

CIRCUIT DESCRIPTION

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4

ELECTRONIC SWITCHING SYSTEMS
NO. 101
DATA LINK TRANSFER CIRCUIT
FOR SWITCH UNIT

CHANGES

D. Description of Changes

D.1 This circuit was reissued to change the rating to
Mfr Disc.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 3224-RJD-RVL

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SECTION I - GENERAL DESCRIPTION

1. PURPOSE AND FEATURES OF CIRCUIT

1.01 The Data Link Transfer Circuit, hereafter referred to as DLTC, is primarily concerned with reliability in data communication between the switch unit and its associated control unit in the ESS No. 101 system. It is installed in the switch unit between the Data Receiver Circuit and Data Transmitter Circuit and the trunk pairs connecting to the control unit. The DLTC provides the following features:

- (a) Line-splitting pads for the two data receivers operating off the incoming data trunk pair.
- (b) Termination of the incoming data trunk pair in the event of the removal from service of either data receiver or for line-checking purposes.

(c) Connection of the output of either of the two data transmitters onto the outgoing data trunk pair.

(d) The simultaneous interchange, in conjunction with the associated control unit DLTC, of digit trunk pairs No. 1 and 2 with the incoming and outgoing data trunk pairs, respectively, in the event of unsatisfactory transmission over either data trunk pair.

(e) All the optional wiring necessary, at the switch unit, for data communication over loaded or nonloaded facilities.

2. GENERAL OPERATION

2.01 Circuit operation is controlled by four relays, three in the switch unit Transfer and Alarm Circuit and one in the control unit DLTC. In the Transfer and Alarm Circuit, relay T1 connects either data transmitter onto the outgoing data trunk pair. The other two relays, T2 and T3, each remove a data receiver from the padded side of the incoming data trunk pair and substitute a line terminating resistor in place of the removed receiver. Jacks J1 and J2 in the Transfer and Alarm Circuit perform the same function as relays T2 and T3, respectively, and also provide access to the incoming data signal for test purposes. The relay in the control unit DLTC controls the interchange of digit and data trunk pairs as follows.

2.02 Across each data trunk pair is a relay (C1 or C2) in the DLTC which is normally operated, via the associated trunk pair, by current from the control unit. This current, in addition to operating the relay, provides some degree of wetting of cable splices. When an interchange of data and digit trunk pairs is to take place, the current to each relay, C1 and C2, is interrupted. When these relays both drop out, a third relay, C3 in the DLTC, operates and interchanges digit trunk pairs No. 1 and 2 with the incoming and outgoing data trunk pairs, respectively.

SECTION II - DETAILED DESCRIPTION

1. GENERAL

1.01 For descriptive purposes, the DLTC may be divided into four main sections: (a) splitting pads, (b) receiver substitution, (c) transmitter transfer, and (d) cable transfer.

2. SPLITTING PADS

2.01 Since two data receivers are operated off the incoming data trunk pair, a splitting pad is required to provide this connection and still maintain the desired line termination. In the DLTC a choice of pads is provided: a 900-ohm pad for loaded facilities and a 225-ohm pad for nonloaded facilities. The proper pad is installed by means of wiring options: Y option for loaded facilities, X option for nonloaded facilities. The voltage loss across either pad is 6 db, ie, the data signal voltage measured across the T and R leads (the input to the pad) is 6 db greater than that measured across the T1 and R1 or T2 and R2 leads (the outputs of the pad). Resistors R8, R9, R10, R14, R15, and R16 (300 ohms each) and R5, R6, R7, R11, R12, and R13 (75 ohms each) on CPS 284 form one-half of the resistances of the 900- and 225-ohm pads, respectively. A second CPS 284 is used to supply the other half of each pad resistance in parallel. The wiring is arranged so that if either CPS 284 is removed, the data signal remains on both data receivers. Under these emergency conditions, the signal level at the data receivers is attenuated approximately 2 db more.

2.02 In order to match to pad impedance, options at the data receiver input provide an input impedance of either 900 ohms (Y option) or 225 ohms (X option). Due to blocking capacitor C1 in the DLTC or capacitors in the data receiver transformers, the dc normally present on the incoming data trunk pair does not pass through the pads.

3. RECEIVER SUBSTITUTION

3.01 The action of relay T2 or jack J1 is to transfer the padded tip and ring data leads (T1 and R1) from the input of data receiver No. 1 to the proper line terminating resistor (R3 or R4). The proper terminating resistor is preselected by means of wiring options. For loaded facilities, a 909-ohm resistor (R3) is used (Y option). For nonloaded facilities, a 226-ohm resistor (R4) is used (X option). Relay T3 or jack J2 perform the same function in association with data receiver No. 2.

3.02 Relay T2 or T3 is operated in the Transfer and Alarm Circuit during regular maintenance routines or whenever a trouble is suspected in the associated Data Receiver Circuit or any circuit fed by the receiver up to and including the associated switch store. A dummy or test plug is inserted into jack J1 or J2 whenever it is desired to remove the associated data receiver from service or to perform tests on the incoming data trunk (tip and ring contacts on the jack).

4. TRANSMITTER TRANSFER

4.01 Since a switch unit contains two data transmitters but only one outgoing data trunk pair, a pair of transfer contacts is provided (on relay T1 in the Transfer and Alarm Circuit) so that either transmitter may be connected to the trunk pair. Relay T1 is operated during regular maintenance routines or whenever a trouble is suspected in the online transmitter or its associated scanner. Circuitry in the Transfer and Alarm Circuit is arranged so that both data transmitters receive, and therefore transmit, a steady space message, ie, no word, during this transfer operation. To minimize transients during transfer, which might otherwise cause the associated control unit data receiver to pick up a false message, EMB contacts are used and 0.1-megohm resistors (R1 and R2 on CPS 284) are shunted across each set of contacts. These resistors apply a voltage across the capacitors of the transformers in the data transmitters at the dc level existing across the outgoing data trunk pair and, therefore, eliminate transients due to capacitor charging current which might otherwise occur when the unused transmitter is transferred onto the trunk pair. Options at the data transmitter output provide an output impedance of either 900 ohms (Y option) or 225 ohms (X option) for transmission over loaded or nonloaded facilities, respectively.

5. CABLE TRANSFER

5.01 A cable transfer, ie, the simultaneous interchange of digit trunk pairs No. 1 and 2 with the incoming and outgoing data trunk pairs, respectively, takes place during regular maintenance routines or whenever a trouble is suspected in either data trunk pair. Normally, data transmission takes place over the data trunk pairs and digit signaling over the digit trunk pairs. However, when a transfer occurs, the reverse is true, ie, data transmission is over digit trunk pairs No. 1 and 2 and digit signaling, for digit trunk circuits No. 1 and 2, is over the data trunk pairs. This imposes the restriction that the transmission characteristic of digit trunk pair No. 1 or 2 must be the same as those of its associated data trunk pair.

5.02 A cable transfer takes place as follows. Across each data trunk pair is a 2-winding supervisory relay (C1 or C2) located in the DLTC which, in the normal situation, is operated by current from the control unit. This current ranges between approximately 13 and 25 ma, depending on the dc loop resistance of the trunk pair. For loops less than 1000 ohms, a 1000-ohm current limiting resistor is in series with the relay windings. For loops greater than 1000 ohms, the current limiting resistor is shorted out (Z option). In addition to operating the relay, this current also serves to wet the data trunk pair.

5.03 When a cable transfer is to take place, a relay CT in the control unit DLTC is operated by the control unit maintenance center circuit. The CT relay interchanges the corresponding digit and data trunk pairs in the control unit, thereby removing current from relays C1 and C2 and causing 48 volts dc to appear across dc open-circuited digit trunk pairs No. 1 and 2. When relays C1 and C2 both drop out, a third relay, C3 in the DLTC, is operated and completes the cable transfer at the switch unit end. To return from the transferred to the normal connections, relay CT is released, thereby returning the control unit trunk pairs to their normal connections and supplying current to relays C1 and C2. When either C1 or C2 is operated, relay C3 drops out and the trunk pairs at the switch unit end are returned to normal.

3.03 To connect the output of either of the two data transmitters onto the outgoing data trunk pair.

3.04 To provide 0.1-megohm shunts across the transfer relay contacts to reduce the transients on the data transmitting pair during transfer of the data transmitters.

3.05 To provide the optional wiring necessary at the switch unit for data communication over loaded or nonloaded facilities.

3.06 In response to a zero loop current in both the incoming and outgoing data trunk pairs, to transfer the data transmitter T and R leads, normally connected to the cable pair assigned for data transmission, to the associated cable pair assigned for digit signaling and to make a complementary transfer with respect to the T and R leads of the associated digit trunk. At the same time, and in a similar manner, to transfer the T and R leads of the data receivers and those of their associated digit trunk.

SECTION III - REFERENCE DATA

1. WORKING LIMITS

1.01 Data Trunk Pairs

	<u>Incoming</u>	<u>Outgoing</u>
	ohms	
Max Ext Ckt Loop Res	2450	2450
Max Ext Cond Res	2000	2000
Min Insulation Res	30,000	30,000

1.02 Digit Trunk Pairs: The transmission characteristics and dc resistance of digit trunk pairs No. 1 and 2 shall be the same as those of the incoming and outgoing data trunk pairs, respectively.

1.03 Loop Current: The dc loop current in the incoming or outgoing data trunk pairs in normal, ie, untransferred, operation shall be between 13 and 25 ma.

2. FUNCTIONAL DESIGNATIONS

None.

3. FUNCTIONS

3.01 To provide line-splitting pads for the two data receivers operating off the incoming data trunk pair.

3.02 To provide termination of the incoming data trunk pair when either data receiver is removed from service.

4. CONNECTING CIRCUITS

- (a) Transfer and Alarm Circuit - SD-LH017-01.
- (b) Data Receiver Circuit - SD-LH031-01.
- (c) Data Transmitter Circuit - SD-LH032-01.
- (d) Data Link Transfer Circuit - SD-LH054-01.

5. MANUFACTURING TESTING REQUIREMENTS

5.01 The switch unit DLTC shall be capable of performing all of the service functions specified in this CD and of meeting all of the requirements of the Circuit Requirements Table.

SECTION IV - REASONS FOR REISSUE

D. Description of Changes

D.1 Effective this issue the circuit rating is changed to A&M Only.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5732-JWH-LAW