1001A DATA COUPLER

DESCRIPTION, INSTALLATION, MAINTENANCE, AND TESTS

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1. GENERAL

1.01 This section contains the information required for installing and maintaining 1001A data couplers (Fig. 1).

1.02 This section is reissued to indicate that the KS-16886-L2 transformer, the 1044A connecting block, and the resistor be replaced by the standard KS-20426-L1 transformer. This eliminates a problem of overheating and provides a simpler installation. Since this reissue constitutes a general revision, arrows generally used to indicate changes have been omitted.

1.03 The data access arrangement (DAA) includes both the data coupler and telephone set as described in appropriate tariffs. The 1001A [rated Manufacture Discontinued (MD)] is an automatic data coupler which provides the means for connecting customer-provided, automatic data equipment to the switched network for data and voice communications. The uniform service order code (USOC) for this coupler is CBS.

1.04 The 1001A data coupler provides the following:

- Interface control lead voltages as specified in Electronic Industries Association (EIA) Standard RS-232-B.

- ***A*** lead control for operation with key telephone equipment.

- Capability of operation with data auxiliary set (DAS) 801-type automatic calling unit (ACU).

1.05 Additional telephone functions, such as alternate voice service, may be provided with an associated telephone set as a standard option. Audible monitoring of data transmission and mode indication through switch contacts are provided by 503C and 2503C telephone sets.

1.06 The data coupler may interface customer equipment directly to local loop facilities, key telephone system station lines, or to private branch exchange (PBX) station lines.

1.07 At installations where TOUCH-TONE® calling service has been ordered, the customer may generate tone signals for originating calls through the transmission interface leads of the coupler.

1.08 The service offering in which the data coupler is used provides the customer with end-to-end transmission performance characteristics comparable to DATA-PHONE® service on the switched telecommunications network. Because customer equipment, over which the Bell System has no design control, may contribute significantly to error performance, the Bell System cannot assume responsibility for the accuracy of transmitted data. End-to-end facilities, including the local loop, will be engineered and maintained to equivalent DATA-PHONE service requirements. These requirements are specified in Section 314-205-501 for local loops and Section 314-205-500 for the switched network.

2. DESCRIPTION

A. Physical Description

2.01 The 1001A data coupler is a wall-mounted unit measuring 9 inches wide, 11 inches high, and 2-1/4 inches deep. The coupler weighs approximately 2-1/2 pounds and is enclosed in a gray plastic housing. The housing consists of a dark gray base and a light gray cover which snap together. Two keyhole slots and one screw hole are provided on the base for mounting the unit on a wall or other vertical surface. ***The coupler must be vertically mounted to allow proper operation of the mercury relay.***

Note: Three No. 6 by 3/8-inch pan-head metal screws and three No. 6 by 1/2-inch wood screws are shipped with each data coupler repaired and returned to the field for service. Use of larger screws will short circuit printed paths on the circuit pack.

2.02 Circuitry for the coupler is mounted on a single printed CP. Eight screw terminals at the lower end of the CP provide the interface for connection to customer equipment (Fig. 2). Two additional unmarked terminals are open-ended (not connected) on the board and provide extra tie points when required. Interface control leads use EIA RS-232-B voltage levels. See Table A for lead designations. The cord required for connecting the customer modem to the interface must be supplied by the customer.

2.03 Eight screw terminals at the upper left and right sides of the printed CP provide the interface for connecting the telephone line and associated apparatus to the coupler. The housing cover must be removed to make connections within the coupler. To remove, lift cover up from the bottom to relieve tension on mounting lips, then pull cover out at the top. Use D station wire to terminate the connections. The following pairs of leads terminate on this interface:

- T and R—Telephone line transmission pair

- KA and KA1—Key system ***A*** lead control contacts to indicate the off-hook condition to associated key telephone equipment

- A and A1—Extension of associated telephone set switchhook (line switch) to terminal equipment

- P1 and P2—Low-voltage ac leads from external transformer to internal power supply. Terminals 3 and 4 of transformer KS-20426-L1 are wired to P1 and P2 screw terminals.

2.04 Two locking switches and associated lamps (TST and ANS) are located at the top of the coupler to provide control and indication of test mode conditions. The two lamps glow dimly when the unit is not in test mode.

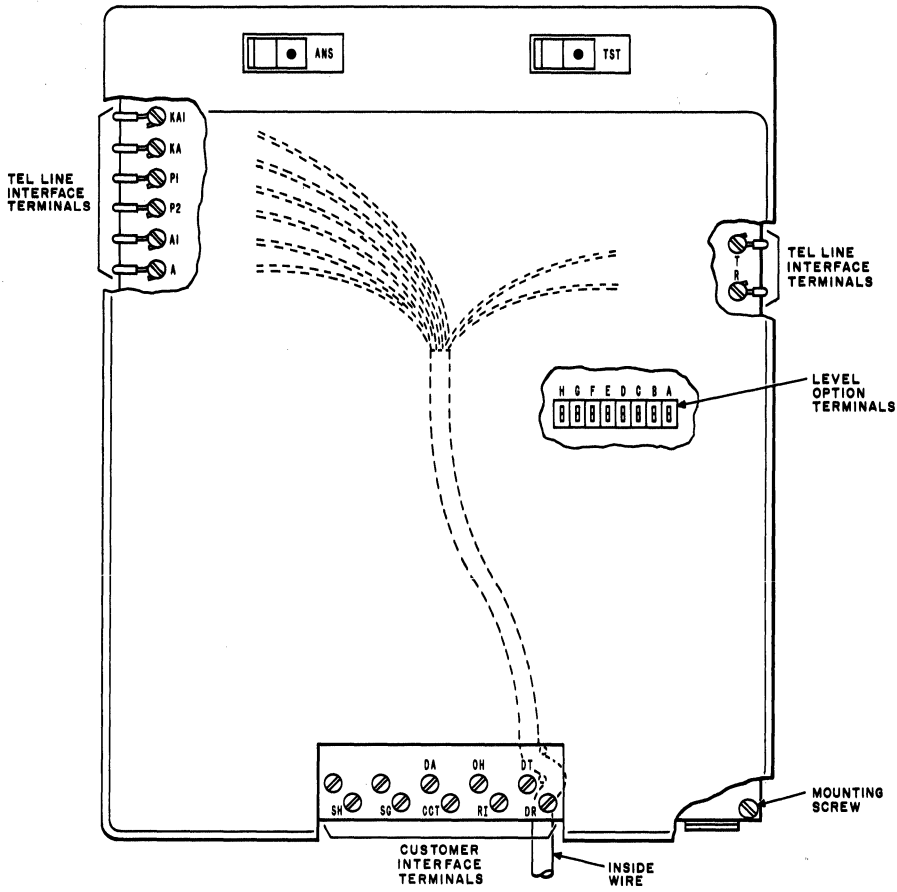


Fig. 2—Route of Station Wiring and Location of Terminals

2.05 Level option terminals located on the CP are strapped by the installer for adjusting the power threshold of the automatic level control (ALC) (limiter) circuit of the coupler.

2.06 The data coupler is designed to operate over a range of 0 to 120°F, with a relative humidity of up to 95 percent.

2.07 One external transformer (KS-20426-L1) is required with each coupler to step down the standard 117-Vac to 23.6 Vac. The internal rectifier provides the dc supply to all the coupler circuitry except to the ALC circuit which is powered directly from telephone line current.

B. Functional Description

2.08 ***General:*** The data coupler is a network protective unit designed to interface with a customer-provided automatic data terminal. The coupler provides signals to the data terminal to indicate the detection of ringing signals. In response to the signals, the data terminal provides signals which cause the coupler to seize the line, trip ringing, and cut through the transmission path.

TABLE A

CUSTOMER INTERFACE LEAD DESIGNATIONS FOR 1001A DATA COUPLER

TERMINAL DESIGNATION	FUNCTION	
DT	Data Tip	600-Ohm Transmission Leads
DR	Data Ring	
OH	Off-On Hook Control	
DA	Request Data Transmission Path Cut-Through	
RI	Ring Indication	
CCT	Coupler Cut-Through	
SH (or MI)*	Switchhook Status of Associated Tel Set	
SG	Signal Ground	

* This terminal is redesignated MI when the coupler is installed with a 503C or 2503C telephone set.

Prior to the transmission path cut-through, a 2-second delay is provided to allow proper operation of automatic message accounting equipment. A polarity guard, ALC, and a coupling transformer are provided to protect the telecommunications network, coupler, and customer equipment. In addition, the coupler circuitry permits the data terminal to originate and terminate data calls automatically.

2.09 ***Coupler Transmission Path:*** The coupler transmission path primarily consists of a coupling transformer, an ALC circuit, and a polarity guard (Fig. 2). The transformer terminates the telephone loop and provides a 2-way protective function (ie, hazardous voltages, surge protection, and longitudinal isolation). The ALC circuit prevents the customer signal level from exceeding the prescribed maximum limit. The polarity guard maintains the polarity of the line current and voltage required by the ALC circuit.

2.10 The ALC circuitry continuously monitors the output of the data signals. Option strapping on the level-adjusting network determines the proper power level (threshold) at which the circuit operates to control the output signal.

2.11 The signal power level is continuously averaged by the detector and integrator. When the averaged signal level exceeds the threshold during any 3-second interval, current is driven through the thermistor. The thermistor heats up, decreases in resistance, and since the thermistor shunts the transmission path, reduces the signal level to the threshold value.

Data Mode

2.12 ***Ring Detection:*** The ring detector (Fig. 3) is activated when 20-Hz ringing signal is present on the line, indicating an incoming call. The R relay, part of the ring detector, operates and releases in response to each half cycle of ringing current. Contact closures of the R relay contact are used to drive the ring integrator (RI) circuit. After approximately 2 cycles of 20-Hz ringing signal are detected by the RI circuit, it operates to reset the 2-second call timer through inverter Q15 and to operate the Q18 interface driver.

> ***Note:*** When dial pulsing through certain 1001A couplers into a No. 5 crossbar or a step-by-step central office, sharp pulses are generated which cause capacitor C8 to discharge

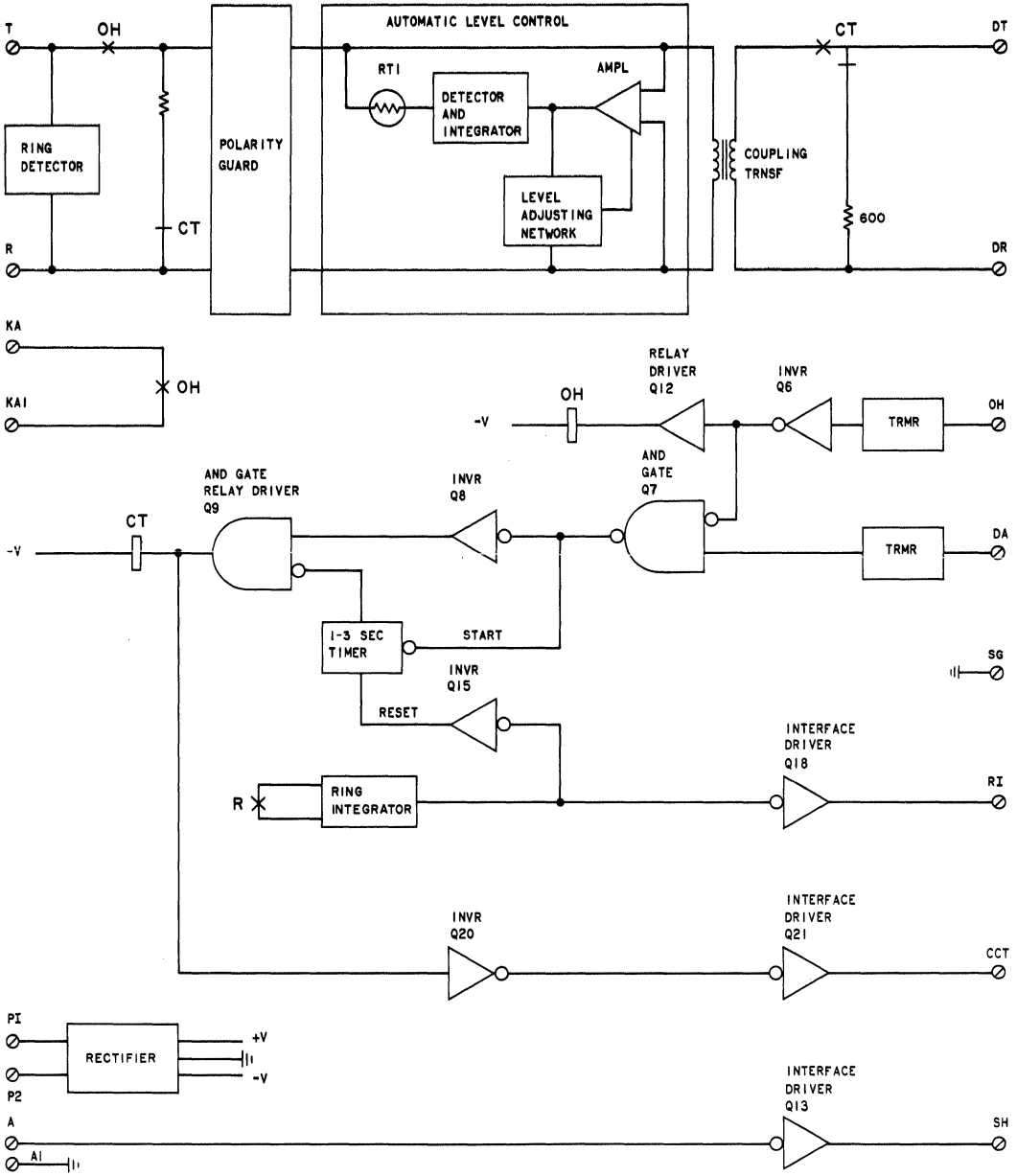


Fig. 3—Functional Schematic of 1001A Data Coupler—Data Mode

into the R relay. This causes the R relay to operate momentarily, and may result in the RI circuit being activated during dialing. This condition can be corrected by the addition of a 458A, 458C, KS-21222, or equivalent diode (50-volt 1-amp silicon junction, such as a 1N4001). This diode is connected between the collector of transistor Q12 and the negative side of capacitor C13. Connect the cathode of the diode to the capacitor. If the diode is installed incorrectly (reversed), the RI circuit will be activated permanently and the OH relay will operate erratically. This diode may be installed by the employee during a maintenance visit. When a coupler is returned to the repair facility, the diode is installed. This reduces the RI positive-to-negative transition to less than 10 ms from approximately 100 ms. Some customer terminals will not operate correctly with the short interval and may require that the diode be removed.

2.13 ***Answering Incoming Calls:*** When a positive input is applied through the inverter (Q15), the timer resets for a timing cycle and removes an input from the Q9 AND gate. When OH and DA are turned ***on***, a negative input causes the timer to start the 2-second timing interval. This timing interval is required by the serving central office billing equipment. At the end of the interval, a positive input is applied to the Q9 AND gate which remains constant until the timer is reset (ie, the coupler responds to another incoming call). This removes the timer from the circuit except on incoming calls.

2.14 When Q18 operates, a positive voltage is applied to the RI interface lead to inform the data terminal of the incoming call. In response, the data terminal applies voltages to the OH and DA interface leads.

An EIA ON voltage is a voltage more positive than +5 volts. An EIA OFF voltage is a voltage more negative than -5 volts.

2.15 The voltage on the OH lead applies an input to the Q6 AND gate and operates the OH relay. Performing the off-hook function, the OH relay closes the loop to trip ringing and closes the KA lead to signal the associated key telephone equipment or ACU, if provided.

2.16 The voltage on the DA lead supplies an input to the Q7 AND gate. The output of the AND gate starts the timer circuit and applies an input to the Q9 AND gate relay driver. At the end of the timing interval, the second input (from timer) to the Q9 AND gate operates the CT relay and the Q21 interface driver.

2.17 The CT relay removes the terminating resistor (R) from the loop and connects the data terminal to the telephone line through the ALC circuit.

2.18 The Q21 interface driver applies a voltage to the CCT interface lead to inform the data terminal that the data terminal is now connected to the local telephone loop through the coupler.

> ***Note:*** The presence of the ON voltage on the CCT lead does not imply that an end-to-end connection has been established.

2.19 The data coupler contains no circuitry to generate or detect answer tone signals. The customer must provide or detect answer tone when required.

2.20 ***Automatic Answer:*** The customer can provide automatic answer of incoming calls by providing a positive ON voltage to the OH interface lead in response to a positive RI interface lead output. The customer must hold OH input positive to remain in data mode. Also, the exclusion key option must provide for the coupler to control the line (option A).

2.21 ***Call Origination (Dial-Pulsing):*** The customer can originate a call by dial pulsing (rotary dial) or tone-address signaling (eg, TOUCH-TONE). A positive (ON) voltage applied to the OH interface lead, either as a call origination or as a transfer from a manually originated call, will cause the OH relay to provide the off-hook function as previously described. A negative (OFF) voltage applied to the lead causes the OH relay to drop and open the telephone loop. Also, the circuit between the KA lead and the KA1 lead is opened. This sequence of operation permits the data terminal to generate dial pulses for call origination when dial tone is present. The pulsing sequence and timing requirements are as follows (Fig. 4):

(1) The OH lead is closed.

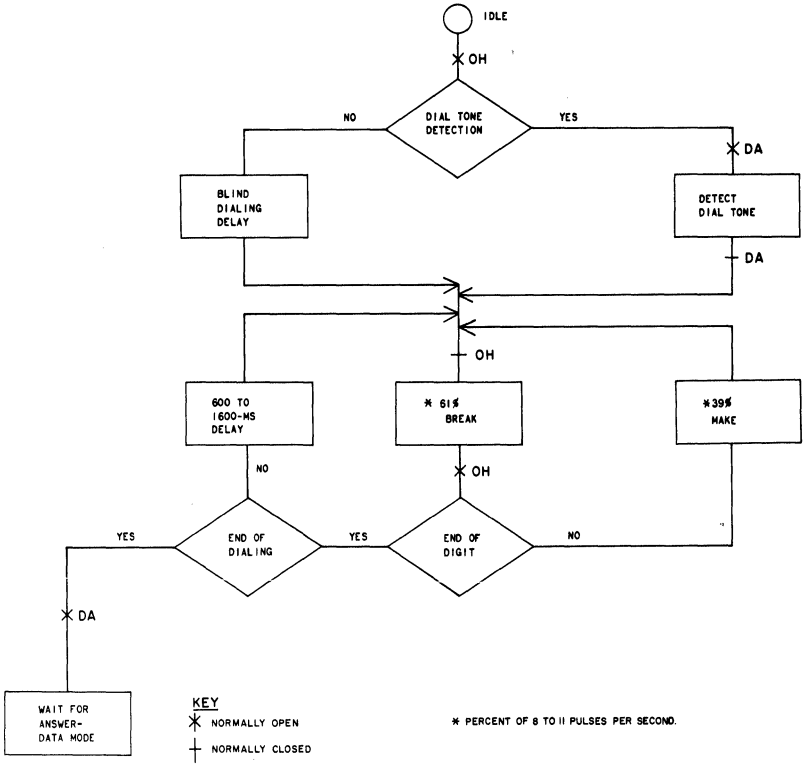


Fig. 4—Customer Automatic Calling Sequence Diagram—DC Dial Pulsing

Note: The DA lead may be closed to detect dial tone or, after an interval, the presence of tone may be assumed and blind dialing initiated. The DA lead must be released for the remainder of the dialing sequence after tone is detected. The dialing rate is 8 to 11 pulses per second.

(2) The OH lead is opened for 61-percent break interval.

(3) The OH lead is closed for 39-percent make interval.

(4) Steps (2) and (3) above are repeated for the number of pulses required, eg, a total of five releases of the OH lead for the digit 5.

(5) After the last pulse of a given digit, a 600- to 1600-ms delay occurs and the first pulse of the next digit is started.

(6) After all digits have been generated, the DA lead is closed.

In the event the local loop is 800 ohms or more and DA is ON before OH, insufficient line current may be drawn to hold the line. In this case, a 2A range extender must be installed at the serving central office (SCO).

2.22 Operation of the DA lead, either for the detection of dial tone or after the dialing sequence is completed, causes the circuit to function

the same as on incoming calls when combined with the operation of the OH lead. The CT relay operates to connect the data terminal to the telephone line, and the Q21 interface driver turns ***on*** the CCT lead to inform the terminal equipment that the coupler has closed the transmission path to the local loop.

> ***Note:*** Since there is no ringing signal present on an outgoing call, the 2-second timer is not reset and CCT turns ***on*** immediately after OH and DA are turned ***on.***

2.23 ***Call Origination (Tone-Address Signaling):*** Figure 5 shows the call origination sequence for tone-address signaling. As previously stated, turning ***on*** the OH and DA leads causes the coupler to go off-hook and provide a transmission path between the data terminal and the telephone line. When dial tone is present, multifrequency signals are generated to access the switched network. The customer may then wait for answer tone or a verbal answer before transmitting data.

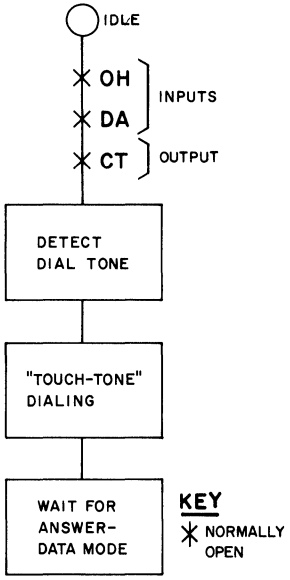


Fig. 5—Customer Automatic Calling Sequence Diagram—TOUCH-TONE Dialing

2.24 ***Call Termination:*** When data transmission is complete, the data coupler does ***not*** provide automatic disconnect. ***The data terminal must recognize the end of the call and must turn OFF the OH interface lead.*** In turn, the OH and CT relays drop to open the telephone loop and to disconnect terminal equipment from the coupler. The coupler returns to idle state. A line current status indicator (LCSI) may be installed with the coupler on an optional basis to aid the customer in recognizing end of call. The LCSI is further described in 3.11 through 3.14.

Test Mode

Operation of the TST switch while transmitting data will interrupt the data signals.

2.25 A test circuit provides the means for applying a test tone to the line through the ALC circuit (Fig. 6). This permits testing the level control, the local loop, and certain logic control functions of the coupler. The circuit is designed to be remotely tested from the local test desk (LTD), although a data test center (DTC) or other designated test location may perform the test.

2.26 The test circuit consists of a test oscillator, test (TE) relay, and two switches (TST and ANS) with associated lamps. The TST switch is used to initiate the test mode. The switch operates the test relay and causes the TST lamp to light. Operation of the test relay (1) removes the transmission path from customer equipment and connects the output of the test oscillator to the customer side of the transformer, (2) removes the interface leads from the customer equipment to prevent false operation and connects the leads in the test configuration, (3) enables the ANS lamp to light on incoming ringing, and (4) connects the DA and OH functions to the ANS switch.

2.27 The data coupler detects incoming ringing signals, which causes the ANS lamp to light (ie, 2 seconds ON and 4 seconds OFF). When the ANS switch is operated, the coupler answers the call and the following occurs: (1) the OH relay operates to trip ringing, (2) the timer starts, (3) the TST and ANS lamps go off, and (4) at the end of the timer interval, the CT relay operates to couple the oscillator output through the ALC to

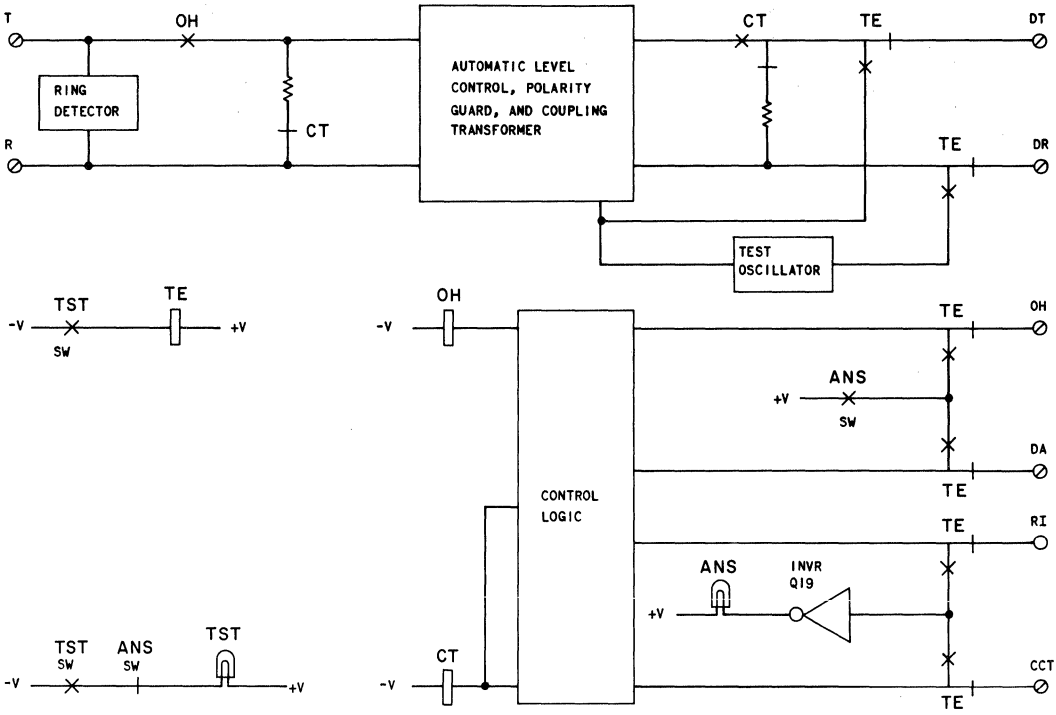


Fig. 6—Functional Schematic of 1001A Data Coupler—Test Mode

the telephone line and to cause the ANS lamp to relight.

2.28 The test circuit generates a 2800-Hz signal at a level which exceeds the maximum power level allowed for any coupler installation. This level causes the ALC circuit to operate and reduce the signal level to the value specified at time of installation.

2.29 Restoring the TST and ANS switches releases the coupler from test mode. ***The TST and ANS switches must both be restored for proper operation of the coupler.***

3. OPTIONS

A. Telephone Sets

3.01 An associated telephone set is a standard option with the data coupler. The coupler SH and SG interface leads provide the customer with the status of the line switch on an associated telephone set when used with the data coupler. The coupler can be installed without a telephone set for fully automatic operation. When a telephone set is provided, the exclusion key and telephone set ringer wiring options must be specified on the service order. The exclusion key options provide for either the coupler or the telephone set to control the line. Telephone set ringer options provide the desired ringing features for each of the two line control options. A description of these options is included in the following paragraphs.

(a) ***Option A—Coupler Controls Line (Automatic Operation)***

(b) ***Option B—Telephone Set Controls Line***

(c) ***Option C—With Ringer Connected on Telephone Set Side of Exclusion Key:***

(1) When coupler controls line

When the exclusion key ***is not operated,*** the coupler RI interface lead can be activated but the telephone set cannot ring.

When the exclusion key ***is operated,*** the telephone set cannot ring and the coupler RI interface lead cannot be activated (since handset must be lifted to operate exclusion key and this causes dial tone).

(2) When telephone set controls line

When the exclusion key ***is not operated,*** the telephone set can ring but the coupler RI interface lead cannot be activated.

When the exclusion key ***is operated,*** the coupler RI interface lead can be activated but the telephone set cannot ring.

(d) ***Option D—With Ringer Connected on Telephone Line Side of Exclusion Key:***

(1) When coupler controls line

When the exclusion key ***is not operated,*** the coupler RI interface lead can be activated and the telephone set can ring.

When the exclusion key ***is operated,*** the telephone set cannot ring and the coupler RI interface lead cannot be activated (since handset must be lifted to operate exclusion key and this causes dial tone).

(2) When telephone set controls line

When the exclusion key ***is not operated,*** the telephone set can ring but the coupler RI interface lead cannot be activated.

When the exclusion key ***is operated,*** the telephone set can ring and the coupler RI interface lead can be activated.

3.02 Options specified in 3.01 apply to the standard [502A/B or 2502B (Section 502-501-102 or 502-503-102)] as well as the multifunction telephone (MFT) [503C or 2503C (Section 502-501-120 or 502-503-120)] when used with the 1001A data coupler. Connections for these options using the 502- and 2502-types are shown in Fig. 7. Additional options are available using the MFT, and are discussed in 3.03 and shown in Fig. 8 and 9. Wall-mounted telephones are not recommended and should not be used.

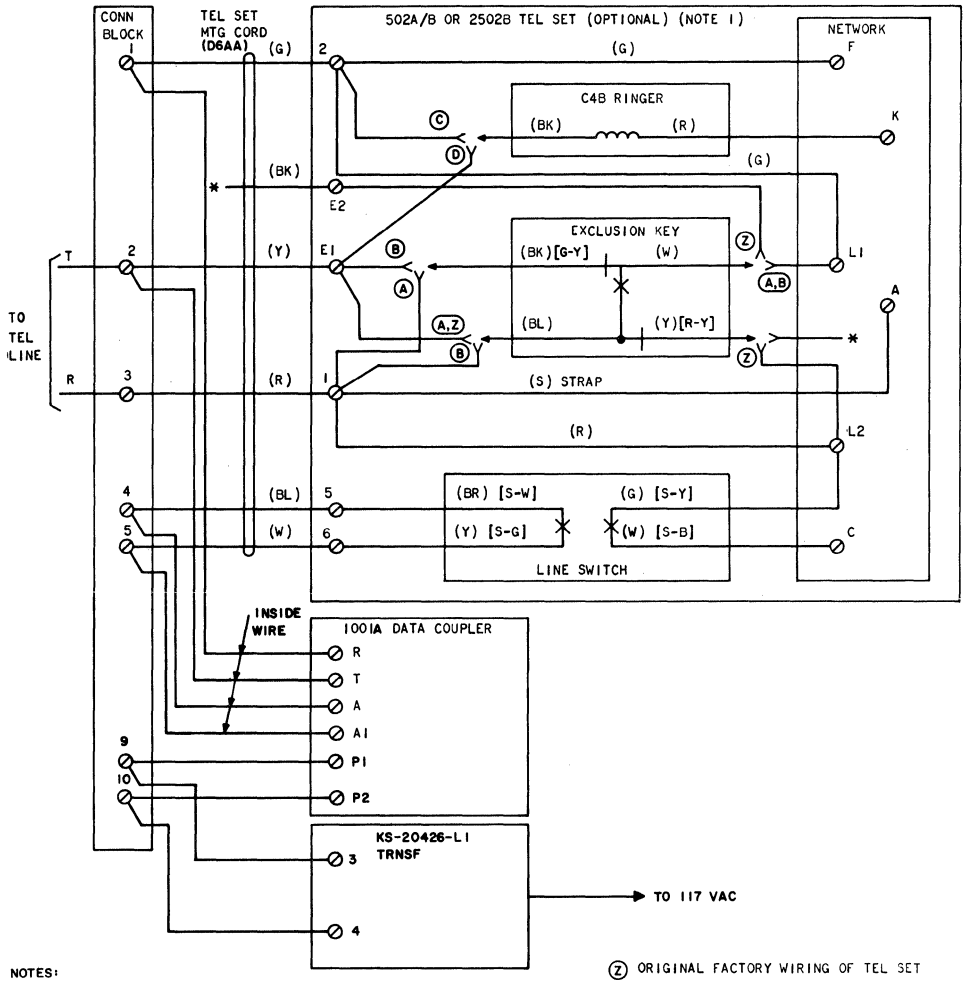
3.03 The 503- (rotary dial) and the 2503-type (TOUCH-TONE dial) telephone sets furnish the customer the following additional options:

- Allows monitoring of data transmission and voice answer-back signals through the telephone handset as used in digital inquiry voice answer-back (DIVA) applications.

- Provides an indication of whether telephone line is connected to telephone set or data coupler, or it may be used to provide an indication of SH (ie, on-hook or off-hook).

These additional features provided by the 503C (or 2503C) telephone set necessitate the use of a triple transfer exclusion key and a high-impedance bridging transformer in the telephone set. One set of the exclusion key contacts switches the line between the telephone and the coupler. The second set switches the monitoring circuit, and the third set provides the mode indication. The high-impedance transformer allows the attendant to monitor data transmission with the telephone handset. Both telephone sets are provided in a light gray housing; however, they may be enclosed in standard 500- or 2500-type housings of another color if desired.

3.04 In a multiple data coupler installation, it is often desirable to associate several data couplers with one telephone set. Key telephone sets are available in 6-, 10-, 18-, and 30-key sizes. Key telephone sets can connect to one of several different lines. The auxiliary key contact for each line, designated the A lead, is used to operate associated circuitry. The A lead may also be used to operate a relay which transfers a line from the data coupler to the telephone set as shown in Fig. 10. The function of the exclusion key is replaced by the line pickup key on the key telephone set. Note, however, that the coupler is never disconnected from the line when wired as shown in Fig. 10. The switchhook indicator function (SH lead) is not available with key telephone set installations unless auxiliary key telephone units (KTUs) are used. The coupler is assumed to be the primary station. Data calls can be originated and answered without interference from the telephone set. To indicate activity of the data coupler, the OH contact is used to connect the winking lamp



NOTES:
1. EXCLUSION KEY AND RINGER MUST BE REWIRED FOR DESIRED OPTION
2. IF C4A RINGER IS USED, WIRE AS FOLLOWS:
   (BK) TO 2 OR E1, DEPENDING ON OPTION USED
   (S) TO K OF NETWORK
   (S-R) TO A OF NETWORK
   (R) TO 1 OF TERMINAL STRIP

Ⓩ ORIGINAL FACTORY WIRING OF TEL SET
* INSULATE AND STORE
( ) CURRENT COLOR CODE
[ ] MD COLOR CODE

EXCLUSION KEY OPTION	WIRING OPTION
COUPLER CONTROLS LINE	A
TEL SET CONTROLS LINE	B

RINGER OPTIONS	WIRING OPTION
RINGER ON TEL SET SIDE OF EXCLUSION KEY	C
RINGER ON TEL LINE SIDE OF EXCLUSION KEY	D

Fig. 7—Typical Connections for 1001A Data Coupler With 502A/B or 2502B Telephone Set

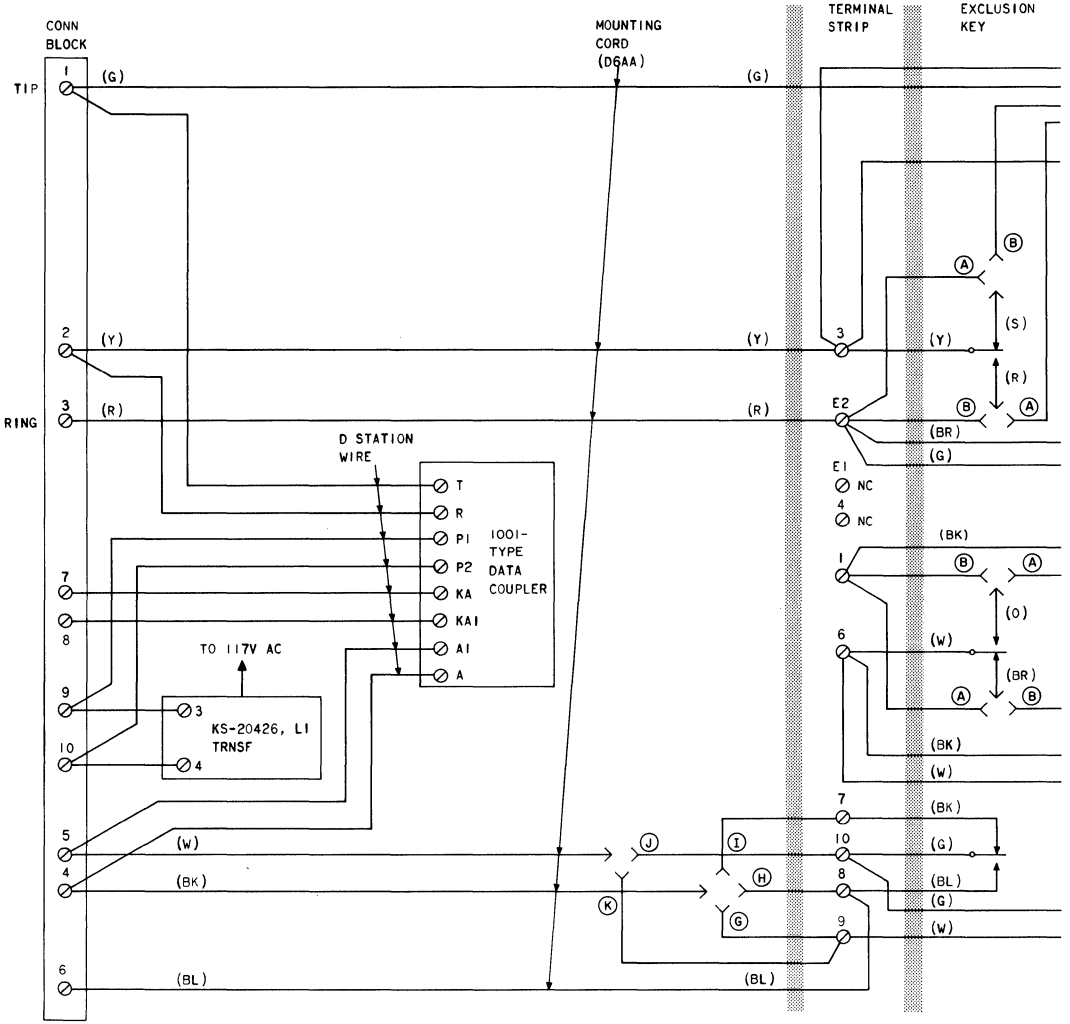
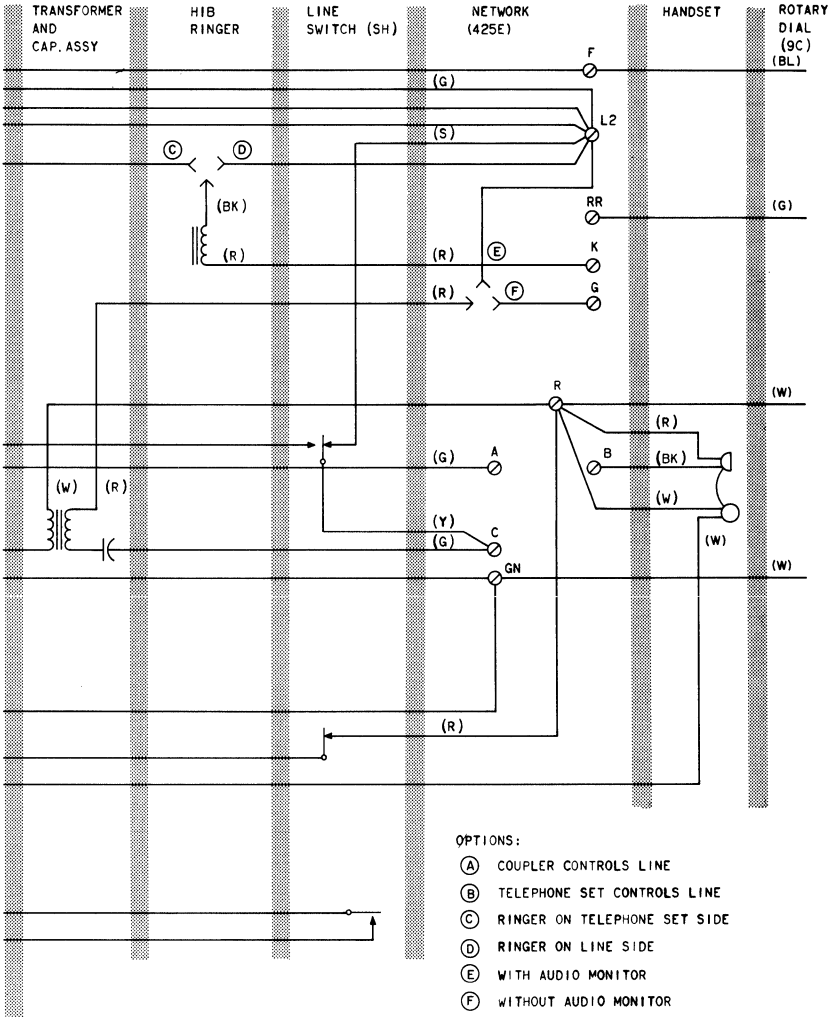


Fig. 8—Typical Connections for 1001A Data Coupler With 503C Rotary Dial Telephone Set (Sheet 1 of 2)



INDICATOR	ADDITIONAL OPTIONS WITH	
	OPTION A	OPTION B
VOICE MODE	H, K	I, K
DATA MODE	I, J	H, K
SWITCHHOOK	G, J	G, J

Fig. 8—Typical Connections for 1001A Data Coupler With 503C Rotary Dial Telephone Set (Sheet 2 of 2)

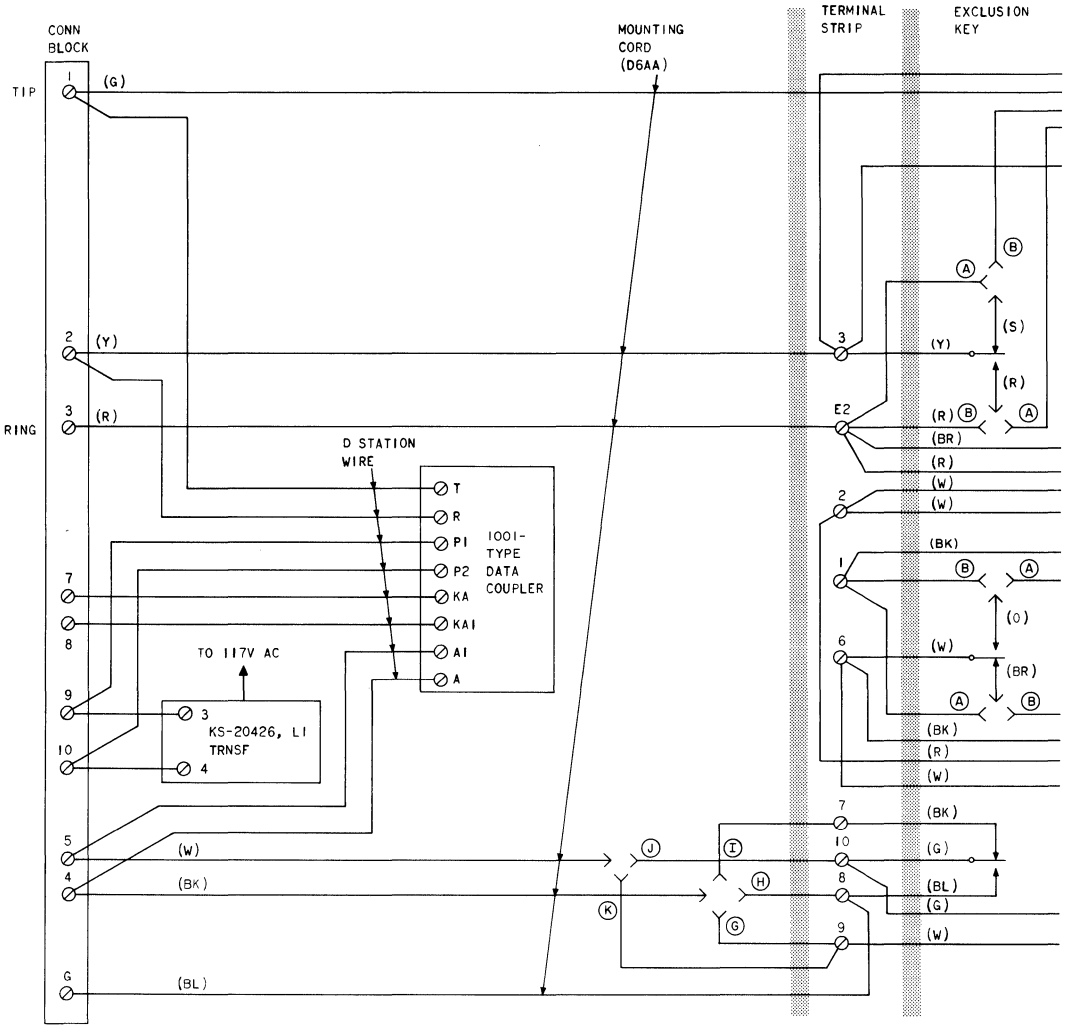
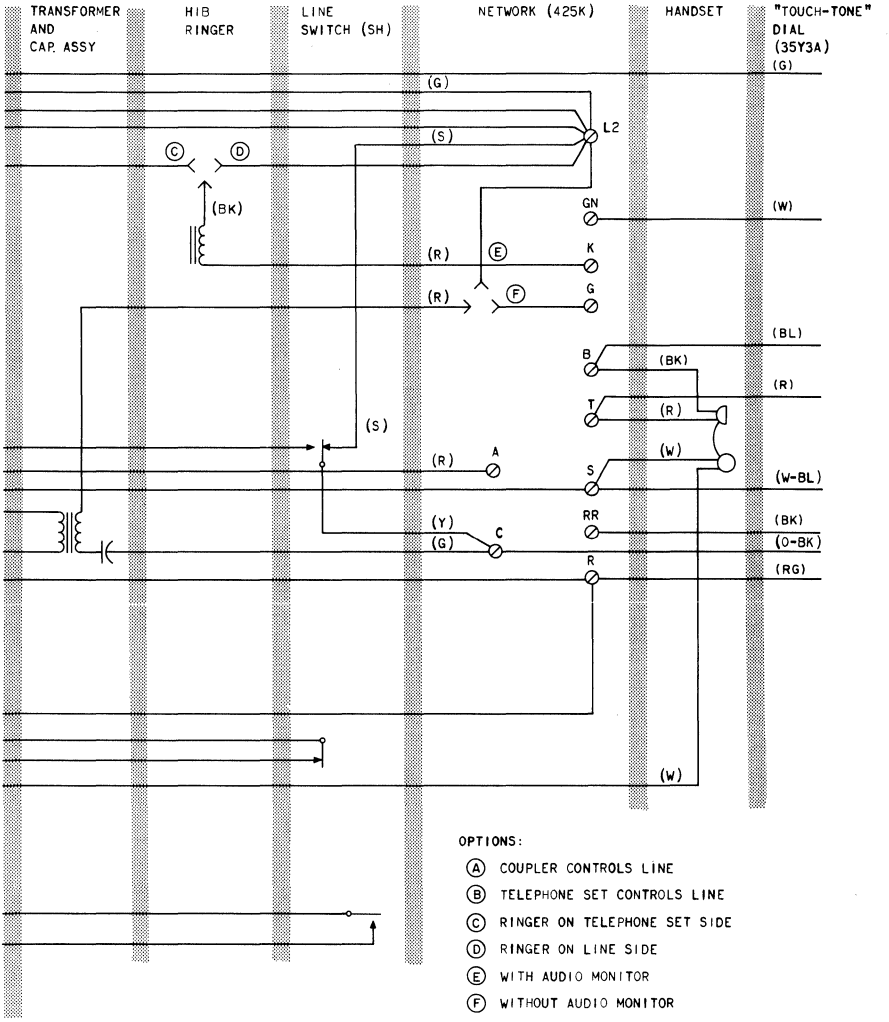


Fig. 9—Typical Connections for 1001A Data Coupler With 2503C TOUCH-TONE Dial Telephone Set (Sheet 1 of 2)



INDICATOR	ADDITIONAL OPTIONS WITH	
	OPTION A	OPTION B
VOICE MODE	H, K	I, K
DATA MODE	I, J	H, K
SWITCH HOOK	G, J	G, J

Fig. 9—Typical Connections for 1001A Data Coupler With 2503C TOUCH-TONE Dial Telephone Set (Sheet 2 of 2)

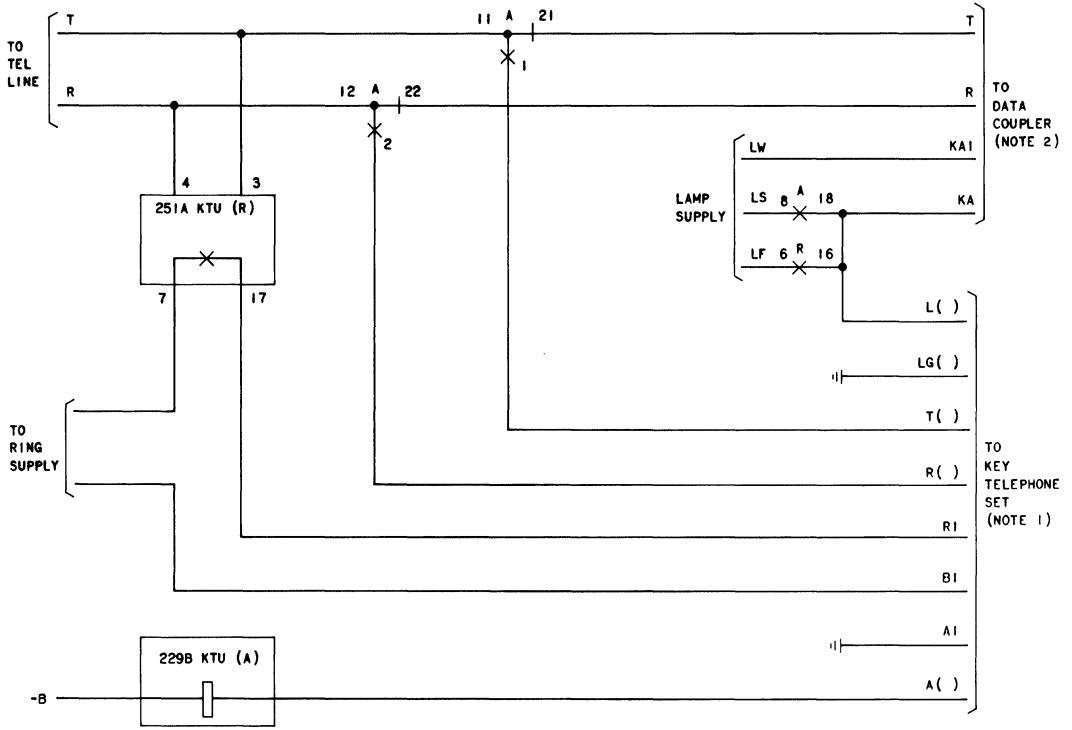
supply to the telephone set. The lamp under the key designated for the line assigned to this coupler winks when the data coupler is on-line and off-hook.

To prevent damage to the data coupler, each coupler must be powered by an individual transformer.

3.05 Apparatus necessary for providing telephone service for automatic data couplers consists of a key telephone set with enough capacity for the lines involved, a transfer relay for each line involved, and a ringup relay for each line that requires manual answering as a service feature. Figure 10 shows the connections for a representative type of KTU. Other types of KTUs that provide the required features may be used at the discretion of the telephone company. Additional features, such as common pickup of a single group of lines from any of several telephone sets, may be supplied by bridging key telephone sets and adding additional KTUs. Any service commonly offered in a local area should be provided according to local practices.

B. ACU Application

3.06 The data coupler is designed to operate with automatic data terminals which can generate dial pulses for automatic calling. The coupler will



NOTES:
1. THE KEY TELEPHONE LEADS FOLLOWED BY A PARENTHESIS ARE ASSIGNED TO THE SAME LINE.
2. TRANSFORMER CONNECTIONS NOT SHOWN.

Fig. 10—Key Telephone Unit Connections With a 1001A Data Coupler

also operate with a DAS 801-type ACU to provide the automatic calling function on either TOUCH-TONE or dc dial pulse lines. A partial schematic of a coupler/ACU connection is shown in Fig. 11, and a description of operational sequences is provided in the following paragraphs. A diagram for connecting the ACU to the coupler is shown in Fig. 12.

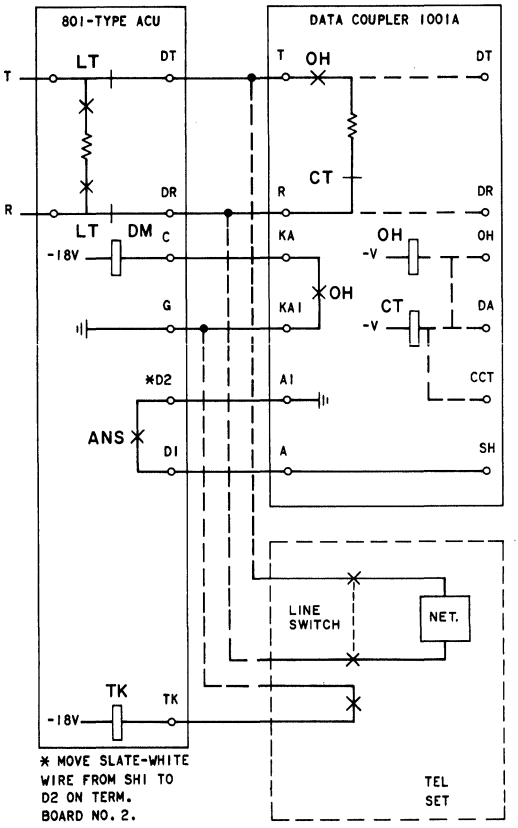


Fig. 11—Partial Functional Schematic—ACU Applications With 1001A Data Coupler

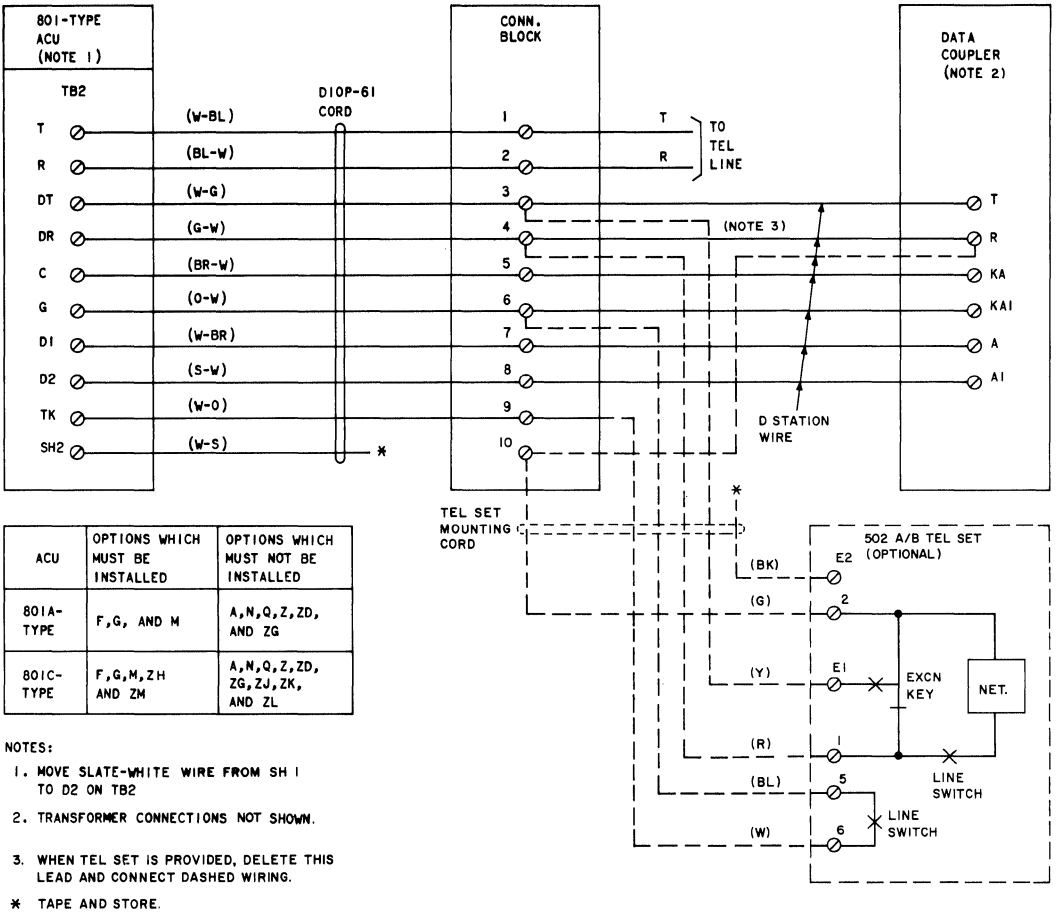
Note: When an optional 801-type ACU is provided for automatic call origination, install the unit in accordance with the section covering that unit.

3.07 ***Call Origination:*** Call origination with an ACU can be based on end-of-number (EON) operation or on answer-tone detection by the ACU.

3.08 To originate a call by using ***EON operation,*** the control leads to the coupler interface are in the ***off*** condition (the DA lead may be turned ***on*** permanently when all call originations are via the ACU). The ACU transfers the line from the coupler to the ACU in response to the call request (CRQ) signal from the data terminal. The normal dial sequence is presented to the ACU followed by the EON code. When the EON code is received, the ACU operates the ANS relay which causes the SH lead on the coupler to turn ***on.*** The previously operated LT relay in the ACU drops to return line control to the coupler. The data terminal responds to the ***on*** condition of the SH lead by turning ***on*** the OH lead on the coupler. Operation of the OH relay drops the ANS relay which turns the SH lead ***off.*** The OH relay operates to close and hold the loop and to supply the required supervisory contact closure to the ACU. The ACU turns ***on*** the DSS lead, and the customer terminal should respond by turning ***off*** circuit CRQ. The data terminal turns ***on*** the DA lead (if not permanently ***on***) and looks for the CCT lead to indicate that the terminal has been cut through to the local telephone line. The data terminal should wait for answer tone or other signal from the called station before attempting to send data.

3.09 To originate a call by using the ***answer-tone detection operation,*** the control leads to the coupler interface are in the ***off*** condition (the DA lead may be turned ***on*** permanently when all call originations are via the ACU). The ACU transfers the line from the coupler to the ACU in response to the CRQ signal from the data terminal and accepts the normal dial sequence as presented. After dialing is completed, the ACU waits for detection of answer tone (2025 or 2225 Hz) from the called station. When the answer tone is detected, the ACU operates the ANS relay, which causes the SH lead on the coupler to turn ***on.*** The previously operated LT relay drops in the ACU to transfer line control back to the coupler. The sequence of operation now follows the same as for EON operation.

3.10 ***Call Termination:*** The data terminal terminates a call by turning ***off*** the OH lead to the coupler. The OH relay drops to open the



ACU	OPTIONS WHICH MUST BE INSTALLED	OPTIONS WHICH MUST NOT BE INSTALLED
801A-TYPE	F,G, AND M	A,N,Q,Z,ZD, AND ZG
801C-TYPE	F,G,M,ZH AND ZM	A,N,Q,Z,ZD, ZG,ZJ,ZK, AND ZL

NOTES:

1. MOVE SLATE-WHITE WIRE FROM SH 1 TO D2 ON TB2
2. TRANSFORMER CONNECTIONS NOT SHOWN.
3. WHEN TEL SET IS PROVIDED, DELETE THIS LEAD AND CONNECT DASHED WIRING.

* TAPE AND STORE.

Fig. 12—1001A Data Coupler Connections With 801-Type ACU

loop-holding path and to inform the ACU that the data line is idle. The data terminal must monitor the DLO interface lead from the ACU to determine when the next call may be originated.

C. Line Current Status Indicator (LCSI)

3.11 An LCSI may be installed with the coupler on an optional basis to aid the customer in recognizing end of call. The LCSI will not work on facilities served by certain central offices and it performs differently with some of the central offices that it ***will*** work with. Refer to Table B to determine the applicability to a particular installation.

Caution should be exercised in using the LCSI to indicate a far-end disconnect. Momentary line current interrupts occur during call setup. They can be up to 400 ms long and can occur 10 seconds after dialing is completed and, at the called end, 500 ms after answering a call. In response to far-end disconnect, some switching offices

TABLE B

LINE CURRENT STATUS INDICATOR APPLICATION*

OFFICE SERVING OFF-HOOK END	END OFF-HOOK	END ON-HOOK	MIN CURRENT INTERRUPT	RELATED TO DIAL TONE	USE OF LCSI FOR DISCONNECT
ESS	Called	Calling	12 ms	Before	Okay
ESS	Calling	Called	37 ms	Before	Okay
No. 5 X-Bar	Called	Calling	10 ms	Before	Okay
No. 5 X-Bar	Calling	Called	32 ms	After	Discourage
No. 1 X-Bar	Called	Calling	0.4 sec	After	Discourage
No. 1 X-Bar	Calling	Called	0.4 sec	After	Discourage
SXS	Called	Calling			Discourage
SXS	Calling	Called			Discourage

* The use of dial long line circuits and carrier facilities on local loops will isolate station equipment from central office dc interrupts.

interrupt line current, but it is important to note that some do not. When such interrupts do occur, the LCSI contact will open momentarily. To avoid misinterpretation of momentary opens, it is recommended that an open should not be interpreted as an indication of far-end disconnect unless it is greater than 5 ms in duration. Customers should verify disconnect arrangements with the local telephone service organization before relying on the LCSI for that function.

3.12 The LCSI can be arranged to present an EIA voltage with a parallel indication to SH contact closure spare leads (option Z) ***or*** a contact closure (option Y) to the customer as an indication of line current. The EIA voltage is derived from the SH driver circuit in the data coupler under control of the switchhook or the LCSI. If no associated telephone set is used, the indication is LCSI only. The LCSI indication will be a voltage on the SH lead at the customer interface. The contact closure option is a set of the LCSI relay contacts connected to two terminals on a separate connector block.

3.13 The LCSI (Fig. 13) must be made locally. It consists of a dry reed relay and two varistors on a 74B-49 connecting block measuring 2.75 inches wide, 4 inches long, and 1.6 inches high. The relay is in series with the coupler and gives a contact closure at the customer interface or the input to the coupler SH driver circuit when at least 20 mA of line current is flowing through the relay and coupler. The two varistors are used to provide a low-impedance transmission path to the coupler.

If the customer uses the contact closures directly, current through the terminals should be limited to less than 10 mA. The customer circuit must also be noninductive with an open circuit voltage less than 50 Vdc. The maximum length of the loop over which the coupler can operate is reduced by

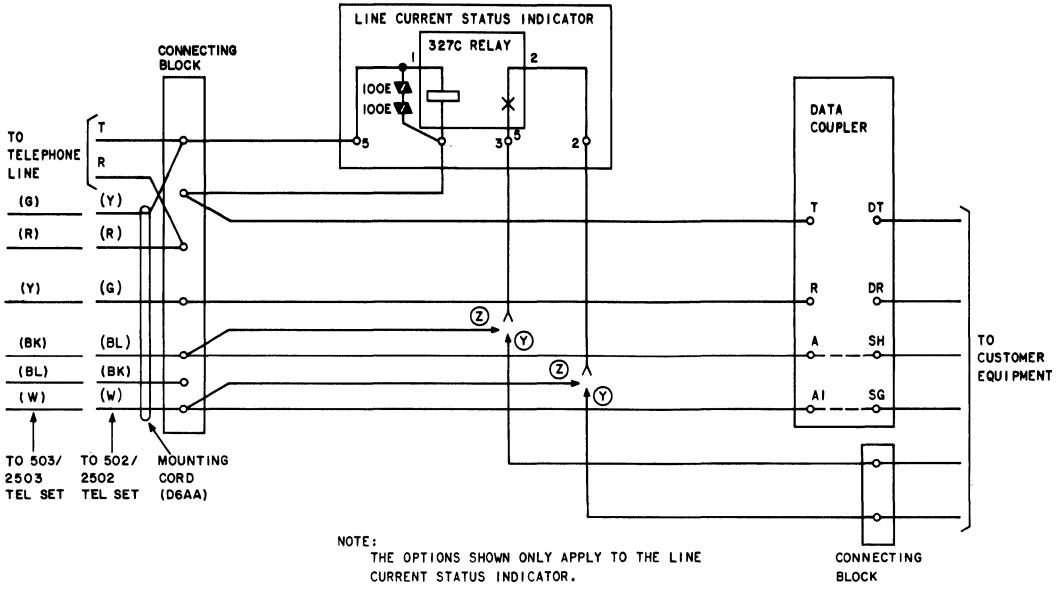


Fig. 13—Line Current Status Indicator Connection Diagram

approximately 800 feet if an LCSI is used.

3.14 Assemble the LCSI in accordance with the following procedures:

(1) Remove cover from the 74B-49 connecting block.

(2) Remove the 426A electron tube assembly, including mounting screw, and discard.

Warning: The adhesive used in (3) sets quickly and should not be allowed to come in contact with anything (especially the skin of the installer) except the relay, the applicator, and the connecting block base.

(3) Apply adhesive (Eastman 910 or equivalent) in the area to be occupied by the 327C relay.

(4) Place relay on baseplate, topside down.

(5) Remove and discard the lower screws from terminal strip eyelets in positions 2, 3, 4, and 5.

(6) Wire the LCSI in accordance with Fig. 13.

4. INSTALLATION AND CONNECTIONS

4.01 The 1001A data coupler may be used with various types of SCO lines, key telephone systems, or PBX lines that provide access to the switched network.

All installation connections and tests must be performed prior to the customer making any connections to the interface.

4.02 Verify that the assigned loop facilities meet the transmission requirements for the specific data service before proceeding with the installation. General requirements for DAA are covered in

Sections 314-205-500 and -501. Requirements for the 1001A data coupler are as follows:

(a) ***Loop Loss:*** Maximum 1000-Hz insertion loss (including coupler loss of 2 dB) is 11 dB.

(b) ***Set Classification:*** Installation measurements to be made should have been determined from the type of data modem information provided by the customer and specified on the service order. When the modem type cannot be determined, Type II requirements should be specified. When the type of modem can be obtained from the customer, the following guidelines should be used.

(1) For all analog modems, Type II requirements should be specified.

(2) For all other modems, requirements based on speed of modem (same as for switched DATA-PHONE service) should be specified.

(3) If the type of modem is known to be similar to a Bell System DATA-PHONE data set, use the requirements for that particular data set.

4.03 Installation of the coupler should comply with general practices to ensure an orderly station arrangement. Information relating to selection of type of connecting block and electrical code requirements is given in Section 590-010-200. See Fig. 14 for typical interconnection block diagram.

4.04 When test or demonstration calls are made, refer to Section 010-250-001 for proper procedure for crediting charges.

4.05 Location of the coupler shall be determined by the following conditions:

- ***The coupler must be mounted vertically*** on a wall or other vertical surface with the TST and ANS switch at the top, to ensure proper operation of OH mercury relay.

- The coupler must be within range of the interface cord supplied by the customer. This cord should not exceed approximately 50 feet to meet EIA RS-232-B voltage specifications.

- Location of the coupler should provide easy access for viewing and operating the TST and ANS switches by the customer attendant.

A. Installation of Data Coupler

4.06 Install the coupler on a wall or vertical surface as follows:

(1) Remove the tape securing the cover to the base pan. Retain the envelope which contains screws for mounting CP to the base pan and screws for mounting the base pan. The envelope is located between the tape and cover.

(2) Remove the snap-off cover assembly from the coupler.

(3) Position the coupler base pan vertically against the wall with the keyhole slots narrow end up and the slots not less than 11 inches above the top of the baseboard or other obstruction which will be below the unit. Secure the base with three No. 6 by 1/2-inch wood screws for porous surfaces, or No. 6 by 3/8-inch pan-head type AB self-tapping screws for metal surfaces; the screws are supplied with the coupler.

(4) Route the D station wire through the slots and pins on the base as shown in Fig. 2. Attach the CP to the base pan by using the six self-tapping screws that are in the envelope. Connect the leads as required to the terminals on each side of the printed wiring board. ***Care should be taken not to overtighten screws or stripping of the base pan screw holes will result.***

4.07 When the coupler installation does not include an associated telephone set, tip and ring of the telephone line may be connected directly to terminals T and R, respectively, on the coupler instead of to terminals on an associated connecting block shown in Fig. 7, 8, and 9. See 3.01 through 3.05 for information on installing an optional telephone set.

B. Installation of Power Transformer

4.08 The 1001A data coupler is powered by a wall-mounted KS-20426-L1 low-voltage transformer supplied with each coupler. The KS-20426-L1 transformer provides two primary terminals in the form of parallel blades for use in

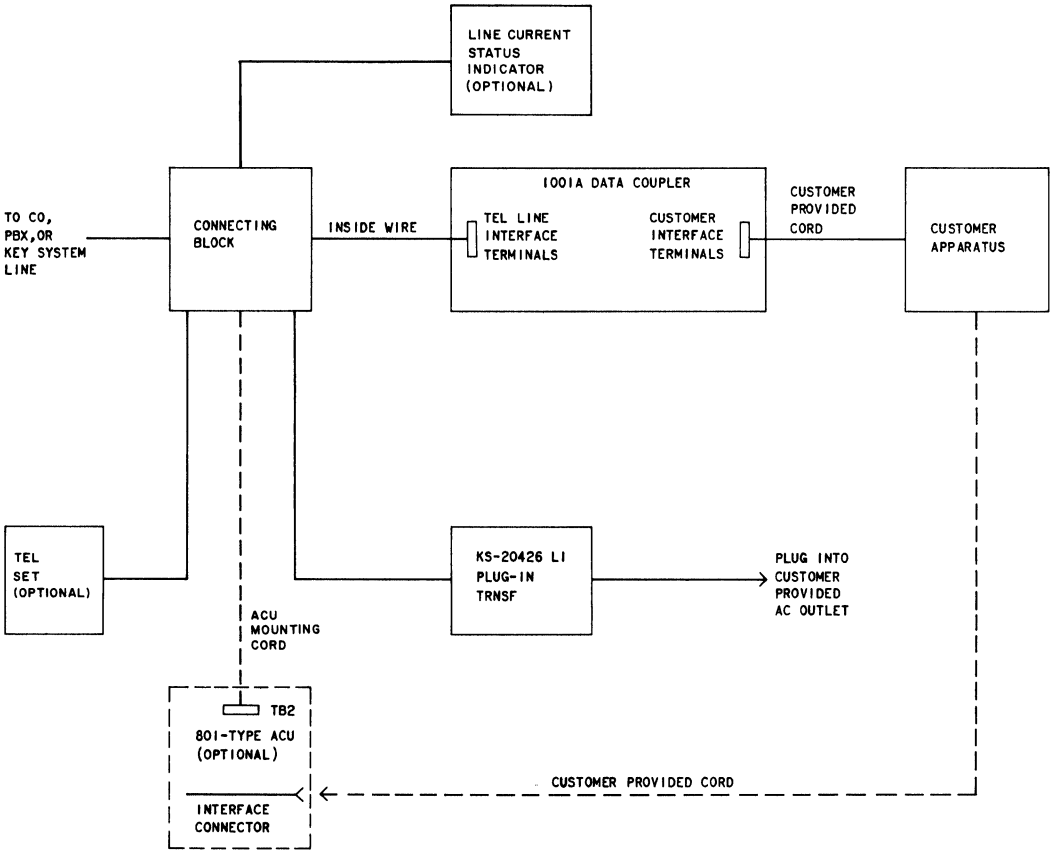


Fig. 14—Block Diagram of Typical 1001A Data Coupler Installation

a standard 2-pole, 3-wire grounded receptacle which serves as the mounting device. Two recessed screw terminals provide the means for connecting the transformer secondary. Connections from the transformer are made ***directly to the coupler*** or to an associated connecting block (Fig. 7). The furnished clamp must be used to hold the transformer securely in the receptacle. The receptacle must not be under control of a switch.

To prevent damage to the data coupler, each data coupler must be powered by an individual transformer.

C. Completion of Installation

4.09 Install cover assembly by hooking bottom end (end with small hinged cover) to base pan, swinging cover up and over the ANS and TST keys, and pressing until cover snaps into place. ***Exercise care when removing or installing coupler cover to prevent damaging the ANS and TST switches.***

4.10 Install telephone set if specified on the service order. If a 503- or 2503-type telephone is used, redesignate the SH terminal on the data coupler as "MI" (mode indicator).

4.11 Instruct the customer to raise only hinged portion of coupler cover to gain access to interface terminals. Also, inform customer that overtightening screws may cause stripping of threads.

Do not connect the customer interface leads to the coupler unless requested by, and under direction of, the customer.

4.12 After the coupler and associated units have been connected to the telephone line, perform the tests outlined in Part 5.

4.13 Inform the customer, at the time the coupler is installed, of the maximum permissible signal power output from the customer data equipment. The output level of the customer-provided equipment is the power measured at the customer interface into a 600-ohm resistive load. It may vary between -1 and -10 dBm depending upon the 1000-Hz loss of the local loop including the nominal insertion loss (approximately 2 dB) of the coupler.

5. MAINTENANCE AND TESTS

5.01 Maintenance and test procedures are provided to assist the employee during installation and troubleshooting visits to a data coupler station. All level measurements and test results made during installation must be recorded on a circuit layout record card (CLRC) to assist in analyzing future trouble and to detect gradual degradation of service. Telephone the test results to the plant service center (PSC), or equivalent test location, prior to leaving the customer location. Some tests will require disconnection of customer equipment from the interface in order to make tests and/or to replace a defective coupler. The following precautions ***must*** be taken:

- ***Obtain permission from the customer to disconnect the interface leads from the coupler.***

- ***Turn the power to both the customer equipment and to the coupler OFF before the customer leads are disconnected. Power to the coupler can be removed by unplugging the KS-20426-L1 low-voltage transformer.***

- ***After all tests are completed and the interface is reconnected, ask the customer to verify that the interface has been reconnected properly.***

A. Maintenance

5.02 All repair employees should be familiar with the tariff provisions which generally provide for a "maintenance service charge" for each customer-requested repair visit to a DAA installation. When the customer requests such a repair visit and it is subsequently determined that the trouble is ***not*** in the Bell System equipment, inform the customer and notify the PSC to fill out Form E-5855 in conformance with Section 660-101-312.

5.03 Maintenance of the coupler on customer premises is limited to local tests, testing by the serving or test office, or replacing a defective unit.

> ***Note:*** Do not attempt individual component repair or replacement on the printed CP.

5.04 Customers using data couplers are instructed, when trouble is experienced, to perform the necessary testing to sectionalize the problem. If the results of the tests indicate that the trouble is in Bell System equipment, the condition should be reported to the designated PSC or equivalent test center. All available information concerning the trouble should be forwarded to the PSC.

5.05 The PSC must analyze the information provided by the customer to determine if a trouble condition does exist and the most probable cause. Available tests (ie, normal dc loop test and remote test of coupler) should be performed to determine if a telco employee must be dispatched to customer premises. The conditions which could warrant a maintenance visit and efforts which lead to each are shown in Fig. 15.

5.06 On a maintenance visit, perform the tests or evaluations to isolate and clear the trouble within the station as directed by the PSC. Begin with the steps shown in Fig. 15 when the test results and analysis received from the PSC lead to that particular activity. If a trouble report is not available or if the report is inconclusive, follow

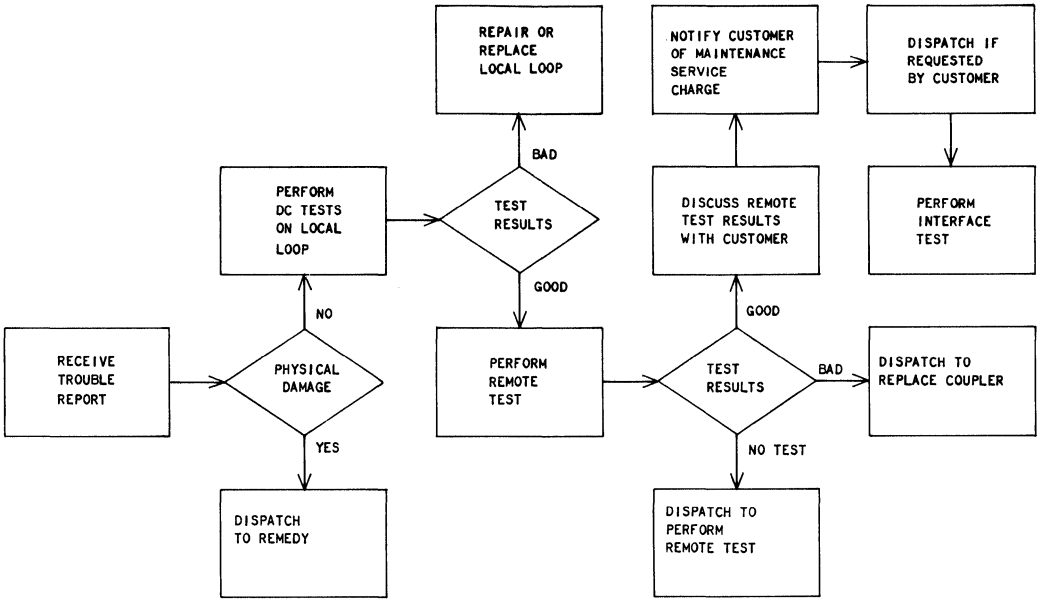


Fig. 15—Basic Activities Prior to Dispatching Employee

the suggested sequence of activities as illustrated in Fig. 16 and described in the following:

(1) The telco employee must be properly equipped with information (BSP documentation, line card details, etc), spare coupler, and test equipment, etc, for locating trouble and effecting repairs at the customer premises.

(2) Upon arrival at the coupler station, question the customer to obtain any information relating to the reported trouble, then perform a visual and mechanical inspection of the installation. Check that TST switch on coupler is not partially operated. Check for disconnected or broken cords, inside wiring, drop wire, broken components or any other possible trouble causes. Repair or replace any defective or marginal components (ie, ringer, dial, handset, etc).

(3) Perform a remote test to the local test desk (LTD) or equivalent test location.

(4) If any components were replaced or repaired ***and*** the results of the remote test are satisfactory, close trouble report.

(5) If all components are satisfactory ***and*** the results of the remote test are satisfactory, perform an interface voltage test.

(6) If the results of the interface voltage test ***or*** remote test are not satisfactory, replace the coupler. Ensure that all level measurements made during the required installation tests are properly recorded on the CLRC.

(7) Perform a remote test on the new coupler.

(8) If the results of the new coupler remote test are ***not*** satisfactory, notify the PSC.

(9) If the results of the new coupler remote test are satisfactory, request the customer to verify that service is restored (ie, try to exchange data with the station that caused the trouble report).

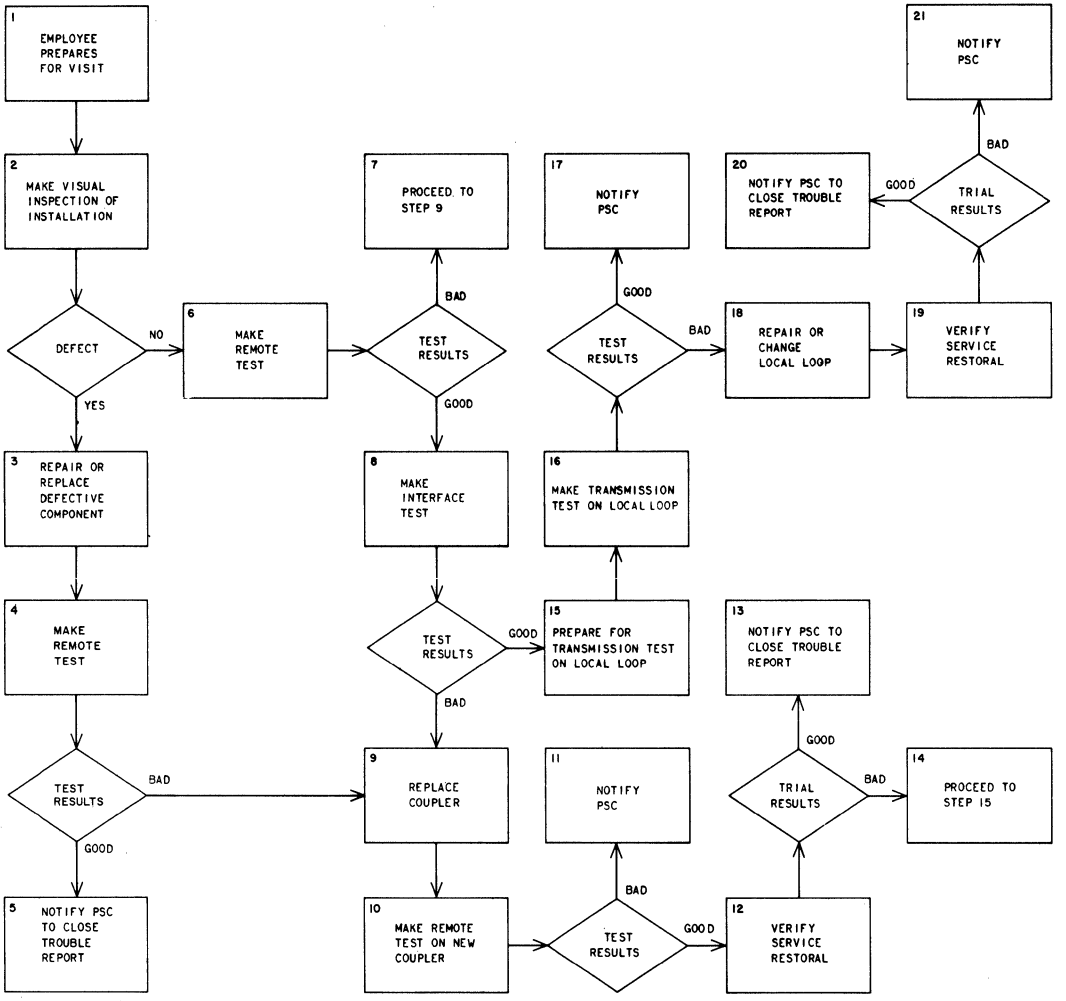


Fig. 16—Activities for Troubleshooting at a Coupler Station

(10) When the customer is satisfied with the service, notify the PSC to close the trouble report.

(11) If the customer cannot exchange data or is ***not*** satisfied with the service, disconnect the coupler and perform a complete transmission test of the local loop as described in Section 314-205-501.

(12) If the results of the loop test are satisfactory, notify the PSC.

Note: The preceding investigation has eliminated the coupler and local loop as possible trouble; therefore, attention must be directed to the data terminal or facilities.

(13) If the results of the loop test are ***not*** satisfactory, arrange with the PSC to have

the loop repaired or changed. The repaired or changed loop must meet requirements outlined in Section 314-205-501.

(14) After changing the defective loop, reconnect the coupler to the telephone line. Perform the insertion loss and impedance matching tests to determine if maximum allowable customer level has been changed. Notify customer of level change and then request customer to verify service restoral (ie, try to exchange data with the station that caused the trouble report).

Note: Prior to leaving customer premises, perform the remote test and record the new level on the CLRC.

(15) When the customer is satisfied with the service, notify the PSC to close the trouble report.

(16) If the customer cannot exchange data or is not satisfied with the service, trouble may still exist in another component of the system or in the data terminal, and further investigation must be pursued. Notify supervision, who can escalate following normal procedures of data technical (DATEC) support. Refer to Sections 010-521-100 and -101. Notify the PSC of the repair work that has been completed and wait for further instructions.

B. Tests

5.07 The following tests are required to ensure proper installation of the data coupler and to determine the operating condition of the unit during a maintenance visit:

- Insertion Loss Test
- Impedance Matching Test
- Remote Test
- Interface Voltage Test
- ACU Test
- LCSI Test
- 503C or 2503C Telephone Set Test.

5.08 The following test equipment is required for the tests:

- 600-ohm ±1 percent resistor
- KS-16979-L1 volt-ohm-milliammeter (VOM), or equivalent with a high-impedance, bridging-type ac voltmeter with a dB scale such that 0.776 Vac corresponds to 0 dB.
- 1013-type hand test set, or equivalent
- KS-19353-L4 oscillator or equivalent with a 600-ohm output impedance and a capability of a -5 dBm reading when connected across 600 ohms.

Note: The insertion loss test ***and*** the impedance matching test are required to determine proper level option strapping, using Table C.

Insertion Loss Test

5.09 The insertion loss test measures the combined loss of the loop and coupler. The results of the test are used to determine the maximum allowable customer signal power level which will result in a signal level no greater than -12 dBm at the SCO. This test requires that the customer interface leads be disconnected from the coupler in accordance with precautions listed in 5.01. The coupler must be connected to the telephone line. Proceed with the test as follows:

(1) Ensure that the KS-20426-L1 transformer is connected to the coupler and plugged into the power receptacle.

(2) Locate and remove any existing straps on level option terminals A through H (Fig. 2).

Note: Cover must be removed to gain access to level option terminals. ***Exercise care when removing coupler cover to prevent damaging the TST and ANS switches on older-type couplers.***

(3) Connect 600-ohm resistor across terminals DT and DR. If a transmission test set is used instead of the VOM, the test set provides the 600-ohm termination.

TABLE C

LEVEL OPTION STRAPPING FOR 1001A DATA COUPLER

MEASURED LEVEL (INSERTION LOSS TEST) DBM	MAXIMUM ALLOWABLE CUSTOMER LEVEL DBM	MEASURED LEVEL (IMPEDANCE MATCHING TEST) DBM				
		−3.6 to 0	−4.6 to −3.7	−5.6 to −4.7	−6.6 to −5.7	−6.7 to −9
		LIMITER OPTION STRAPS				
−2.5 to −3.4	−10	A, B, D, E	A, C, D, E	B, C, D, E	A, B, C, D, E	A, B, C, D, E
−3.5 to −4.4	−9	A, B, C, E	A, B, D, E	A, C, D, E	B, C, D, E	A, B, C, D, E
−4.5 to −5.4	−8	D, E	A, B, C, E	A, B, D, E	A, C, D, E	B, C, D, E
−5.5 to −6.4	−7	C, E	D, E	A, B, C, E	A, B, D, E	A, C, D, E
−6.5 to −7.4	−6	A, E	C, E	D, E	A, B, C, E	A, B, D, E
−7.5 to −8.4	−5	A, B, C, D	A, E	C, E	D, E	A, B, C, E
−8.5 to −9.4	−4	A, C, D	A, B, C, D	A, E	C, E	D, E
−9.5 to −10.4	−3	A, B, C	A, C, D	A, B, C, D	A, E	C, E
−10.5 to −11.4	−2	C	A, B, C	A, C, D	A, B, C, D	A, E

Example: Value obtained in insertion loss test = 6.4 dB.
Value obtained in impedance-matching test = −4.2 dBm.
A strap should be placed between terminals D and E.

(4) Connect strap between terminals DA, OH, and SH.

(5) Connect the hand test set across tip and ring of the telephone line and dial the milliwatt supply (1000 Hz) at the SCO.

Note: If a telephone set is associated with the coupler, remove the handset, ensure that the exclusion key is in talk position, and dial the milliwatt supply.

(6) When the tone is heard, short terminal A to A1 with a clip lead and remove the hand test set from the line (or restore the talk key to data mode on the associated telephone).

(7) Condition the VOM to measure approximately -5 dBm. Measure and record the level (in dBm) of the signal across the coupler DT and DR terminals with the VOM.

(8) Remove the clip lead from A to A1. (The SCO connection will terminate.)

Impedance Matching Test

5.10 This test follows the insertion loss test on either an installation or maintenance visit; therefore, the level option terminals should not be strapped for this test. Proceed with the test as follows:

(1) Set the oscillator for a 1000-Hz frequency and a 600-ohm output impedance.

(2) Select the proper scale on the VOM to measure -5 dBm.

(3) Connect the test equipment and straps as shown in Fig. 17.

(4) Adjust the oscillator output level to obtain a -5 dBm indication on the VOM.

Note: After the indication is obtained, do not change the frequency or level setting on the oscillator.

(5) Connect the hand test set across tip and ring of the telephone line, and dial a quiet battery termination at the SCO.

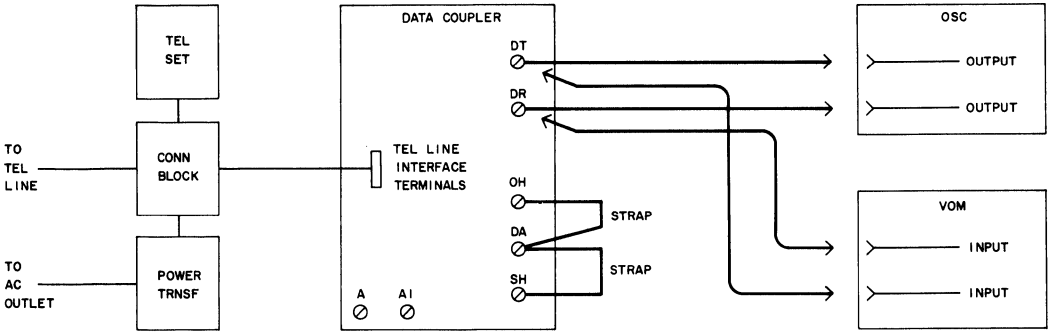


Fig. 17—Test Equipment Connections for Impedance Matching Test

Note: If a telephone set is associated with the coupler, remove the handset, ensure that the exclusion key is in talk position, and dial the quiet termination.

(6) After the connection is completed, short terminal A to A1 with a clip lead and remove the hand test set from the line (or operate the data key to data mode on the associated telephone).

(7) Measure the signal level with the VOM. Use this value to derive the level option strapping from Table C.

(8) Remove the straps, disconnect test equipment, and restore the connection to normal. (The SCO connection will terminate.)

5.11 Using the values obtained in 5.09 and 5.10, apply straps in accordance with Table C. Mark the maximum input limit on the data coupler as determined in 5.09 (Fig. 1).

Note: Cut pieces of insulated 24-gauge solid wire to fit between appropriate terminals. Strip insulation from wire ends and, using long-nose pliers, seat ends of wire straps under terminals.

Remote Test

5.12 The remote test is required in measuring the test signal of the coupler at the SCO at time of installation. The test signal provides a check of the local loop and the limiting function of the coupler. Subsequent readings can then be compared with the initial reading for indications of service degradation.

5.13 The data coupler must be connected to the telephone line for this test and the KS-20426-L1 transformer connected to the coupler and plugged into the ac receptacle. Proceed with the test as follows:

(1) Connect the hand test set across tip and ring of the telephone line and contact the LTD.

Note: If a telephone set is associated with the coupler, remove the handset, ensure that the exclusion (data) key is in talk position, and establish a connection to the LTD.

(2) Request the LTD employee to call the coupler and measure the level of the test tone (2800 Hz) received at the LTD.

(3) Agree upon length of time required to perform the test and restore the connection to idle state (hang up).

(4) Operate TST switch to ON position (depress the red dot half of switch). The TST lamp lights.

(5) Observe that the ANS lamp flashes in response to the incoming call from the test desk. The flashes in response to the ringing cycle are approximately 2 seconds ON and 4 seconds OFF until the ANS switch is operated.

(6) Operate ANS switch to ON position (depress red dot half of switch). The TST and ANS lamps go off. After a 2-second interval, the ANS lamp lights.

(7) After the agreed testing interval, operate TST and ANS switches to OFF position.

(8) Reestablish the connection to the LTD and request the level reading from the employee. This level indicates the loss of the loop and coupler at 2800 Hz. If the test is made at time of installation, the actual value of the loss ***must be recorded*** on the CLRC for comparison against measurements made in subsequent tests. If the level of the 2800-Hz signal on subsequent tests varies by more than 2 dB from the original value, it is an indication of possible trouble in either the loop or coupler.

(9) If the test tone must be measured at a remote test desk or DTC over facilities of unknown or varying loss, a successful receipt of tone indicates that there is ac continuity in the loop and coupler and that the coupler operates satisfactorily. However, the measured level is not important.

(10) Restore the telephone connection to normal.

Interface Voltage Test

5.14 The interface voltage test assures that the interface terminals of the coupler will respond to proper signals from the customer terminal or will indicate to the terminal when the coupler is conditioned for the various operational modes.

5.15 This test requires that the customer interface leads be disconnected from the coupler in accordance with procedures outlined in 5.01. The coupler must be connected to the telephone line and the KS-20426-L1 transformer connected to the coupler and plugged into the ac receptacle. Use the VOM to make the measurements during the test. Proceed as follows:

Note: When making measurements in the following steps, be careful to observe proper polarity with the meter.

(1) Connect a strap between terminals A and A1.

Note: Exercise care when removing the coupler cover to prevent damaging the ANS and TST switches on older-type couplers.

(2) Measure the voltage between terminals (+) SH (or MI) and (-) SG. The meter indicates between +8 and +12 Vdc.

(3) Remove strap from terminals A and A1.

(4) Measure the voltage between terminals (-) SH (or MI) and (+) SG. The meter indicates between -8 and -12 Vdc.

(5) Originate a call to the coupler from another line or arrange to be called from the LTD. Observe that the voltage between terminals RI and SG follows the ringing cycle and swings between +8 to +12 (ON) and -8 to -12 (OFF) Vdc. The ON interval is approximately 2 seconds and the OFF interval approximately 4 seconds.

(6) Connect a strap between terminals OH and SH (or MI), and short terminal A to A1 with a clip lead.

(7) Measure the voltage between (-) RI and (+) SG. The meter indicates between -8 and -12 Vdc after ringing is tripped.

(8) Measure the voltage between terminals (-) CCT and (+) SG. The meter indicates between -8 and -12 Vdc. Leaving the meter on terminals CCT and SG and strap on terminals OH and SH (or MI), connect an additional strap between terminals DA and SH (or MI). After 2 seconds, observe that the voltage swings to between +8 and +12 Vdc.

(9) Connect the meter between terminals KA and KA1. The meter indicates continuity between terminals.

(10) Remove short from between terminals A and A1. An open is indicated on the meter between terminals KA and KA1.

(11) Measure the voltage between (-) CCT and (+) SG. The meter indicates between -8 and -12 Vdc.

(12) Hang up the calling telephone and remove test equipment and straps from the coupler.

ACU Test

5.16 When an ACU is associated with the coupler, the ACU can be tested as described in the appropriate sections for DAS 801-type ACU (Sections 598-010-ZZZ and 598-012-ZZZ). Options required for the ACU are indicated in Fig. 11. This test requires that the customer interface leads be disconnected from the coupler in accordance with precautions listed in 5.01. The coupler must be connected to the telephone line and the KS-20426-L1 transformer connected to the coupler and plugged into the ac receptacle. Proceed with the test as follows:

(1) While testing the ACU, use the VOM to observe that the SH (or MI) lead turns ***on*** at the appropriate time by measuring the voltage between terminals (+) SH (or MI) and (-) SG. The meter indicates between +8 and +12 Vdc for the ON condition.

(2) Disconnect test equipment and restore the connection to normal.

LCSI Test

5.17 This test should be used to verify proper operation of the LCSI. The option Z test is performed without disconnecting the customer LCSI interface, while the option Y test requires disconnecting the customer LCSI interface.

Take necessary precautions to ensure that the customer does not receive inadvertent signals.

Note: When making measurements in the following steps, be careful to observe proper polarity with the meter.

LCSI With Option Z (EIA Interface)

(1) Measure the voltage between terminals (-) SH (or MI) and (+) SG. The meter indicates between -8 and -12 Vdc (OFF).

(2) Operate TST key.

(3) Initiate a call to the coupler.

(4) When the lamp under the ANS key lights, operate ANS key.

(5) Measure the voltage between terminals (+) SH (or MI) and (-) SG. The meter indicates between +8 and +12 Vdc (ON).

(6) Restore TST and ANS keys to normal.

LCSI With Option Y (Contact Interface)

(1) After disconnecting the customer leads from the separate connecting block, measure the resistance between the two terminals at the customer interface. The meter indicates an open circuit.

(2) Operate TST key.

(3) Initiate a call to the coupler.

(4) When the lamp under the ANS key lights, operate ANS key.

(5) Measure the resistance between the two terminals on the separate connecting block. The meter indicates a short circuit.

(6) Restore TST and ANS keys to normal and reconnect customer leads.

503C or 2503C Telephone Set Test

5.18 This test verifies that the telephone set mode indication and audible monitor features are operating properly. Requirements of this test are based on the logic sense which gives an ON (+) voltage when the telephone set is connected to the line. In all other cases, the mode indication will be OFF (- voltage). This test can be performed without disconnecting the customer interface. Take necessary precautions to ensure that the customer does not receive inadvertent signals.

Note: When making the following measurements, be careful to observe proper polarity with the meter.

5.19 Lift telephone handset. Using the VOM, make voltage measurements between terminals MI (+) and SG (-) on the data coupler, in accordance with the options installed and Table D. Return handset to cradle.

Note: It is only necessary to make the one pair of readings corresponding to the options installed.

TABLE D

MFT SET TEST WITH 1001A DATA COUPLER

INDICATOR	OPTIONS INSTALLED	VOLTMETER READING, DC	
		EXCLUSION KEY	
		UP	DOWN
Voice Mode	A, H, K	+8 to +12	−8 to −12
Data Mode	A, I, J	−8 to −12	+8 to +12
Switchhook	A, G, J	+8 to +12	+8 to +12
Voice Mode	B, I, K	−8 to −12	+8 to +12
Data Mode	B, H, K	+8 to +12	−8 to −12
Switchhook	B, G, J	+8 to +12	+8 to +12

Note: Switchhook operated for all readings.

5.20 Initiate a call to the coupler. Lift handset to answer call. After a 3-second delay, a 2800-Hz tone is heard in handset.

6. REFERENCES

6.01 The following Bell System Practices provide additional information that may be helpful in installing the data coupler:

SECTION	TITLE
010-250-001	Crediting Charges on Test Calls
010-521-100	Data Technical (DATEC) Support
010-521-101	Data Technical (DATEC) Support—Designee Directory
314-205-500	Data Systems—DATA-PHONE® Service and Data Access Arrangements on Direct Distance Dialing Network—Overall Data Transmission Test Requirements
314-205-501	Data Systems—DATA-PHONE® Service and Data Access Arrangements on Direct Distance Dialing Network—Test Requirements for Subscriber, Foreign Exchange, and Remote Exchange Lines
590-010-200	Data Sets and Data Access Arrangements—General Installation and Connection Information
598-010-ZZZ	Data Auxiliary Sets 801A-Type
598-012-ZZZ	Data Auxiliary Sets 801C-Type
660-101-312	Maintenance Service Charge on Services With Customer-Provided Equipment (CPE)

6.02 Detailed information on the 1001A data coupler is contained in the following schematic drawing (SD) and circuit description (CD):

SD-&CD-1D206-01 1001-Type Data Couplers