

1000B DATA COUPLER

DESCRIPTION, INSTALLATION, MAINTENANCE, AND TESTS

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1. GENERAL

1.01 This section contains information required for installing, testing, and maintaining the 1000B Data Coupler (Fig 1). Detailed information is contained in SD- and CD-1D205-01.

1.02 The data coupler is a protective unit which connects customer-provided equipment to private line facilities for data and voice communications.

1.03 The 1000B Data Coupler is designed to provide the following:

- Isolation of customer equipment for the protection of telephone plant and personnel
- Protection of customer equipment from metallic and longitudinal surges occurring on the telephone facilities
- Automatic linear control of signal level above a specified threshold
- Test circuitry for manual remote test capabilities

● Two-way transmission path.

1.04 Alternate voice service may be provided with an associated telephone set and appropriate supplementary equipment. The quality of voice transmission through the coupler may be impaired on consistently strong signals.

1.05 The data coupler is one type of protective interconnecting arrangement, as described in appropriate tariffs, which must be included on all voice-grade private line data channels that terminate in customer-provided equipment.

1.06 When the interface to the customer equipment is 2-wire, the data coupler provides complete protection. However, if the interface to the customer equipment is 4 wire, the coupler is used on the send pair and additional equipment is required on the receive pair to provide proper protection.

1.07 The service offering in which the coupler is used does not provide for a specific data error performance. The telephone company does not assume responsibility for the accuracy of the transmitted data and only ensures that the transmission parameters of the private line circuits are met as ordered. The circuit requirements are specified in Section 314-410-500.

1.08 The customer equipment should limit dc currents through the DT and DR terminals to less than 1 milliamperes to prevent distortion of the data signals.



Normally, private line circuits do not present metallic voltages to the T and R terminals of the coupler. If voltages do appear in excess of 5 volts, open circuit, distortion of the data signals, and damage to the coupler could result.

1.09 The term **central office** is used in this section to represent the repair service bureau, serving test center, or any other organization

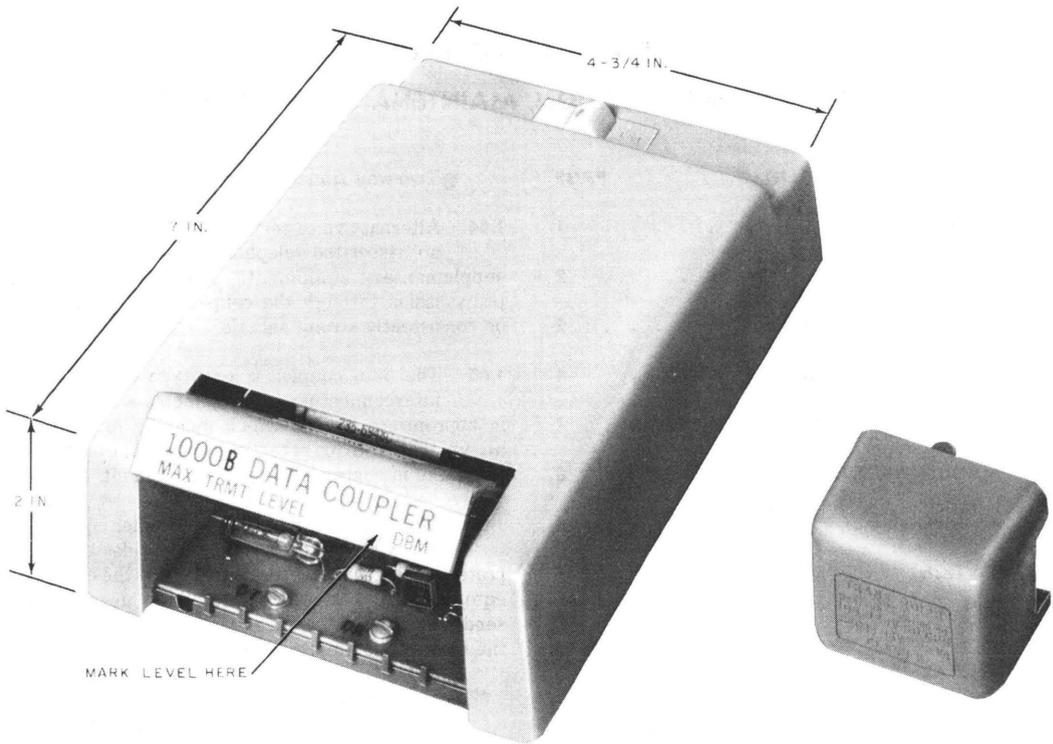


Fig. 1—1000B Data Coupler with 2012B Transformer

designated locally to provide control over private line channels.

2. DESCRIPTION

A. Physical Description

2.01 The data coupler is a wall-mounted unit measuring 4-3/4 inches wide, 7 inches high, and 2 inches deep. The coupler weighs approximately 1-1/2 pounds and is enclosed in a gray plastic housing. The housing consists of a dark gray base and a light gray cover that snap together. One key hole slot and one screw hole are provided in the base so that screws may be used for mounting the unit.

2.02 The circuitry for the coupler is mounted on a single printed circuit pack. Two screw

terminals, located under the hinged portion of the cover, provide the interface for connecting the customer equipment (Fig. 2). The cord required for connecting to the interface must be provided by the customer.

2.03 Four screw terminals are provided on the printed circuit pack for connecting the telephone line and 2012B transformer, or equivalent, to the coupler. The housing cover must be removed so that the installer using D station wire may terminate the connections. The following pairs terminate on the four terminals:

- T and R—Telephone transmission line
- P1 and P2—Low-voltage ac leads from external transformer.

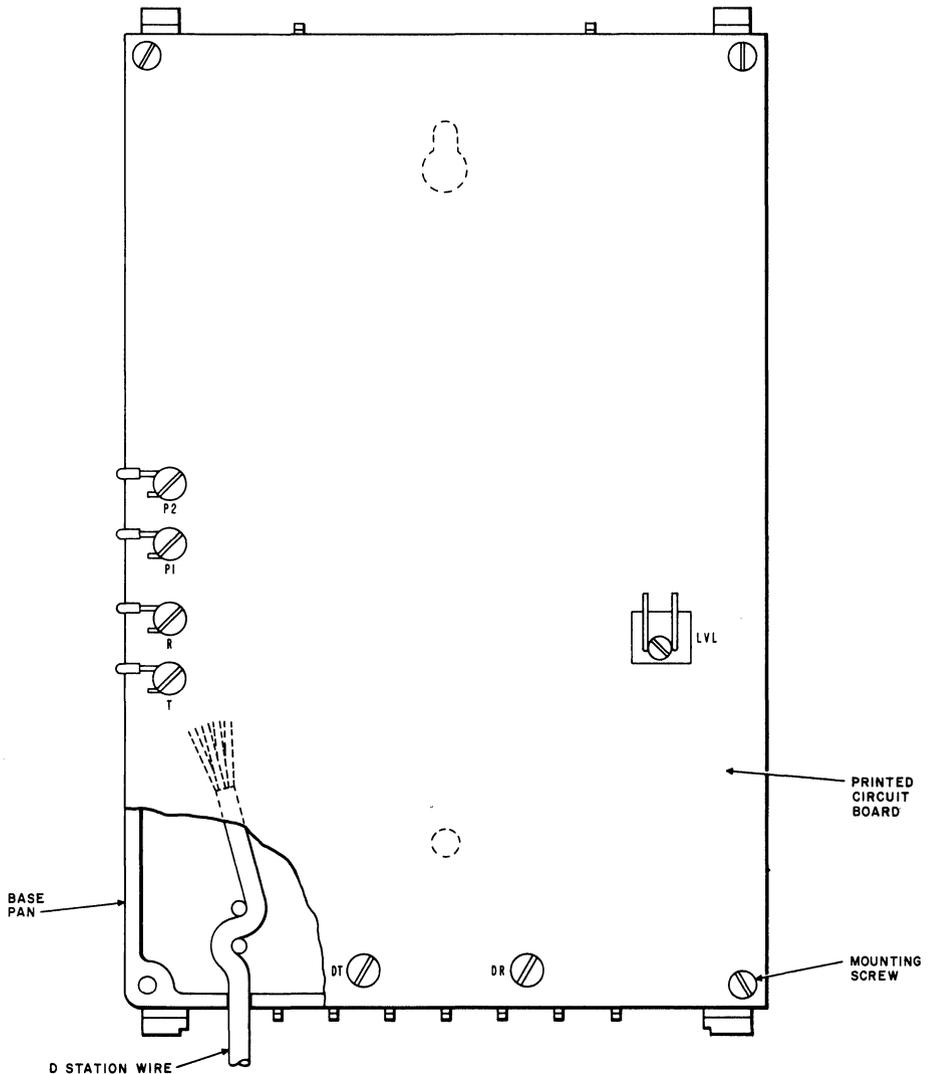


Fig. 2—Route of Station Wiring and Location of Terminals

2.04 A test key (TST) located near the top controls the test mode condition of the coupler.

2.05 A screw switch (LVL) is located on the circuit pack for selecting the threshold of the

automatic level control (limiter) circuit of the coupler.

2.06 The data coupler is designed to operate over a range of 20 to 120°F with a relative humidity up to 95 percent.

2.07 A 2012B transformer steps down the 117-volt ac power to the nominal voltage required by the coupler. The rectifier in the coupler provides the dc supply.

B. Functional Description

2.08 The data coupler connects the telephone plant with a data modem that is provided by the customer. The coupler is intended for use with other telephone company equipment on voice-grade private line facilities which will include 2- or 4-wire configurations.

2.09 The coupler circuitry (Fig. 3) provides a transmission path consisting of the following.

- **Coupling transformer:** provides a 2-way protective function (ie, hazardous voltages, surge protection, and longitudinal isolation).
- **Automatic level control (ALC) circuit:** prevents the customer's signal level from exceeding the prescribed maximum level.
- **Capacitor coupling and surge protector circuit:** couples the output signal to the telephone line with minimum delay distortion and guards the circuit against metallic surges.

2.10 The control circuit continuously monitors the customer's data signal level. The detector and integrator continuously average the input power level and when the 3-second average signal exceeds the preset operating level, current is driven through the thermistor. The thermistor heats up, decreases in resistance, provides a shunt path for the data signal, and decreases the level to the preset value. This prevents the signal from exceeding the threshold.

2.11 The level at which the coupler circuit operates to control or limit the data signal is one of two values: **0 dBm** and **-8 dBm**. The value is selected by means of the LVL screw switch (Fig. 2) on the printed circuit board. With the screw open (normal position), 0 dBm value is selected. With the screw closed (optional value), -8 dBm value is selected.

2.12 The transmit level of the customer modem will determine the limiting level setting of the coupler for a particular installation. The level should be consistent with the design of the private

line ordered by the customer. The transmit level of the data modem is the power measured at the customer interface into a 600-ohm resistive load.

Note: The maximum limit must be marked on the data coupler at the time of installation (see Fig. 1).

2.13 Test Mode: The data coupler test circuit provides the means for applying a test tone to the line through the ALC circuit (Fig. 3). This permits testing the coupler level control and the line. The coupler circuit is designed to be remotely tested from the central office or tested locally on the customer premises.

2.14 The test circuit consists of a tone oscillator and a TST key. Operation of the key removes the transmission path from the customer equipment and connects the power supply to the test oscillator. The key also connects the oscillator output to the customer side of the coupling transformer to apply the tone to the line. The tone is a 2800-Hz signal with a level high enough to cause the ALC circuit to operate and reduce the signal to the level (either 0 or -8 dBm) which was specified at the time of installation, thereby testing the limiting action.



Accidental or intentional operation of the TST key while transmitting data will interrupt the data signals.

2.15 Restoring the TST key removes the test oscillator from the circuit and releases the coupler from the test mode.

3. INSTALLATION AND CONNECTIONS

3.01 The 1000B Data Coupler may be used on voiceband private lines associated with customer-provided data equipment. The coupler is just one of the many different components which typically make up a private line data station arrangement. This practice covers only the 1000B Data Coupler, and the specific connections for the unit will depend on the particular station arrangement.

3.02 The installation of the coupler should comply with general practices to ensure an orderly station arrangement. Information relating to a selection of type of connecting block and electrical code requirements is given in Section 590-010-200.

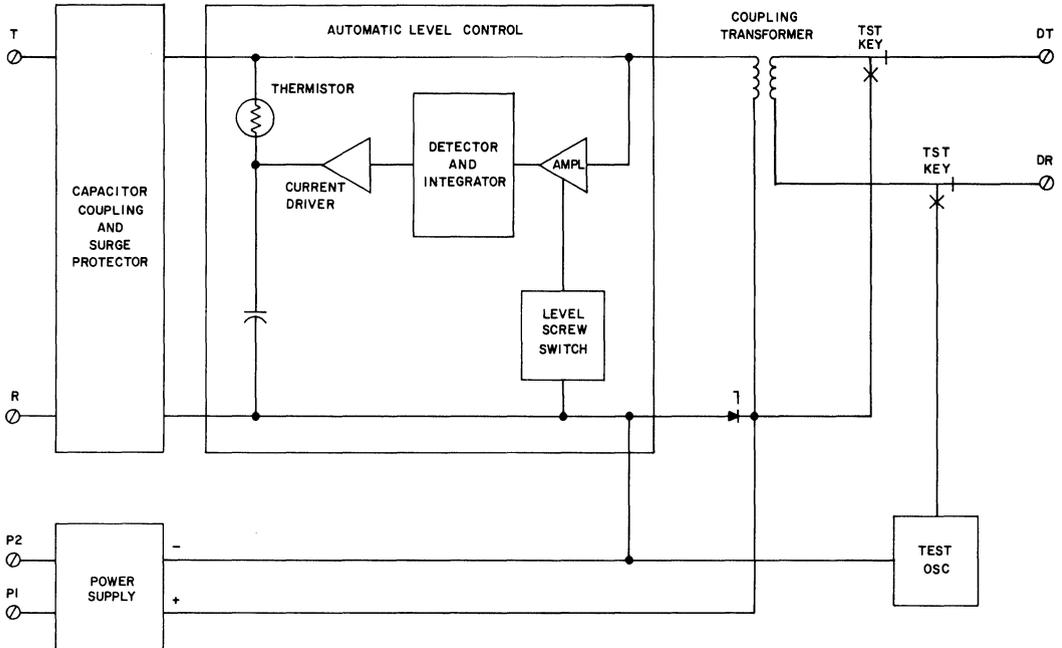


Fig. 3—Functional Schematic of 1000B Data Coupler

3.03 The location of the data coupler shall be determined by the following conditions.

- The coupler should be mounted on a smooth surface.
- The coupler must be within range of the interface cord supplied by the customer.
- The location of the coupler should provide easy access for operation of the test key by the customer attendant.

Note: In general, there is no restriction on the length of the customer interface cord. The telephone company responsibility terminates at the coupler interface.

3.04 Install the coupler as follows.

- (1) Remove the snap-off cover assembly.

- (2) Remove the four screws securing the printed circuit board to the base pan and remove the board.

- (3) To install coupler on wall, position the base pan vertically against the wall with key hole slot up. The base pan should be at least 3 inches above the top of the baseboard or other obstruction which will be below the unit. Secure the base with two screws.

- (4) Route the D station wire through the slots and pins on the base as shown in Fig. 2. Attach the circuit board to the base pan by using the four screws. Connect the four leads as required to the terminals on the board.



Care should be taken not to overtighten screws or stripping will result.

3.05 A 2012B transformer is provided with each coupler. The transformer primary terminals are two parallel blades which serve as the mounting device in a standard 117-volt, 60-Hz ac power receptacle. Two recessed screw terminals provide the means for connecting to the transformer secondary. The ac receptacle, furnished by the customer, must have continuous power and must not be under control of a switch.

Note: The power must always be on during the transmitting mode or the data signals will be distorted.

3.06 The data coupler and transformer may be connected in accordance with the typical wiring diagram shown in Fig. 4. The coupler may connect directly to a 2-wire private line, to the send pair of a 4-wire private line, or to other telephone equipment. Any associated apparatus which is required to complete the station arrangement should be installed as outlined in appropriate practices.

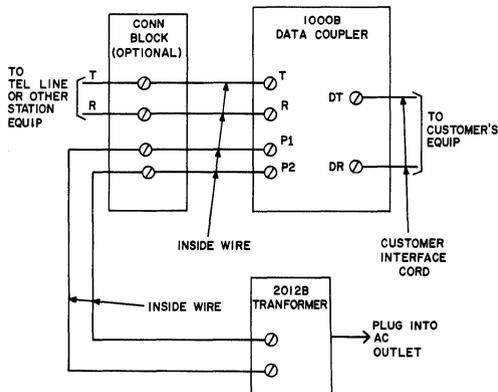


Fig. 4—Typical Data Coupler Connections with Associated Transformer

3.07 When the connections have been completed, the level limiting function of the unit must be checked. Perform the limiter operational test as outlined in Part 4.

3.08 After the installation has been completed, perform the remote test outlined in Part 4.

The results of the remote test made during installation must be recorded on a line history record card, or equivalent, by the central office to assist in analyzing future trouble and to detect gradual degradation of the service.

3.09 After the installation, verify that the private line meets the transmission requirements for the specific data channel ordered by the customer. The requirements for various private line offerings are outlined in Section 314-410-500.

4. MAINTENANCE AND TESTS

4.01 The maintenance and testing procedures described in this part are to assist the employee during installation and troubleshooting visits to a data coupler station.

A. Maintenance

4.02 All repair forces should be familiar with the tariff provisions which generally provide for a "Maintenance of a Service Charge" for each repair visit in which it is found that the trouble condition results from or is caused by customer-provided equipment. When such a condition exists, the employee should notify the customer and request the central office to fill out form E-5855 in conformance with Section 660-101-312.

4.03 Maintenance of the coupler on customer premises should be limited to local tests, testing with a central office, or replacing a defective unit. Field repair should not be attempted on a defective coupler. The unit should be returned to the Western Electric Service Center to be salvaged for the best allowance.

B. Tests

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

- Limiter operational test

- Remote test.

4.05 The following test equipment is required for the limiter test:

- 600-ohm resistor

- Hewlett-Packard 400D vacuum tube voltmeter (VTVM), KS-16979-L1 or KS-14510-L1 volt-ohm-milliammeter, 3A noise measuring set, or equivalent meter for measuring signal level
- KS-16979-L1 or KS-14510-L1 volt-ohm-milliammeter, or equivalent meter for measuring resistance.

4.06 Limiter Operational Test: The limiter operational test makes use of the test oscillator to verify that the coupler will properly limit an input signal that exceeds the preset maximum level. Proceed with the test as follows:

- (1) After obtaining permission from customer to interrupt service, disconnect the telephone line and connect the 600-ohm resistor between terminals T and R.

PRESET LEVEL ON COUPLER	400D AND KS-16979-L1
0 dBm	-2 ± 0.5 dBm
-8 dBm	-9.6 ± 0.7 dBm

* With FUNCTION switch set at NM BRDG.

- (6) To complete operational test, use available ohm meter and measure resistance across terminals DT and DR. With the TST key in the OFF position (blank half of switch depressed), a reading of approximately 85 ohms should be obtained on the meter. Operate TST switch to ON position and observe meter indication of infinite resistance (an open condition).

- (7) Remove the resistance and test equipment from the coupler and restore the connection to normal.

4.07 Remote Test: The remote test is required to measure the test signal of the coupler at the central office at the time of installation. The test should also be performed with customer's

Note: Obtain access to terminals T and R by removing the snap-off cover from the coupler. Access to the terminals may also be obtained at the appearance of tip and ring on the connecting block which terminates the D station wire.

- (2) Plug the 2012B transformer into an ac outlet.
- (3) Connect available meter across T and R terminals to measure signal level.
- (4) Operate the TST key to the ON position (depress the red dot half of switch).
- (5) Observe definite increase in meter reading. After a few moments, the reading should decrease to the appropriate following value:

METER READING

KS-14510	*3A
0.6 ± 0.05 v	84 ± 0.5 dBrn, 3 kHz flat
Approx 0.25v	77 ± 0.7 dBrn, 3 kHz flat

assistance prior to a station maintenance visit. The test signal provides a check of the local channel and the limiting function of the coupler.

4.08 The data coupler must be connected to the telephone line for this test. Proceed with the test as follows.

- (1) Plug the 2012B transformer into an ac outlet.
- (2) Using a telephone set connected to the switched telecommunications network, contact the controlling central office and request the employee to measure the level of the test tone (2800 Hz) received on the private line channel.

- (3) Agree upon length of time required to perform the test, and when instructed by test employee operate the TST key (depress red dot half of switch).
- (4) After the agreed testing interval, operate the TST key to normal position (depress blank half of switch).
- (5) Call the test office and request the level reading. When the test is made at time of

installation, the actual value of the received 2800-Hz signal level *must* be recorded on the line history card 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 local channel or the coupler. A measured level within 2 dB of original value provides a high confidence level that the coupler and associated line are operating satisfactorily.