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INSTRUCTIONS FOR INSTALLATION OF THE 198420 MODIFICATION KIT (BELL SYSTEM 1A COUPLER) TO CONNECT TELETYPE TERMINAL APPARATUS TO 103 SERIES DATA SETS

1. GENERAL

a. The 198420 modification kit provides facilities for the interconnection of Teletype terminal equipment and data sets which conform to the standards of the Electronics Industries Association. In accordance with these standards, all data and control leads of the data set carry bi-polar voltage signals.

b. The 198420 kit accepts current-no-current data and control signals from the teletypewriter and converts them into suitable bi-polar signals for use by the data set. In addition, it accepts polar data and control signals from the data set and converts them into current-no-current signals for use by the teletypewriter.

NOTE

It is recommended that signal generators equipped with gold-plated contacts be used in conjunction with this coupler. Although the circuit is designed to accommodate a relatively high voltage drop in the BA circuit, tests have shown that Tungsten contacts can exhibit complete nonconductivity under some operating conditions.

c. The kit is intended for use with Bell System Data Sets 103 A,B,C,E, and F all of which use the EIA interface. A power cord is provided to connect AC power to the coupler.

d. The 198420 kit provides coupling facilities for the following EIA and/or special interface circuits which are associated with the 103 A,B,F, and E Data Sets.

<u>Circuit Designation</u>	<u>Description</u>	<u>Data Set</u>
AA	Protective Ground	103A, F, E;
AB	Signal Ground	103A, F, E;
BA	Transmitted Data	103A, F, E;
BB	Received Data	103A, F, E;
CA	Request to Send	103F
CB	Clear to Send	103A, F, E;
CC	Data Set Ready	103A, F, E;
CD	Data Terminal Ready	103A, E;
CE	Ring Indicator	103A, E;
CF	Data Carrier Detector	103A, F, E;
CJ	Local	103F
CK	Originate	103F
CL	Send Restraint	103E

e. The 198420 modification kit consists of:

- 1 146420 Cord, Power
- 2 182539 Connector
- 30 182644 Terminal
- 1 312418 Data Set Coupler (comes assembled from the factory)

2. INSTALLATION

NOTES

Interconnection between the 312418 coupler and data set is provided by a seven foot cable provided with the coupler. The cable terminates in a 25 pin connector in accordance with EIA standards and is universally adaptable to the associated connector provided on the 103A, B, F, and E Data Sets.

Interconnection between the 312418 and the teletypewriter must be provided. This cable must terminate in two specified receptacles for connection to the coupler.

The power input to the coupler is 115 ± 10 percent V AC, 60 ± 1 percent CPS. This power must be provided through the Male Twist-Lock Connector which is mounted on the coupler.

a. Mount the 312418 Data Set Coupler on the facilities provided in the terminal apparatus.

NOTE

The coupler may be mounted in any area suitable to the specific teletypewriter with which it is used. Mounting holes are provided on the coupler for panel mounting, relay rack mounting, or it may be set on a shelf without mounting provisions, if permissible. The coupler may be oriented in any position desired without affecting operation. In all cases, make certain that the AC power input connector is not blocked. Figure 1 illustrates the device and provides dimensions for the mounting holes provided.

- b. Loosen the three 181242 Screws and remove the 198418 Cover.
- c. Connect the 198419 cable assembly between the J2 connector and the data set.
- d. Connect the 198424 Transformer to the J-1 connector.
- e. Connect the cable provided by the terminal apparatus to the J-3 and J-4 connectors.
- f. Replace the cover.

g. A 121246 Cable Clamp, 181243 Screw W/Lock Washer, and 7002 Flat Washer are provided in a muslin bag attached to the coupler for use by the installer to secure the 198419 Cable Assembly, if so desired.

3. THEORY OF OPERATION

a. A cable is provided with the coupler for connection to the data set. The cable terminates in a 25 pin connector which has been standardized for use with the data set are shown below (see 6468WD). Refer to Paragraph 3.b. for a description of the circuit references.

PIN ASSIGNMENTS FOR 145914 CONNECTOR (PART OF 198419 CABLE ASSEMBLY)

<u>Pin No.</u>	<u>103A</u>	<u>103F</u>	<u>103E</u>
1	AA	AA	AA
2	BA	BA	BA
3	BB	BB	BB
4	R	CA	R
5	CB	CB	CB
6	CC	CC	CC
7	AB	AB	AB
8	CF	CF	CF
9	+20	+20	+20
10	-20	-20	-20
11	R	CK	R
12	R	CJ	R
13	U	U	U
14	NA	NA	NA
15	U	U	U
16	U	U	U
17	NA	NA	NA
18	R	R	R
19	U	U	U
20	CD	R	CD
21	U	U	U
22	CE	R	CE
23	R	R	R
24	NA	NA	NA
25	R	R	CL

NOTE: U - Unassigned.

R - Reserved (used on other data sets in the series).

NA - Not Applicable - assigned by EIA but not applicable in this series.

b. The terminal apparatus must provide a cable for connection to the coupler. The cable should terminate in a twist-lock connector and in two 182539 Connectors with 182644 Terminals. These connectors are to terminate in J3, J4 and P1 on 6468WD with pin assignments as shown on the wiring diagram and explained in detail below. For customer convenience, two 182539 Connectors and thirty 182644 Terminals are supplied with the coupler.

(1) Power Supply - The terminal apparatus must supply 117VAC on the twist-lock. This is connected to T1 which in turn provides two 20VAC outputs with a center tap to ground. CR10, CR11, CR12, and CR13 comprise a rectifier bridge providing ± 20 VDC which is filtered by C1 and C2. R1 and R2 are power limiting resistors.

(2) AA - Protective Ground - This conductor shall be electrically bonded to the frame of the terminal apparatus. It may be further connected to external grounds as required by applicable regulations and is available at J3-2.

(3) AB - Signal Ground - This conductor establishes the common ground reference potential for all interchange circuits except Circuit AA (Protective Ground). It may be connected to Circuit AA or the frame, as required by applicable regulations, and is available at J4-6.

(4) BA - Transmitted Data - Signals on this circuit are generated by the terminal apparatus for transmission to remote data sets.

(a) All signal generators or regenerators in the terminal apparatus should be installed in series between J3-12 and -20 volts (J3-13). When the signal generator contact is closed (mark), -20 volts is presented at J2-15. When the contact is open (space), +10 to +20 volts is presented at J2-15 through R3. Local copy (similar to half-duplex) will be received through CR2 which is part of the input gate to Circuit BB (Received Data).

(b) Line Break (normally closed contact) should be wired across J3-1 and J3-11. This provides a non-interfering break when receiving remote traffic on Circuit BB (Received Data). If line break is not to be used, a strap must be provided across J3-1 and J3-11.

(c) If local copy is not to be received when transmitting (similar to full-duplex operation), the signal generators should be wired between J3-1 and J3-11 and a strap provided between J3-12 and -20 volts (J3-13).

(d) The signal generator in the terminal apparatus is required to break 40V DC at approximately 15 ma in this circuit.

(5) BB - Received Data - Signals on this circuit are generated by the data set in response to data signal received from remote data sets.

(a) Data signals received by the data set are presented to CR1 as ± 5 to ± 25 volt signals. Signals generated by the local signal generator are similarly presented to CR2. CR1 and CR2 serve as an input gate to Q1. Negative signals (mark) at CR1 or CR2 are blocked and the base of Q1 is held negative by -20 volt through R13 which allows the transistor to conduct. This provides ground at the junction of the collector of Q1, CR14, R15, and R20, the latter two of which are current limiting resistors for receiving selector magnet drivers which may be operated at 20 or 60 ma when connected to J4-3 or J4-2, respectively. The negative input to the selector magnet driver should be connected to -20 volts (J3-13.) CR14 limits the collector voltage. Inductive devices, such as relay coils, may also be operated from this circuit at -20 volts. Positive signals (space) at CR1 or CR2 are conducted through R14 and CR3 to ground holding the base of Q1 positive which turns the transistor off.

(6) CA - Request to Send - Signals on this circuit are generated by the terminal apparatus to condition the data set to transmit. The "ON" condition must be maintained whenever traffic is ready to be transmitted or is being transmitted.

(a) A contact closure between $+20$ volts (J3-7) and J3-14 presents $+15$ volts at J2-8 through R5 indicating an ON condition. If the contact is open, -10 to -20 volts appears at J2-8 through R4 indicating an OFF condition.

(b) The Request to Send contact in the terminal apparatus will break 40V DC at approximately 13 ma.

(c) For Receive Only operation, Circuit CA should be held OFF at all times.

(d) For Transmit Only operation, Circuit CA should be held ON at all times.

(7) CB - Clear to Send - Signals on this circuit are generated by the data set to indicate that the data set is ready to transmit data when in the ON condition.

(a) Signals of ± 5 to ± 25 volts are presented to R16 by the data set. Negative signals are conducted through CR5 to ground holding the base of Q2 negative and turning the transistor off. Positive signals are conducted through R16 turning Q2 on as well as K1 relay. CR4 limits the collector voltage. The contacts of the Clear to Send relay (K1) include one make and one transfer contact presented to the terminal apparatus at J4-11, J4-12, J4-13, J4-14, and J4-15. These contacts may be used to turn on a tape reader, control relay, signal lamp, or any other feature required by the terminal apparatus.

(b) The nominal pick-up and release time of the Clear to Send relay is approximately 7 and 37 milliseconds, respectively.

(c) The load on the Clear to Send relay contact should not exceed 3 amps at 115V AC, 60 cps, resistive or 3 amps at 30V DC, resistive. Adequate spark suppression should be provided.

(8) CC - Data Set Ready - Signals on this circuit are generated by the data set to indicate that it is ready to operate (ON condition). The OFF condition indicates any abnormal or test condition which impairs normal operation.

(a) Signals of + 5 to + 25 volts are presented to R17 by the data set. Negative signals are conducted through CR7 to ground holding the base of Q3 negative, turning the transistor off, and opening the collector circuit. Positive signals are conducted through R17 turning Q3 on and making the collector ground. CR6 limits the collector voltage.

(b) Control devices, such as relays, may be connected between J4-9 and + 20 volts (J3-7). The operating current of these devices should not exceed 50 ma.

(9) CD - Data Terminal Ready - Signals on this circuit are generated by the terminal apparatus to control switching of the data set to a communications channel. The ON condition causes the data set to be connected to a communications channel. The OFF condition removes the data set from a communications channel for such reasons as terminating a call, freeing the line for alternate use, or permitting the use of the terminal apparatus for an alternate function.

(a) A contact closure between J3-10 and -20 volts (J3-13) presents -15 volts at J2-9 through R9 indicating an OFF condition. If the contact is open, +10 to +20 volts appears at J2-9 through R8 indicating an ON condition.

(b) The above contact in the terminal apparatus will be required to break 40V DC at approximately 13 ma.

(10) CE - Ring Indicator - Signals on this circuit are generated by the data set to indicate that ringing current is being received from a remote station. The ON condition indicates that a ringing signal is being received with the OFF condition maintained at all other times.

(a) Signals on the circuit are presented to the terminal apparatus on J3-3 directly from the data set as a bi-polar signal. Terminal apparatus using this circuit must conform to EIA requirements for circuit conformance.

(11) CF - Data Carrier Detector - Signals on this circuit are generated by the data set to provide an indication that the data carrier is being received when in the ON condition. The OFF condition indicates that the data carrier is lost.

(a) Signals of + 5 to + 25 volts are presented to R18 by the data set. Negative signals are conducted through CR9 to ground holding the base of Q4 negative, turning the transistor off, and opening the collector circuit. Positive signals are conducted through R18 turning Q4 on and making the collector ground. CR8 limits the collector voltage.

(b) Control devices, such as relays, may be connected between J4-8 and +20 volts (J3-7). The operating current of these devices should not exceed 50 ma.

(12) CJ Local - Signals on this circuit are generated by the terminal apparatus to remove the data set from the communications channel so that the terminal apparatus may function on a local circuit. The ON condition causes the data set to be in the local mode.

(a) A contact closure in the terminal apparatus between J3-6 and +20 volts (J3-7) presents +20 volts at J2-11 and -10 to -20 volts through R7 when the contact is open.

(b) The above contact must break 40V DC at approximately 15 ma.

(13) CK - Originate - Signals on this circuit are generated by the terminal apparatus to determine if the data set functions as an originating or answering station. The ON condition causes the data set to be in the answer mode and the OFF condition causes the data set to be in the originate mode.

(a) A contact closure in the terminal apparatus between J3-4 and -20 volts (J3-13) presents -20 volts at J2-12 and +10 to +20 volts through R6 when the contact is open.

(b) The above contact must break 40V DC at approximately 15 ma.

(14) CL - Send Restraint - Signals on this circuit are generated by the terminal apparatus to cause the data set to send a restraint signal when the ON condition is maintained. The OFF condition causes transmission to be resumed.

(a) A contact closure in the terminal apparatus between J3-15 and +20 volts (J3-7) presents +20 volts at J2-5 and -10 to -20 volts through R12 when the contact is open.

(b) The above contact is required to break 40V DC at approximately 15 ma.

(15) The above circuits may be ignored by the terminal apparatus if control of the circuit is not required or if it is not offered by a specific data set in the aforementioned series. If the control is to be fixed in one state or another, strap options may be specified in the terminal apparatus.

(16) The delay time introduced by the coupler in switching the above circuits may be considered negligible with the exception of circuit CB (Clear to Send), which is described in Paragraph 3.b.(7).

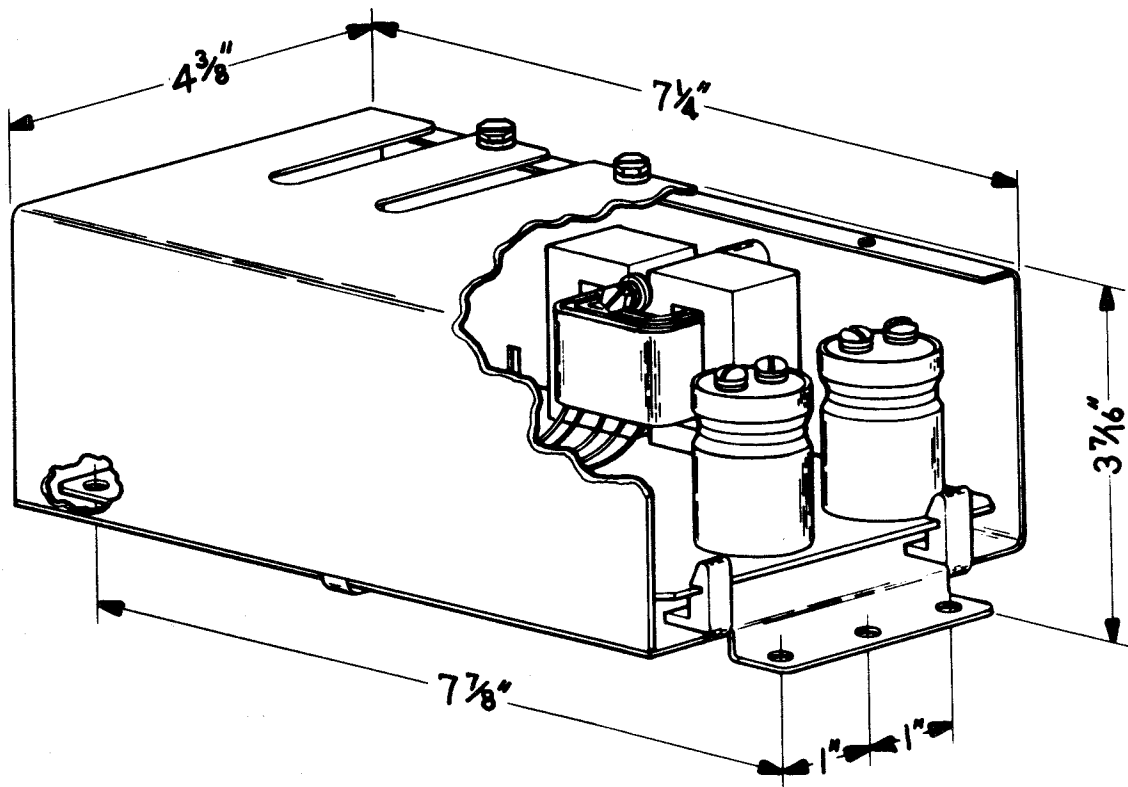
(17) A special circuit requirement of the 811B Data Auxiliary Set requires Resistor R22 to be strapped out of the circuit.

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DATA SET COUPLER

FIGURE 1

TROUBLE SHOOTING INFORMATION	
<u>Symptom</u>	<u>Probable Cause</u>
No. D.C. voltage	CR10, 11, 12, or 13 open. Loose connection on 198421 Circuit Board or P1 Plug. No A.C. Input (117V AC)
No output on transmitting circuits (Circuit BA, CA, CD, CJ, CK, CL,	Wire broken in 198419 Cable. Loose connection on 198421 Circuit Board.
Selector Magnet Always Marking (Circuit BB)	Q1 shorted collector-to-emitter. CR1 or CR2 open. Wire broken in 198419 Cable. Loosen connection on 198421 Circuit Board.
Selector Magnet Always Spacing (Circuit BB)	Q1 open base, emitter, or collector. CR1, CR2, or CR3 shorted.
No output from receiving circuits (Circuit CB, CC, CE, or CF).	Q2, Q3, or Q4 open or shorted. CR5, CR7, or CR9 shorted. Wire broken in 198419 Cable. Loose connection on 198421 Circuit Board.

NOTE

It is suggested that the unit be replaced in the field and maintained in a repair center. The repair center should have equipment available to simulate normal operation.

SERVICING INSTRUCTIONS

FIGURE 2.