

**ADMINISTRATIVE DATA LINK
PROCEDURES
NO. 2B ELECTRONIC SWITCHING SYSTEM**

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1. GENERAL

1.01 This section describes the procedures for using administrative data link facilities in a No. 2B Electronic Switching System (ESS). This capability is only available in offices equipped with the 2B-EF-2 or later generic program. For a

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2. OPERATIONAL DESCRIPTION

A. Hardware

2.01 In order to have data link capabilities, a No. 2B ESS office must be equipped as follows:

- 201C Data Set
- Key Telephone Set (with *data* and *talk* mode button)
- Synchronous Data Set Controller.

2.02 The **201C data set** can transmit and receive, but not simultaneously, at 2400 bits per second on basic (unconditioned) voiceband private lines or switched message network. The **key telephone set** is TOUCH-TONE®, or equivalent, with *data* and *talk* modes. The synchronous data set controller (SDSC) consists of two circuit packs (Fig. 1) located within tape data controller 0 (TDC 0). For economy, the SDSC is designed to use buffer circuitry within TDC 0 for the transfer of data to or from the 201C data set. Consequently to transmit data to or from tape requires that TDC 1 be used for tape and TDC 0 be used for data links during data linking activities. (See Fig. 2.)

Note: TDC 0 and TDC 1 can be used normally when data linking is not in progress.

2.03 The remote end of a data link must include a 201C data set, a key telephone set with *data* and *talk* modes, and a terminal unit that is compatible with the No. 2B office data processing equipment. The telephone line may be dialed at either the No. 2B ESS office or the remote office.

B. Software

2.04 The software in the ESS consists of the following two programs:

- Common Data Handler (CDATH)
- Data Link Application (DLAPP).

2.05 The **CDATH** controls SDSC programs and diagnostic routines, provides the data link protocol required for digital data communications message protocol (DDCMP), and loads or unloads

the hardware buffer. CDATH interfaces with the data link user through the DLAPP program. **DLAPP** processes a TTY input message for a requested activity. DLAPP also processes the data for the data link buffer as required by that activity.

C. Transmission

2.06 Data is transmitted over data link facilities in binary form at a rate of 2400 bits per second. A data link procedure evolves through the following phases or conditions of transmission.

(a) **Establishment Phase:** Initial voice contact is made between two data link offices via key telephone set and the dialed line. The **data mode** is then entered by both offices, and a transmission **handshaking** sequence takes place. The handshaking sequence is an automatic character exchange over the data link that determines the operational capability of each office.

(b) **Data Transfer Phase:** After handshaking is successfully completed, data is automatically sent from the transmitting office to the receiving office. The maintenance TTY will type out progress messages periodically which allow monitoring of successful transmission.

(c) **Termination Phase:** At the completion of the data transfer phase, the transmitting station will enter a wait state. During the wait state, the transmitting station waits for a command either to start another dump or to go into a mandatory disconnect sequence.

2.07 In a No. 2B ESS office, data is transmitted from the main store or a tape cartridge located in TDC 1. The tape cartridge contains a 4-track magnetic tape which serves as a backup to the main store. Each track contains the following information.

- (a) **Track 1:** Contains Bootstrap and Generic programs (write protected)
- (b) **Track 2:** Contains checksum and translations
- (c) **Track 3:** Contains remaining translations, patches, and a backdate of translation
- (d) **Track 4:** Contains directory and nonresident programs.

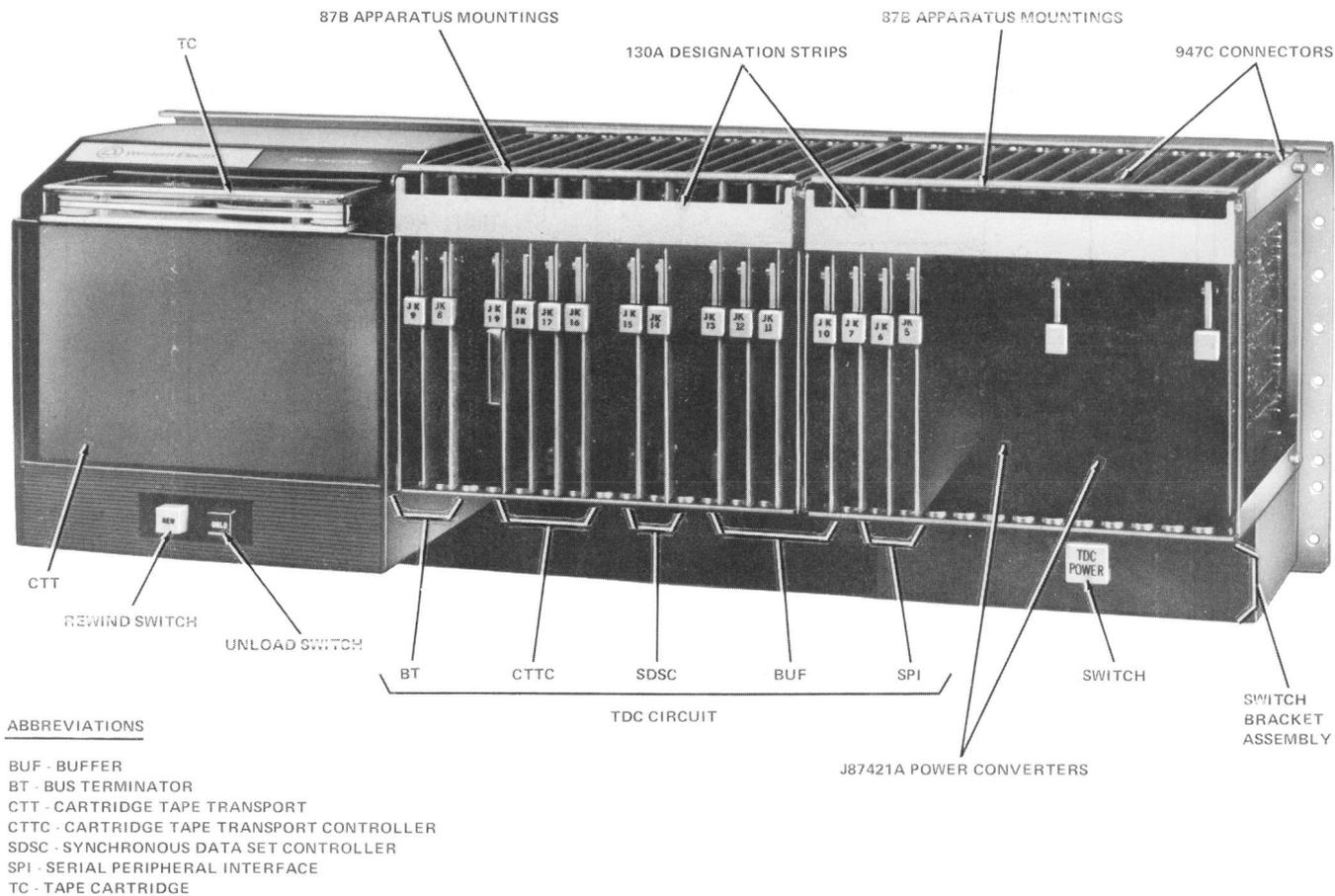


Fig. 1—Tape Data Controller "0" Equipped With SDSC

D. ODA Update

2.08 The data link procedures in this section are primarily intended to be used in conjunction with an ODA translations update. An ODA translations update performed with the aid of administrative data link facilities involves the following activities:

- (a) Transmission of main store translations from a No. 2B ESS office to the regional center
- (b) Updating and repacking of main store translations at the regional center
- (c) Transmission of updated main store translations from the regional center to the No. 2B ESS office

- (d) Tape write and verification of received data at the No. 2B ESS office.

2.09 Before proceeding with an ODA translations update, ensure that the following conditions are met.

- (a) Arrange a transmission schedule with the regional center that will allow a minimum of time between performing the memory dump procedure and the tape write procedure.
- (b) Perform a recent change update procedure per Section 232-304-301 prior to performing the memory dump procedure. All recent change data will be ignored during the transmission of the on-line main store.
- (c) Keep service order activity to a minimum during the period between memory dump

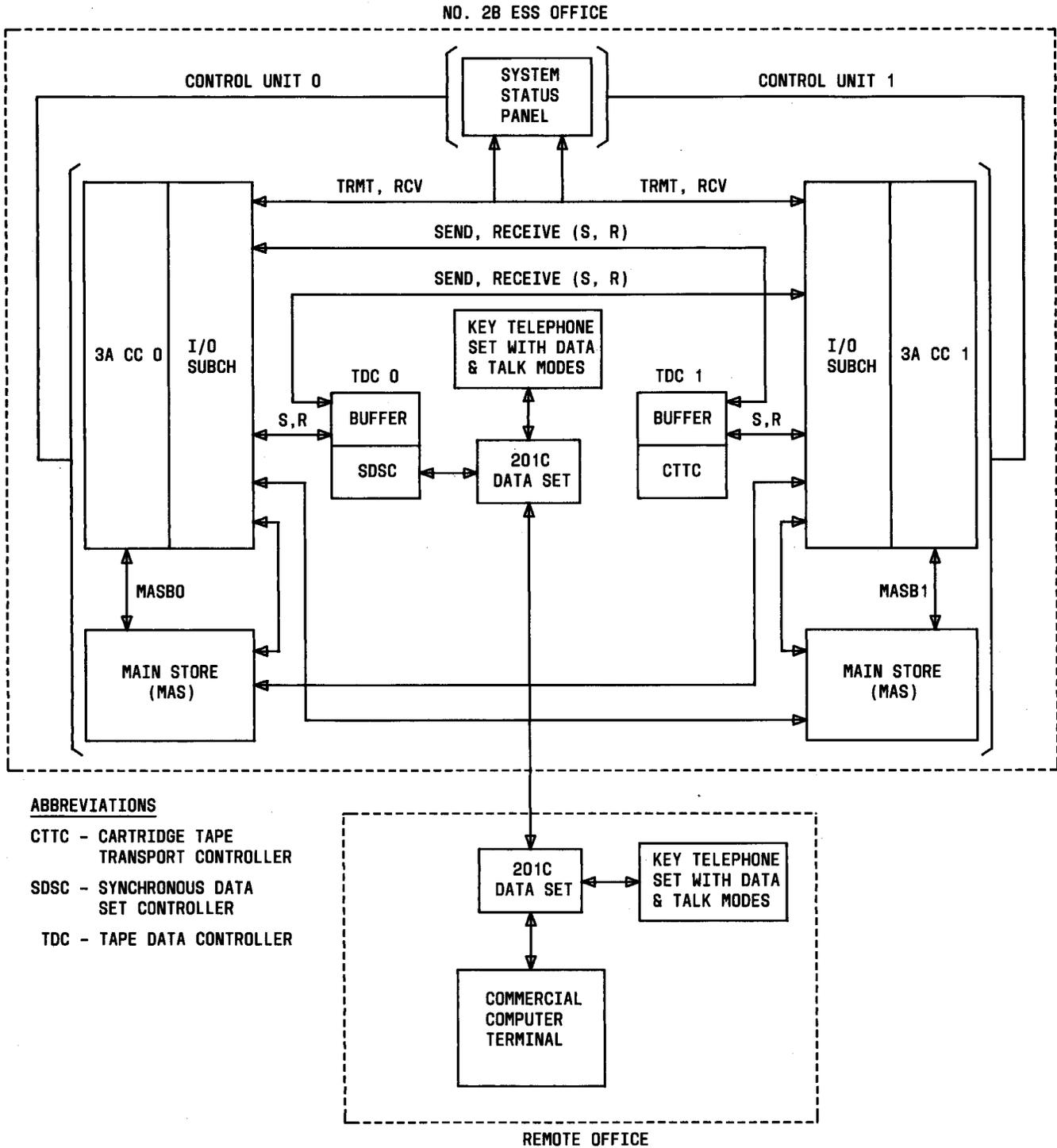


Fig. 2—No. 2B ESS Data Link Block Diagram

and tape write. This is essential to prevent the call store recent change buffers from becoming overloaded during an extended interval. The service order department should be notified of this fact prior to an ODA update.

(d) At the maintenance TTY, type the following message to preserve customer dialed changes to speed calling lists on paper tape:

A RC:PUN:1!

(e) Both the on-line and off-line processors should be in a trouble-free operating condition. The data link should be operated from the normal system state. Data link operation is not affected by CU switches and low level maintenance reset functions (MRFs). During an **emergency situation**, a data link memory dump may be performed with one processor out of service.

E. Flowchart Analysis

2.10 The data link flowchart for a No. 2B ESS office is shown in Fig. 3. It is intended to provide the reader with an overall view of the activities involved in a data link procedure.

2.11 For the purpose of simplification, only the transmission of data in support of an ODA update is considered in the flowchart.

2.12 If data link activities involving tape files are necessary, obtain a complete listing of available tape files as follows:

At maintenance TTY—

Type in:

ALW:TAPEUTIL!

Output message:

ALW TAPEUTIL COMPL

Type in:

DMP:TAPE 1, DIRECTRY!

2.13 Data that is received at the No. 2B ESS office is written on a tape located in TDC 1. Data intended for main store is then loaded into the off-line main store with the on-line CU locked. The integrity of the data is verified by comparing hashsum values at the receiving office with hashsum values at the transmitting office.

2.14 The following information is provided to distinguish the differences between the terms **translation data block** and **tape data block**.

(a) A **translation data block** is a block of main store translations 128 ESS (24-bit) words long. Output messages are repeated at intervals of 32 translation data blocks (10,000 octal words) indicating successful transmission.

(b) A **tape data block** is a block of words within a tape track 594 ESS (24-bit) words long. Output messages are repeated at the beginning of each new tape data block.

(c) When main store translations are written on tape, 4.64 translation data blocks are necessary to fill one tape data block. Output messages for this case follow the **translation data block** format.

3. ERROR CONDITIONS

A. Abort Data Link Activity

3.01 For the sake of clarity, the memory dump and tape write procedures are written with the assumption that transmission will be successful. In reality, however, it is possible that error conditions might occur during data link activities. For this reason, Table A is included in this section to provide corrective procedures for error conditions.

3.02 When a problem condition occurs during data link activities, the following data link abort message is printed at the maintenance TTY:

DL ABT ERR n DLSTAT s

This message reports that the current data link activity is being terminated. The data link program, however, will remain active allowing retransmission attempts at the point of failure provided the talking path is still good.

3.03 In addition to reporting current data link activity terminations, the abort message gives the reason for termination in coded form (error code n) and the software state of the SDSC at the time of error (code S). For a complete listing of error codes and an explanation of their meaning, see OM-2H200-05.

B. Stop Data Link Activity

3.04 At any time during transmission the data link activity can be stopped by typing the following message at the maintenance TTY.

STOP:DL!

The data link stop message will release the talking connection, deactivate the data link program, and release the data set from the SDSC. A new talking path will have to be established and the data link program will have to be activated in order to reinstate data link activities upon receiving the following maintenance TTY output message.

ALW DL STOPPED

C. Diagnostics

3.05 When an error condition is suspected in the SDSC, perform diagnostics on the SDSC by typing in the following message at the maintenance TTY:

ALW:DL!

DGN:SDSC 0!

A fault detected by the diagnostic routines is reported by the following maintenance TTY output message:

REPT SDSC 0 DGN FALT m xx yy zz

where: m = test number failed

xx = I/O order sent

yy = response received

zz = possible type of error

3.06 When an error condition is indicated in the TDC, perform diagnostics on the TDC by typing the following message at the maintenance TTY:

DGN:TAPE!

If SDSC problems still exist, remove and replace the SDSC circuit packs (See paragraph 8.04).

4. MEMORY DUMP PROCEDURE

4.01 The following procedure is used to transmit main store translations or tape file data from a No. 2B ESS office to a remote location.

Note: Tape file data may only be transmitted to remote 2B ESS offices.

STEP	ACTION	VERIFICATION
1	Arrange a schedule with the remote site that will allow uninterrupted transmission.	
2	At system status panel (SSP)— Ensure that system operation is normal.	MAS, ATI, TDC, MISC and MANUAL FORCED lamps extinguished. SYSTEM NORMAL lamp lighted.
3	At the 201C data set— Ensure that remote and self-test features are deactivated.	All front panel buttons disengaged.
4a	If supporting ODA translations update— At TTY— Type in: A RC:PUN 1! (see Note)	System response: OK

Note: This TTY message must be typed at the time of the last RC update before the data transmission is to take place and must

STEP	ACTION	VERIFICATION
	remain in the No. 2B ESS until the office update procedures are completed.	
5a	Perform a recent change update per Section 232-304-301 [see paragraph 2.09(b)].	
6b	If data is from tape file— At maintenance TTY— Type in: INIT:TAPE!	Output message: INIT TAPE COMPL
7	At maintenance TTY— Type in: ALW:DL!	Output message: ALW DL COMPL
8	Type in: DGN:SDSC 0!	Output message: IP DGN SDSC 0 COMPL ATP
9	Establish voice contact with receiving office. Note: Perform Steps 10 through 14 within 5 minutes to avoid a time-out abort.	314-391-3388 SEND DATA # 314-391-3385
10a	If supporting ODA translations update— At maintenance TTY— Type in: TMT:TRNSLN!	Output message: TMT TRNSLN READY
11b	If data is from tape files— Type in: TMT:TAPEFL 1:FILENAME! (Note)	Output message: TMT TAPEFL TRK m BLK n TMT TAPEFL READY
	Note: For FILENAME, enter name of tape file to be transmitted. To obtain a complete listing of available tape files, see paragraph 2.12.	where: m = decimal track number n = decimal block number.
12	At key telephone set— Determine if receiving office is ready.	Ready response received.
13	Request receiving office to enter DATA mode.	
14	Press DATA button.	TALK button lighted. DATA button engaged.
15a	If supporting ODA translations update— At maintenance TTY— Check output messages concerning successful data transmission.	Output messages: TMT TRNSLN BEGIN TMT TRNSLN ADR XXXXX where: XXXXX = octal word address

ACTION

VERIFICATION

Note: The above message is repeated at each octal word address which is a multiple of octal 10000 (ie, 10000, 20000, 30000).

TMT TRNSLN COMPL

Output messages:
TMT TAPEFL BEGIN

TMT TAPEFL TRK m BLK n
where: m = decimal track number
n = decimal block number

Note: The above message is repeated at the end of each transmitted tape block of a specific file.

TMT TAPEFL COMPL

TALK button lighted and engaged.

Output message:
ALW DL STOPPED

16b If data is from tape file—
At maintenance TTY—
Check output messages concerning successful transmission.

17 At key telephone set—
Press TALK button.

18 Establish voice contact with receiving office to notify successful completion of data transmission.

19 When data transmission is complete—
At maintenance TTY—
Type in:
STOP:DL!

call CTE and tell them OK for RC's

5. TAPE WRITE PROCEDURE

Receive from them!

5.01 The tape write procedure is used in a No. 2B ESS office when tape file data or ODA update translations are to be received from a remote location.

Note: It is only possible to receive tape file data from another No. 2B ESS office.

5.02 When receiving ODA update translations, the tape write, tape verify (optional), tape copy, and ODA update procedures are performed.

STEP

ACTION

VERIFICATION

1 Arrange a schedule with the remote site that will allow uninterrupted reception of transmitted data.

STEP	ACTION	VERIFICATION
2	At system status panel (SSP)— Ensure that system operation is normal.	MAS, ATI, TDC, MISC and MANUAL FORCED lamps extinguished. SYSTEM NORMAL lamp lighted.
3	At the 201C data set— Ensure that remote and self-test features are deactivated.	All front panel buttons disengaged.
4	Type in: RMV:TAPE 1!	At cartridge tape transport— REW and UNLD keys enabled. System response: OK
5	At TDC 1— Depress REW key.	Tape rewinds to beginning-of-tape (BOT) mark and then moves forward to load point.
6	Depress UNLD key.	Tape rewinds to BOT mark.
7	Remove and label tape cartridge.	
8	Select an out-of-date tape cartridge that contains the <i>same generic issue</i> as the removed cartridge.	
9	At TDC 1— Insert selected tape cartridge.	
10	At TTY— Type in: DGN:TAPE 1	Output message: IP INIT TAPE COMPL DGN TAPE 1 ATP
11	Type in: RST:TAPE 1;UCL!	Output message: OK
12	At maintenance TTY— Type in: INIT:TAPE!	Output message: INIT TAPE COMPL
	Note: Repeat the above step <i>four</i> times to restore proper tape tension.	
13	At maintenance TTY— Type in: ALW:DL!	Output message: ALW DL COMPL
14	Type in: DGN:SDSC 0!	Output message: IP DGN SDSC 0 COMPL ATP
15	Establish voice contact with transmitting office.	

314-391-3385 Dot 9
3388 Voice

SECTION 232-308-301

STEP	ACTION	VERIFICATION
	<p>Note: Perform Steps 16 through 19 within 5 minutes to avoid a time-out abort.</p>	
16a	<p>If tape file data— At maintenance TTY— Type in: RCV:TAPEFL 1:FILENAME! (See Note)</p>	<p>System response: RCV TAPEFL READY</p>
	<p>Note: For FILENAME, enter name of tape file to be received. To obtain a complete listing of tape files, see paragraph 2.12. (Track 1 cannot be written.)</p>	
17b	<p>If supporting ODA translations update— At maintenance TTY— Type in: RCV:TRNSLN 1!</p> <p><i>Receive this →</i></p>	<p>Output message: RCV TRNSLN READY</p>
18	<p>At key telephone set— Inform transmitting office that you are ready to receive data.</p>	
19	<p>Depress DATA button at the request of transmitting location.</p>	<p>DATA button engaged. TALK button lighted.</p>
20a	<p>If tape file data— At maintenance TTY— Check output messages for indication of successful transmission.</p>	<p>Output messages: RCV TAPEFL BEGIN RCV TAPEFL TRK m BLK n m = decimal track number n = decimal block number</p>
		<p>Note: The above message is repeated at the end of each tape block of a specific file.</p>
		<p>RCV TAPEFL COMPL</p>
21b	<p>If supporting ODA translations update— At maintenance TTY— Check output messages to see if successful data transmission has started.</p>	<p>Output messages: RCV TRNSLN BEGIN RCV TRNSLN ADR XXXXX where: XXXXX = octal word address</p>
		<p>Note: The above message is repeated at each octal word address which is a multiple of octal 10000 (ie, 10000, 20000, 30000).</p>
		<p>RCV TRNSLN COMPL</p>
22	<p>At key telephone set— Depress TALK button.</p>	<p>TALK button lighted and engaged. DATA button disengaged.</p>

STEP	ACTION	VERIFICATION
23	Reestablish voice contact with transmitting location to verify completion of transmission.	
24	At maintenance TTY— Type in: STOP:DL!	Output message: ALW DL STOPPED
	Note: Data link procedure is complete.	
25c	If normal system status is desired— Replace data link tape with tape cartridge removed in Step 7. See Section 232-309-305 for proper procedure.	
26d	If supporting ODA translations update and no further action is desired at this time— Return system to normal status by replacing data link tape with tape cartridge removed in Step 7. See Section 232-309-305 for proper procedure.	System response: OK
27e	If supporting ODA translations update and verification of received data <i>is</i> desired— Perform 6. TAPE VERIFY PROCEDURE .	
28f	If supporting ODA translations update and verification of received data <i>is not</i> desired but a second tape cartridge containing ODA updated translations is desired— Perform TAPE COPY PROCEDURE given in Section 232-309-305.	

6. TAPE VERIFY PROCEDURE

6.01 The following procedure is used to verify the integrity of ODA update translations received via data link.

6.02 Before beginning this procedure, ensure that a tape cartridge containing ODA update translations is loaded in TDC 1. See Section 232-309-305 for tape handling procedures.

STEP	ACTION	VERIFICATION
1	Request a set of hashsums (verbally) from remote location on transmitted data.	
2a	If the on-line CU is not CU 0— At maintenance TTY— Type in: SW:CU!	Output message: REPT SW CU
3	At maintenance TTY— Type in: ALW:TAPEUTIL!	Output message: ALW TAPEUTIL COMPL

SECTION 232-308-301

STEP	ACTION	VERIFICATION
4	At SSP— Depress LOCK switch.	LOCK switch lighted. Output message: REPT CU STAT UAV
5	At maintenance TTY— Type in: LOD:OMAS;TAPE 1:TRNSLN! <i>7 MINUTES</i>	Output message: LOD OMAS COMPL TAPEUTIL STOPPED
	Note: For a complete explanation of the LOD:OMAS input message, see IM-2H200-05.	
6	Type in: ALW:OW;UCL!	Output message: ALW OW COMPL
7	Type in: OP:HASH:TRNSLN! <i>4 MINUTES</i>	Output message: OP HASH aaaaaaa bbbbb OP HASH cccccc ddddd OP HASH COMPL where: aaaaaaa = octal stop address of first group bbbbb = decimal hashsum value of first group ccccc = octal stop address of second group dddd = decimal hashsum value of second group. etc.
8	Type in: STOP:OW! Note: Off-line main store is updated by on-line main store upon completion of the STOP:OW message.	Output message: UPD OMAS COMPL ALW OW STOPPED
9	At SSP— Release LOCK switch.	Output message: REPT CU STAT AVL
10	Compare the hashsum values of transmitted data to hashsum values for this version of the generic that includes the data contained on the received file. <i>DO "A AU:RC!" TO PUT AT LIGHT.</i>	Hashsums are identical, indicating successful transmission of ODA translations. If hashsums are not identical, refer to Table A.
11b	If no further action is desired at this time—	

Return system status to normal by replacing data link tape in TDC 1 with the previously removed office tape cartridge. See Section 232-309-305 for proper procedure.

STEP	ACTION	VERIFICATION
12c	If a second tape cartridge containing ODA updated translations is desired— Perform TAPE COPY PROCEDURE given in Section 232-309-305.	
7. ODA UPDATE PROCEDURE		<i>ODA Update Only (No Generic Change)</i> procedure with the following exception:
7.01	The ODA translations update procedure using data link tape cartridges is performed using Section 232-324-302.	● Omit all steps that follow <i>AUDIT:TAPE; DETL!</i> and precede <i>T PR:TWT!</i>
7.02	Before beginning this procedure, ensure that two data link tape cartridges are available and that the current office tapes are loaded in the tape transports.	
7.03	After satisfying the preliminary procedures given in Section 232-324-302, perform the	
8. MAINTENANCE PROCEDURE		
8.01	If the data link line fails during data link operation, both stations should return to the TALK mode and decide on a course of action. The activity may be restarted. (See Table A).	

TABLE A
DATA LINK ABORT PROCEDURES

ERROR CONDITION	CORRECTIVE PROCEDURE	POSSIBLE CAUSE
Failure to receive ALW DL COMPL message.	Restart procedure.	
Failure to receive tape file or translation READY message.	<p>At key telephone set — Establish voice contact with remote office concerning failure.</p> <p>At maintenance TTY — Retype last input message.</p>	
Failure to receive tape file or translation BEGIN message. TALK button lighted.	<p>At key telephone set — Enter TALK mode. Establish voice contact with remote office concerning failure.</p> <p>At maintenance TTY — Retype last input message.</p> <p>At key telephone set — Within 5 minutes, enter DATA mode.</p>	Did not enter DATA mode within 5 minutes of transmission request.
Failure to receive tape file or translation BEGIN message. TALK button extinguished.	<p>At maintenance TTY — Type in: STOP:DL!</p> <p>Output message: ALW DL STOPPED</p> <p>Restart procedure.</p>	Talking path dropped.
Failure to transmit tape block or translation block message.	<p>At key telephone set — Enter TALK mode. Establish voice contact with remote office concerning failure.</p> <p>At maintenance TTY — Enter one of the following messages: <i>For Memory Dump (MAS Translations)</i></p> <p>Type in: TMT:TRNSLN:XXXXX!</p>	<p>Error count threshold exceeded.</p> <p>Temporary interruption of data link activity.</p>

TABLE A (Contd)

DATA LINK ABORT PROCEDURES

ERROR CONDITION	CORRECTIVE PROCEDURE	POSSIBLE CAUSE
Failure to transmit tape block or translation block message. (Contd)	XXXXX = octal start address of failed block. System response: Output message: TMT TRNSLN READY <i>For Memory Dump (Tape)</i> Start activity from beginning. No restart procedure available for tape.	
Failure to receive tape block on translation block message.	<i>For MAS Translations</i> At key telephone set — Enter TALK mode. Establish voice contact with transmitting location concerning last received address. At maintenance TTY Type in: RCV:TRNSLN 1:XXXXX! XXXXX = octal start address of failed block. System response: RCV TRNSLN READY <i>For Tape Data</i> Start activity from beginning. No restart procedure available for type files.	Error count threshold exceeded. Temporary interruption of data link activity.
Failure of retransmission attempts.	At maintenance TTY — Type in: STOP:DL! Output message: ALW DL STOPPED Perform SDSC diagnostics per paragraph 3.05.	Faulty SDSC circuit pack.
Hashsums do not agree.	Resolve hashsum differences with remote office. Start activity from beginning.	Error in transmission. Error in hashsums supplied from remote office.

SECTION 232-308-301

8.02 If a data set or telephone set experiences trouble during data link operation, replace the defective set or have it repaired before continuing data link procedures.

8.03 Repair and maintenance procedures for the tape data controller are covered in Section 232-309-705.

8.04 Repair of the SDSC requires the replacing of circuit pack JK14 or circuit pack JK15 within the tape data controller. Observe the following rules for circuit pack replacement.

The procedures for replacing a faulty SDSC circuit pack are as follows:

- **Assume** that the suspected terminal trouble is being caused by a single fault.
- **Assume** that spare circuit packs, used to replace installed circuit packs, are in trouble-free operating condition.
- **Until the bad circuit pack is found**, rerun the specific terminal test routine (the preceding step of the procedure for each test routine) after each circuit pack replacement.

STEP	ACTION	VERIFICATION
1	At maintenance TTY— Type in: RMV:TAPE 0!	Output message: OK At cartridge tape transport— REW and UNLD keys enabled. At SYSTEM STATUS AND CONTROL section of the system status panel— TDC light emitting diode lighted.
2	At cartridge tape transport Depress REW key.	Tape rewinds to its beginning-of-tape (BOT) mark and then moves in its forward direction to its load point.
3	Depress UNLD key.	Tape rewinds to its BOT mark.
4	At cartridge tape transport— Remove tape cartridge.	
5	Operate TDC POWER key.	TDC POWER lamp extinguished. Power removed from TDC.
6	Remove circuit pack JK14 and replace it with an identical circuit pack that is known to be good.	
Caution: Exercise care when handling circuit packs to reduce damage or contamination. For information concerning the handling and care of circuit packs see Section 032-173-301.		
7	Release TDC POWER key.	TDC POWER lamp lighted. Power restored to TDC.
8	Insert tape cartridge.	

STEP	ACTION	VERIFICATION
9	At maintenance TTY— Type in: DGN:TAPE 0!	Output message: INIT TAPE COMPL DGN TAPE 0 ATP
	Note: Repeat Step 9 four times to restore proper tape tension. Inactive tape cartridges tend to lose tape tension which will increase error rates.	
10	Perform data link procedures.	
11	If data link attempt fails, repeat Steps 1 through 11 with the following exception. In Step 6, remove new JK14 and replace with old JK14. Then remove JK15 and replace it with an identical circuit pack that is known to be good.	
12	Perform data link procedures.	
13	If data link attempt fails, see Section 232-309-705 (Tape Data Facility Maintenance Procedures).	

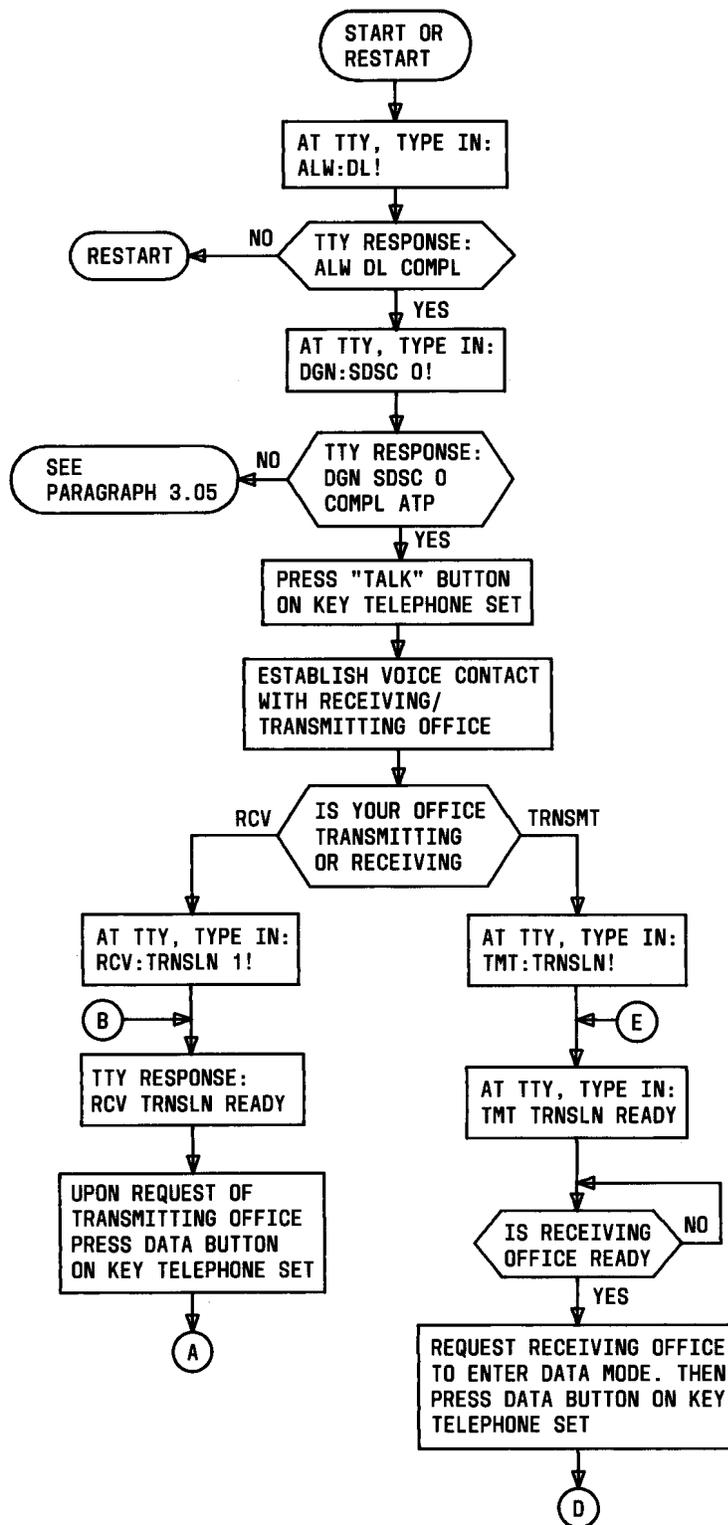


Fig. 3—Data Link Flowchart for No. 2B ESS Office (Sheet 1 of 3)

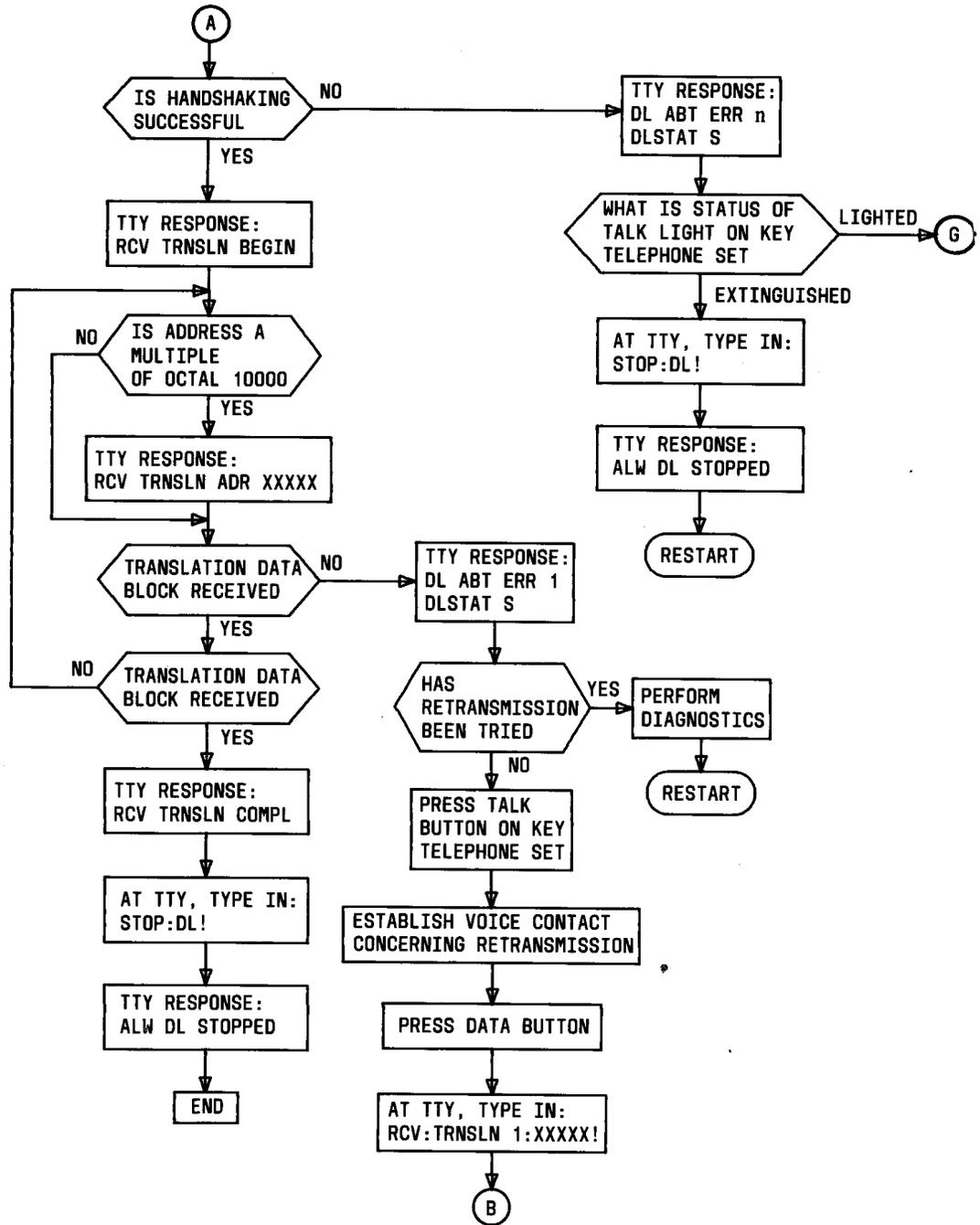


Fig. 3—Data Link Flowchart for No. 2B ESS Office (Sheet 2 of 3)

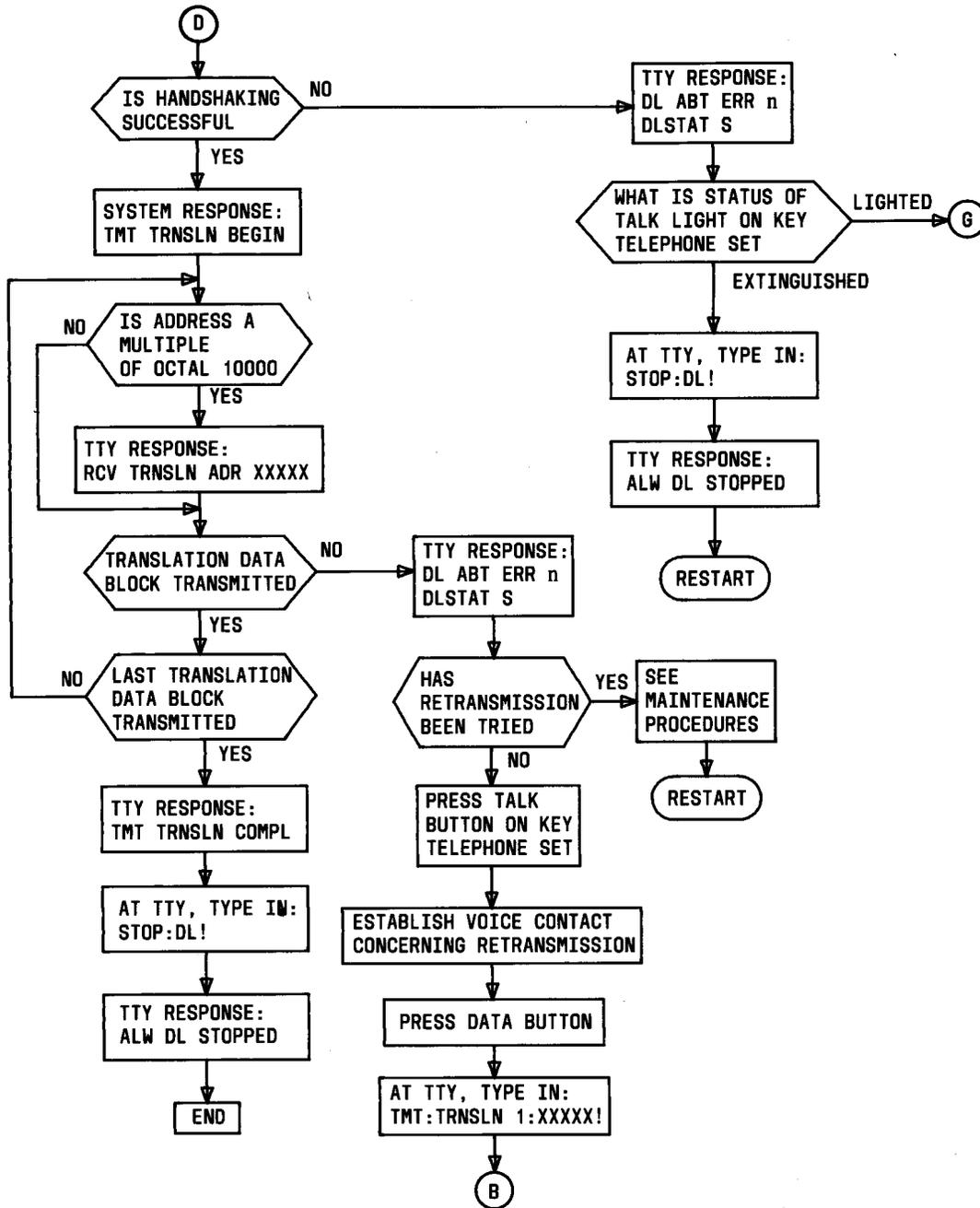


Fig. 3—Data Link Flowchart for No. 2B ESS Office (Sheet 3 of 3)