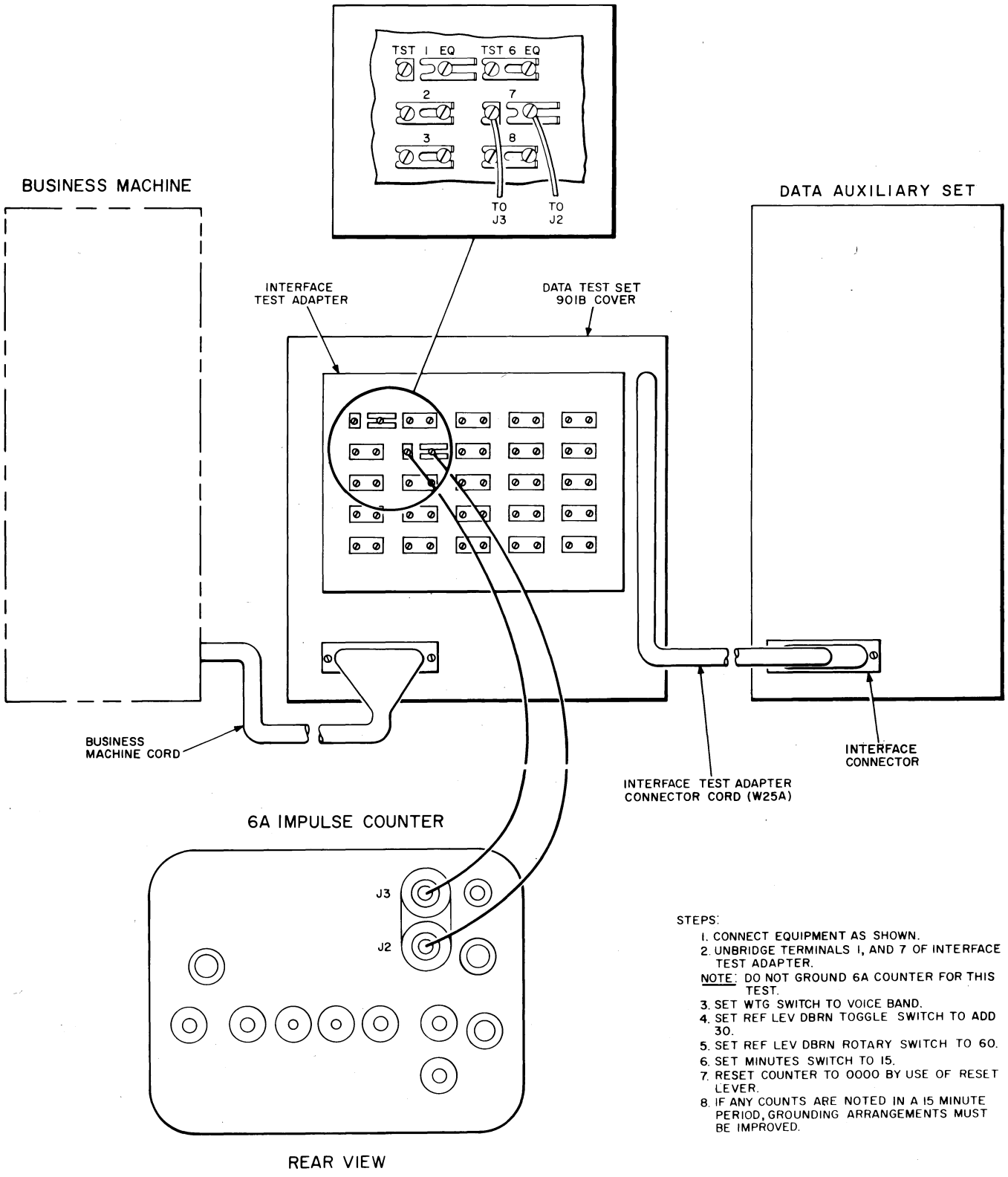


**Fig. 3—Power Ground Noise Test Using 6A Impulse Counter and 901B Data Test Set Cover**

**2.03** Before making a test of the data auxiliary set, verify that the set has been installed in accordance with the section entitled Data Auxiliary Sets 801C3 and 801C4—Installation (598-012-201). Also check to assure that the options listed on the service order have been installed.

| STEP | PROCEDURE |
|---|---|
| 1 | Depress TEST PUSHBUTTON on the ACU (Fig. 4).<br><br>***Requirement:*** PND and TEST lamps should light and dial tone should be audible in the test speaker.<br><br>***Note:*** When instructions are given in the following test to hold the PND key depressed until the PND lamp goes out, it should be understood that the lamp goes out in approximately 80 milliseconds. |

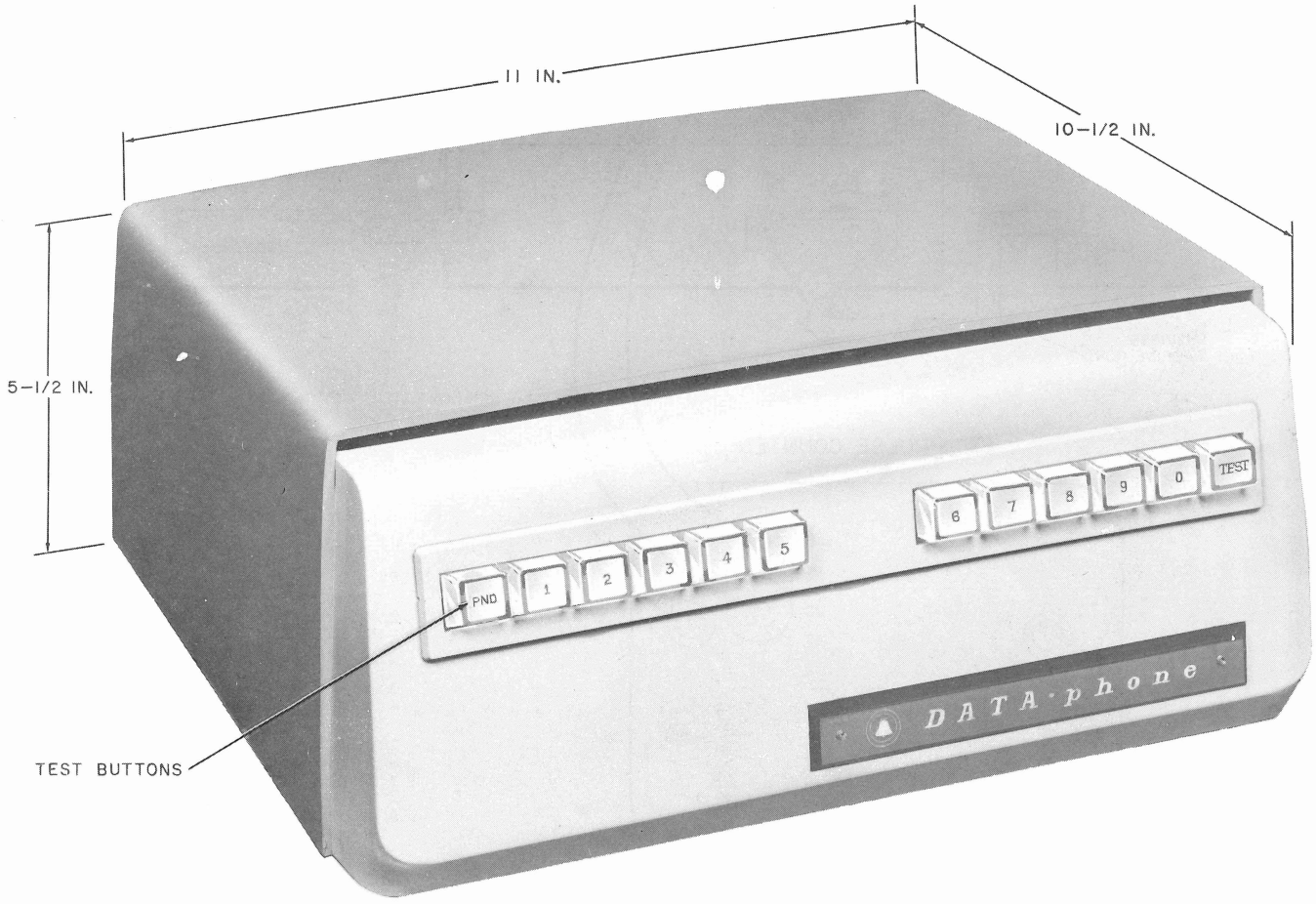


**Fig. 4—Data Auxiliary Set 801C3 and 801C4—Front View**

| STEP | PROCEDURE |
|---|---|
| 2 | Depress the numbered button corresponding to the first number of the TOUCH-TONE TEST TRUNK telephone number and hold it depressed until the PND lamp goes out.<br><br>***Note:*** Failure to wait for the PND lamp to go out may result in a wrong number being sent by the ACU. |
| 3 | When the PND lamp goes out, release the numbered button and wait for the PND lamp to light again. |
| 4 | Follow the same procedure for each of the remaining digits of the telephone number (depress the numbered button, wait for the PND lamp to go out, release the numbered button, wait for the PND lamp to light, depress the next numbered button, etc). The progress of the call can be followed by listening to the test speaker.<br><br>***Note:*** When a misdial occurs, a wrong number is reached, a busy tone is encountered, or the ACU fails to respond as previously indicated, the PND button should be depressed. This will immediately terminate the call and restore the ACU to normal. The dialing sequence may be restarted by depressing the TEST button. |
| 5 | Upon receipt of a signal to start testing, the keys of the ACU are operated in numerical sequence. If the level, frequency, and time duration of each digit are acceptable, a test verification signal is sent to the station. If a digit fails to meet the test requirements a rejection signal is sent following a "no-check time-out" interval.<br><br>***Note:*** The keys 1 through 9 and zero can be used to generate the frequency pairs corresponding to these digits. The 11th and 12th frequency combinations cannot be generated by use of the test keys; however, all seven single frequencies are generated and tested by the previous test sequence. |

**B. Data Test Center Test**

**2.04** This test is conducted under direction of the DTC to determine the ability of the ACU to place a call and transfer the line to the associated data set. To successfully complete this test (to cause the data set to go into the data mode), the data terminal ready (DTR) lead at the data set business machine interface must be in the ON (positive) state.

| STEP | PROCEDURE |
|---|---|
| 1 | Call the data test center (DTC) by using an adjacent telephone and request a remote test of the ACU and follow the DTC instructions.<br><br>***Note:*** Inform the DTC attendant of the type of associated data set and the ACU options provided such as:<br><br>(a) End of number (EON) operation (option B)<br><br>(b) ACU answer detection (option B)<br><br>(c) Data set answer detection without end of number (option E) |

| STEP | PROCEDURE |
|---|---|
| | (d) Answer-tone frequency 2025 Hz (option S)<br><br>(e) Answer-tone frequency 2225 Hz (option T) |
| 2 | Momentarily depress the TEST button.<br><br>***Requirement:*** Dial tone should be heard in the test speaker and lamps PND and TEST should light. |
| 3 | Depress the numbered button corresponding to the first number of the DTC telephone number and hold it depressed until PND lamp is extinguished.<br><br>***Note:*** Failure to wait for the PND lamp to extinguish may result in a wrong number being sent by the ACU. |
| 4 | When the PND lamp extinguishes, release the numbered button and wait for the PND lamp to light again. |
| 5 | Repeat Steps 3 and 4 for each of the remaining digits of the DTC telephone number (depress the numbered button, wait for PND to extinguish, release the numbered button, wait for PND to light, depress the next numbered digit, etc). |
| 6 | When a misdial occurs, a wrong number is reached, a busy tone is encountered, or the ACU fails to respond as previously stated, the PND button should be depressed and the sequence must be repeated.<br><br>***Note:*** After two unsuccessful attempts to reach the DTC using the ACU test keys, call the DTC using an adjacent telephone and inform the DTC of the inability to complete the call. |
| 7 | When the DTC answers the call, the answer can be heard on the test call speaker. The number 9 test button should now be depressed to send a tone to the DTC as a means of identification. |
| 8a | When EON mode of operation is to be tested—<br><br>Simultaneously depress both the number 4 and number 8 buttons. Hold the buttons depressed until PND lamp extinguishes.<br><br>***Note:*** When PND lamp extinguishes, the ACU has transferred the line to the data set. The data set can now detect answer tone and go into data mode. When the ACR timer expires, the TEST lamp will extinguish and the ACU returns to an idle state.<br><br>When the ACU answer-tone detection is to be tesed (801C4)— |
| 9b | The tone (2025 or 2225 Hz as required) must be supplied by the DTC. When the DTC sends the answer tone, it should be momentarily heard in the test speaker. When the ACU detects answer tone, the PND lamp extinguishes indicating the telephone (data) line is transferred to the data set which then enters the data mode. The TEST lamp extinguishes at the end of the ACR timer interval. |

**2.05** If the ACU has successfully completed the previous tests, it may be considered to be operating properly.

## 3. MAINTENANCE TESTS

**3.01** These tests should be made when investigating a trouble condition and maintenance is required. Defective ACUs should be tagged to identify the nature of the trouble and returned to the distributing house for repair.

### A. Call Origination Test

**3.02** This test provides a means to dial the DTC using the 914B Data Test Set (DTS) as a business machine simulator to initiate a call and dial digits manually. The DTC to be called must be instructed that a test of an ACU is to be performed and upon answering the incoming call, answer tone (2025 or 2225 as required by the ACU option) should be sent to the ACU. This test verifies that the ACU will correctly dial the digits given by the 914B DTS. A test of the interdigital timer is also included.

*Note:* The ACU and a data set must be connected to the data line using connection information provided in the Installation and Connection Bell System Practice for the particular data set.

**3.03** A 914B DTS and a suitable timing device are required for this test.


***Test set switches that are neither shown on the test connection diagram (Fig. 5) nor mentioned in text are not required for the test. Lamp indications not called for in the test are not pertinent and may be disregarded. Before making any test connections, ensure that all programming pins are removed from the matrix. Insert only those pins shown in the test connection diagram Fig. 5.***

| STEP | PROCEDURE |
|---|---|
| | *Note:* This procedure should be read carefully and understood before proceeding. Manual dialing using the 914B Data Test Set requires that the digit to be dialed be set up in binary form on the 914B control switches. The time interval between the dialing of each digit should be minimized to prevent central office time out. |
| 1 | Disconnect the power plug of the ACU from the 120 Vac receptacle. |
| 2 | Remove customer cords from the ACU and data set EIA connector. Interconnect the 914B DTS with the ACU and data set as illustrated in Fig. 5. |
| 3 | Condition the 914B DTS as shown in Fig. 5. |
| 4 | Pull out all A interface selector switches except 20A. |
| 5 | Depress all B interface selector switches except 20B. |
| 6 | Program the matrix as shown in Fig. 5. |
| 7 | Connect leads supplied with the 914B DTS from METER INPUT jacks to tip and ring of the connecting block. |
| 8 | Operate POWER switch on the 914B DTS to the ON position. |
| | ***Requirement:*** POWER lamp should light. |

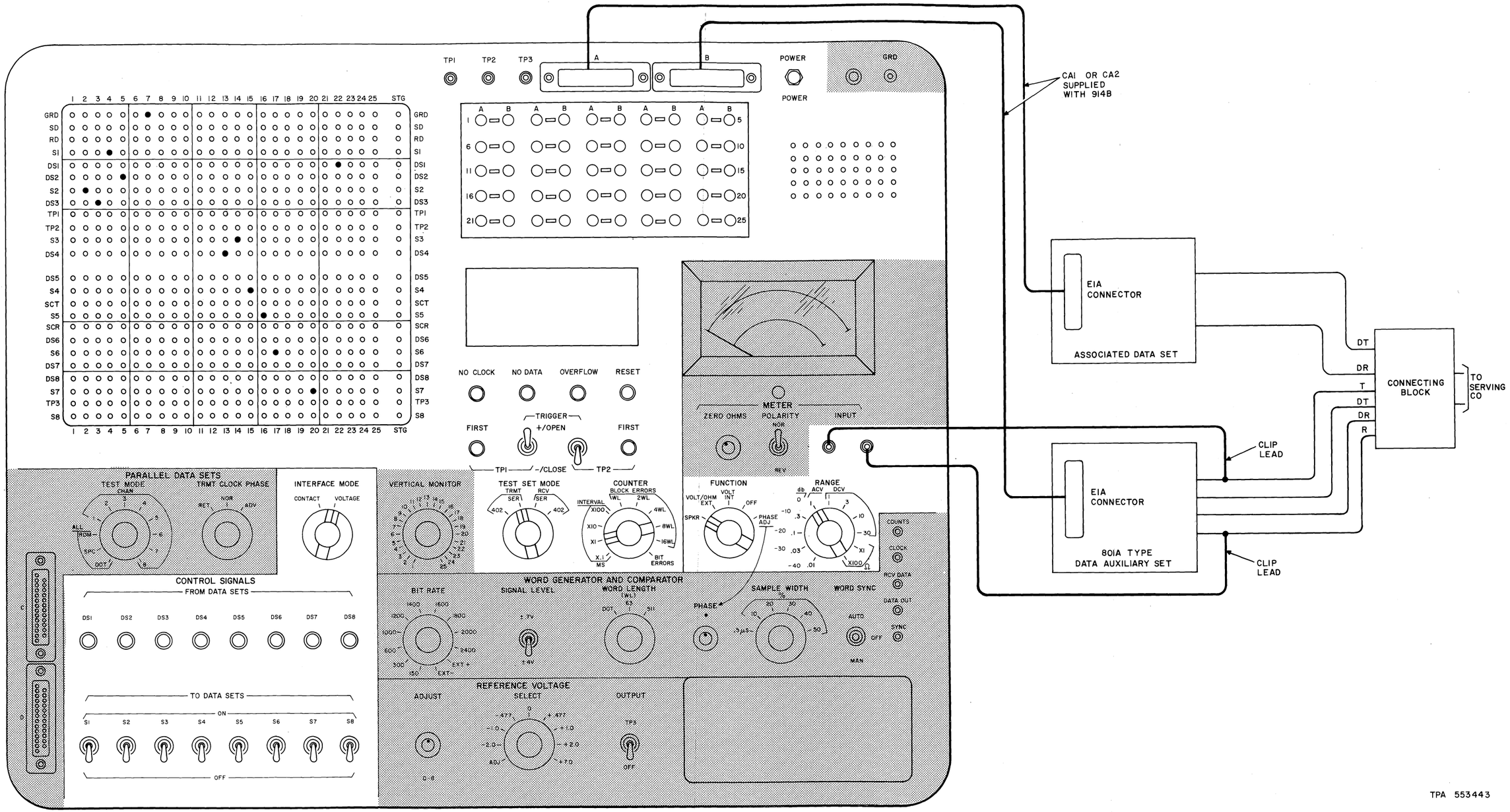


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**Fig. 5—Test Conditions for 914B DTS—Call Origination Test**

| STEP | PROCEDURE |
|---|---|
| 9 | Insert the ACU power plug into a 120 Vac receptacle. |
| 10 | Set the abandon call and retry (ACR) timer to the 40-second position (extreme clockwise position for series 1 through 4 and one setting from full clockwise position for series 5). |
| 11 | Operate switch S7 to the ON position. This conditions the data set to go into the data mode by turning data terminal ready (DTR) ON. |
| 12 | Operate switch S1 (CRQ) to the ON position. |
| | ***Requirement:*** Dial tone should be heard through the 914B DTS speaker and lamps DS1 (DL0) and DS2 (PND) should light. [Level of tone may be controlled by RANGE (ACV) switch.] |
| 13 | Using Table C and switches S3 through S6, set up the first digit of the DTC telephone number to be dialed. |
| 14 | Operate switch S2 to the ON position. |
| | ***Requirement:*** Lamp DS2 will extinguish (the digit present on the NB interface leads is being dialed by the ACU). |
| 15 | Operate switch S2 to the OFF position. |
| | ***Requirement:*** Lamp DS2 will light. |
| 16 | Repeat Steps 13 through 15 for the remaining digits of the telephone number. |
| | ***Note:*** If the ACR timer interval is exceeded, lamp DS3 will light and the test must be repeated. |
| 17 | Verify that the correct digits of the DTC telephone number have been dialed. |
| | ***Requirement:*** Telephone should ring upon completion of the call from the ACU. |
| 18a | When ACU answer-tone detection is to be tested— |
| | Answer tone should be heard coming from the DTC. |
| | ***Requirement:*** DS2 (PND) extinguishes and DS4 (DSS) lights when the line is transferred to the data set. |
| 19b | When EON operation is to be tested— |
| | Using Table C and switches S3 through S6, set up to send 12 to the ACU. |
| 20b | Operate switch S2 to the ON position. |
| | ***Requirement:*** Lamp DS2 will extinguish and DS4 will light when the line is transferred. |

## TABLE C

## BINARY-TO-DECIMAL CONVERSION

| DIALING SWITCH SETTINGS | | | | | VERTICAL MONITOR SWITCH — VOLTAGE READINGS | | | |
|---|---|---|---|---|---|---|---|---|
| DECIMAL DIGIT | S3-NB1 | S4-NB2 | S5-NB4 | S6-NB8 | NB1 POS 14 | NB2 POS 15 | NB4 POS 16 | NB8 POS 17 |
| 0 | ON | ON | ON | ON | + | + | + | + |
| 1 | OFF | ON | ON | ON | − | + | + | + |
| 2 | ON | OFF | ON | ON | + | − | + | + |
| 3 | OFF | OFF | ON | ON | − | − | + | + |
| 4 | ON | ON | OFF | ON | + | + | − | + |
| 5 | OFF | ON | OFF | ON | − | + | − | + |
| 6 | ON | OFF | OFF | ON | + | − | − | + |
| 7 | OFF | OFF | OFF | ON | − | − | − | + |
| 8 | ON | ON | ON | OFF | + | + | + | − |
| 9 | OFF | ON | ON | OFF | − | + | + | − |
| 10 | ON | OFF | ON | OFF | + | − | + | − |
| 11 | OFF | OFF | ON | OFF | − | − | + | − |
| 12 | ON | ON | OFF | OFF | + | + | − | − |
| 13 | OFF | ON | OFF | OFF | − | + | − | − |
| 14 | ON | OFF | OFF | OFF | + | − | − | − |
| 15 | OFF | OFF | OFF | OFF | − | − | − | − |

| STEP | PROCEDURE |
|---|---|
| | **Call Termination Test** |
| 21c | If option Z (call termination by CRQ) is used— |
| | Operate S1 to OFF. |
| | ***Requirement:*** DS1 extinguishes. |

| STEP | PROCEDURE |
|---|---|
| 22d | If option G (call termination through data set) is used—<br><br>Operate S1 to OFF.<br><br>***Requirement:*** DS1 remains on. |
| 23d | Operate S7 to OFF.<br><br>***Requirement:*** DS1 extinguishes. |
| | **Abandon Call and Retry Timer Test** |
| 24 | Set the abandon call and retry (ACR) timer to the 7-second position. |
| 25 | Set S1 to ON.<br><br>***Requirement:*** Lamps DS1 and DS2 light. DS3 lights at end of ACR timer interval.<br><br>***Note:*** Time the interval from the moment switch S1 is operated to the ON position and lamp DS3 lights. Limits are given in Table D. |

**TABLE D**
**ACR TIMER ADJUSTMENT PROCEDURE**

| INTERVAL SELECTED SECONDS | ACR TIMER ADJUSTMENT | MEASURED INTERVAL SECONDS |
|---|---|---|
| 7 | Rotate adjustment screw to extreme counterclockwise position. | 7 to 9 |
| 10 | Rotate adjustment screw one position clockwise from extreme counterclockwise position. | 10 to 12 |
| 15 | Rotate adjustment screw two positions clockwise from extreme counterclockwise position. | 15 to 18 |
| 25 | Rotate adjustment screw three positions clockwise from extreme counterclockwise position. | 25 to 30 |
| 40 | Rotate adjustment screw four positions clockwise from extreme counterclockwise position. | 40 to 48 |
| *40 Monitor | Rotate adjustment screw to extreme clockwise position for 40-second monitor. | 40 to 48 |

*Data Auxiliary Sets 801C3 and 801C4 series 5 and later have an additional switch position at the extreme clockwise to allow use of the speaker for monitoring normal call progress. In this case, the 40-second position is one position counterclockwise from the extreme clockwise position.

| STEP | PROCEDURE |
|---|---|
| 26 | Turn off S1 for reset. |
| 27 | Repeat Steps 24 through 26 for remaining timer intervals given in Table D. |
| | **Timing Test** |
| 28 | Using the test leads supplied with the 914B DTS, connect TP1 to the center terminal of interface selector switch 2 and TP2 to the center terminal of interface selector switch 5. |
| 29 | Set switch TRIGGER-TP1 to the +/OPEN position. |
| 30 | Set switch TRIGGER-TP2 to the −/CLOSE position. |
| 31 | Set the TEST SET MODE switch to TRMT SER position. |
| 32 | Set the COUNTER switch to the X1 position. |
| 33 | Set switches S3 through S6 to the ON position. |
| 34 | Operate switch S1 to the ON position. |
| | ***Requirement:*** Lamps DS1 and DS2 should light. |
| 35 | Remove central office tip and ring leads at the external connecting block. |
| | ***Note:*** This will prevent unwanted digits being sent to the central office. |
| 36 | Momentarily depress the RESET button in the 914B DTS. |
| | ***Requirement:*** Counter display should read 00. |
| 37 | Operate switch S2 to the ON position. |
| | ***Requirement:*** Counter display should read 77 $\pm$3 milliseconds. |
| 38 | Operate switch S1 to the OFF position. |
| | ***Requirement:*** Lamps DS1 and DS2 will extinguish indicating an idle state. |
| 39 | Reconnect central office tip and ring at the external connecting block. |
| 40 | Set the ACR timer to the position specified on the service order. |
| 41 | Return the ACU to its normal operating condition. |

## B. Monitoring of Interface Leads

**3.04** This test should be made when a trouble condition exists that cannot be detected by routine testing, for example, when the ACU is operating under control of the customer equipment. This test requires coordination with the customer and allows monitoring of the interface leads to

evaluate the interaction between the business machine and the ACU during a normal data call by the customer.

**3.05** The following test equipment is required.

- One clip lead
- 914B Data Test Set

| STEP | PROCEDURE |
|---|---|
| | ***Note:*** This procedure must be read carefully and understood before proceeding so the time required between the dialing of digits is minimized. The telephone company employee controls DPR using the 914B DTS and consequently controls the dialing rate. |
| 1 | Set the abandon call and retry (ACR) timer to the 40-second position (extreme clockwise position for series 1 through 4 and one setting from full clockwise position for series 5). |
| 2 | Remove the ACU power cord from the 120 Vac receptacle. |
| 3 | Connect the data auxiliary set and the customer equipment to the 914B DTS as shown in Fig. 6. |
| 4 | Condition the 914B DTS as shown in Fig. 6. |
| 5 | Program the matrix as shown in Fig. 6. |
| 6 | Depress all interface selector switches except 2A and 24A. |
| 7 | Insert the ACU power cord into a 120 Vac receptacle. |
| 8 | Operate POWER switch on the 914B DTS to the ON position.<br><br>***Requirement:*** POWER lamp should light. |
| 9 | Request the customer to turn on the call request (CRQ) lead at the business machine. |
| 10 | Inform the customer to condition the NB interface leads with the digits to be dialed, and turn on DPR lead.<br><br>***Requirement:*** Lamp DS1 will light. |
| 11 | When lamp DS1 lights, move VERTICAL MONITOR switch through positions 14, 15, 16, and 17 in that order and record the polarity of each reading. These polarities may be used later in conjunction with Table C to convert the potentials (binary code) to a decimal digit. This digit may be compared to the known digit stored in the business machine.<br><br>***Note:*** Since the meter polarity switch is in the NORMAL position, a meter deflection to the left (OFF SCALE) indicates a negative reading, and a deflection to the right indicates a positive reading. |
| 12 | Operate switch S1 to the ON position.<br><br>***Requirement:*** Lamp DS1 will extinguish (the digit present on the NB interface leads is now being dialed by the ACU). |

| STEP | PROCEDURE |
|---|---|
| 13 | When Lamp DS1 lights, operate switch S1 to the OFF position. |
| 14 | Repeat Steps 10 through 13 until all the digits of the called station have been dialed (DS1 lights, position VERTICAL MONITOR to verify digit, operate switch S1, etc). |
| 15 | Position FUNCTION switch to SPKR and RANGE switch to ACV 1 after the last digit has been dialed.<br><br>***Requirement:*** Shortly after the called station answers the call, answer tone of either 2025 Hz or 2225 Hz should be heard through the 914B DTS speaker, and data lamp on the associated data set should light.<br><br>***Note:*** It is important that this step be accomplished immediately after the last digit has been dialed, otherwise the answer tone may not be heard through the 914B DTS speaker. The speaker may be used to monitor the remainder of the data call. |
| 16 | Remove all tests connections to the 914B DTS and the ACU. |
| 17 | If the ACU has correctly dialed the digits supplied by the customer and is working correctly, return the ACU to its normal operating condition. If any of the digits were incorrectly dialed, tag the defective ACU describing the cause of trouble and return it to the distributing house for repair. |

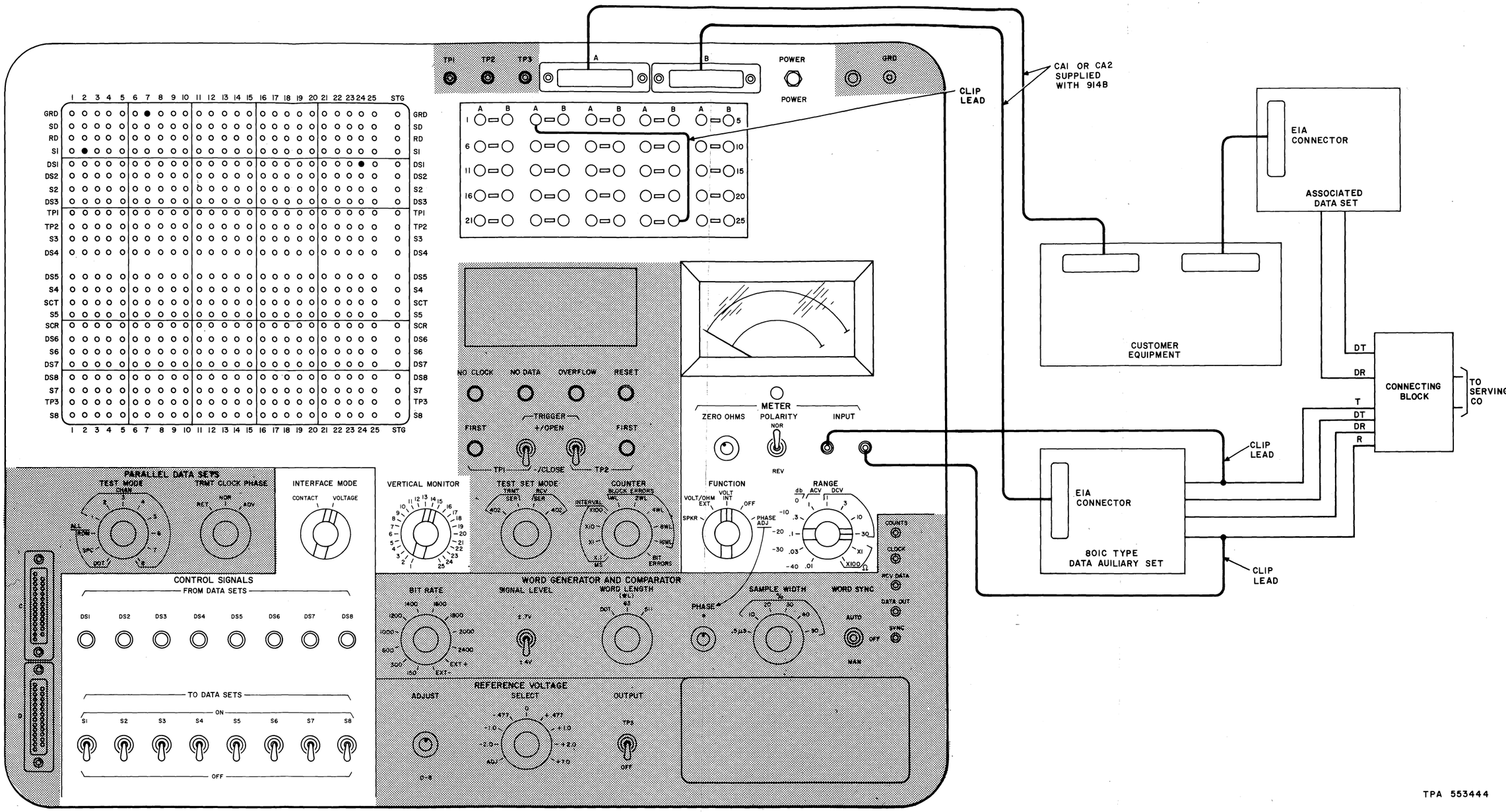


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**Fig. 6—Test Conditions for 914B DTS—Monitoring of Interface Leads**