SWITCHING SYSTEMS MANAGEMENT

NO. 4A TOLL CROSSBAR ASSIGNMENT PRACTICES

OUTPULSER LINK CIRCUITS

CONTENTS   PAGE

1. GENERAL

1.01 4A-Electronic Translator (ET) Switching Systems equipped with common channel interoffice signaling (CCIS) trunk relays will require a balanced incoming traffic load on sender link frames and/or outpulser link circuits (OLCs) which will connect the incoming CCIS call to a sender-outpulser or outpulser, respectively.

1.02 Whenever this section is reissued, the reason for reissue will be listed in this paragraph.

1.03 The following sections of this practice will describe basic OLC functions and "hardware assignments" requirements for the one-way incoming and the incoming portion of the 2-way CCIS trunk relay. "Hardware assignment" requirements will cover the physical specifications for establishing and maintaining an in-service switching system.

1.04 In addition to the hardware OLC assignments explained in this practice, the machine administrator must perform "software assignments" which will program the memory of the electronic translator. These requirements are detailed in the 4A/ETS Translation Guide.

2. OUTPULSER LINK CIRCUIT DESCRIPTION

2.01 Three OLCs are installed in one outpulser link frame (OLF) and are associated with three trunk relay frames as shown in Fig. 1.

2.02 Fig. 2 illustrates the incoming trunk relays cabled to the horizontals of the primary switches of the OLC. Outpulsers are cabled to the horizontals of the secondary switches in the OLC. The verticals of the primary and secondary switches are cabled in a predetermined pattern which allows the forming of links, so any of the

incoming trunks will have access to any of the outpulsers.

2.03 Each OLC consists of eight level, 20 vertical, 240-crosspoint six-wire switches as shown in Fig. 3. The primary switches always terminate a maximum of 120 trunk relays from a single trunk relay frame. The secondary switches contain 48 outpulser appearances.

2.04 A normal 240 crosspoint switch has the six contacts at each vertical location connected to the adjacent verticals as shown in Fig. 4. Because the six wires run parallel across the switches similar to banjo strings, they have been so named. In order to terminate 120 twelve-lead trunks on four 240 crosspoint switches the banjo wiring in the rear of each primary switch must be split at every fourth vertical also shown in Fig. 4. This in effect creates 60 horizontals per switch for a total of 240 horizontals per OLC. This configuration will provide the termination space for 120 trunks, each requiring two horizontals.

2.05 Fig. 5 shows the 12 leads of each trunk split, with six leads connected to the A primary switches and six leads connected to the B primary switches. These leads are multipled to the remaining verticals in the subgroup to provide access to all outpulsers. Subgroups 0 thru 4 appear on the A0 and B0 switches and subgroups 5 through 9 appear on the A1 and B1 switches. Twelve outpulsers are terminated on each secondary switch (0, 1, 2, 3). Each secondary switch is also split, with six leads from each outpulser connected to the horizontals for verticals 0 through 9 and the other six leads connected to the horizontals for verticals 10 through 19.

2.06 To connect a trunk to an outpulser a combination of verticals in the primary and secondary switches must be operated. The exact combination of verticals selected to complete the connection to an outpulser will depend on the availability of an idle outpulser in one of the four subgroups of 12 outpulsers. By the operation of vertical 0 on primary switches A0 and B0 and verticals 0 and 10 in secondary switch 0 a path or link is established to connect an incoming trunk to one of 12 outpulsers cabled to secondary switch 0. By having this incoming trunk also appear on verticals 1, 2 and 3 in switches A0 and B0, there are also links 1, 2 and 3 to the other secondary switches so that the trunk has access to the remaining 36 outpulsers on the OLC.

3. OUTPULSER LINK CIRCUIT OPERATION

3.01 An outpulser group may have a maximum of eleven outpulser link frames, each containing three outpulser link circuits. Each of the 33 OLC terminates 120 different trunk relays for a total of 3,960 individual trunk relays in the outpulser group. These trunk relays may be linked to a maximum of 48 outpulsers that are multipled to all OLC in the outpulser group.

3.02 Each OLC is associated with a single trunk relay frame which is mounted adjacent to the outpulser link frame. Each trunk relay frame is factory equipped with connector ended cables for terminating the trunks on its associated OLC. The same plug-in trunk unit may be used for one-way incoming or 2-way operation. A fixed relationship exists between the location of a trunk on its trunk relay frame and its termination on the OLC. The trunk connector housing or shelf number (0-9) is the same as the OLC subgroup, and the trunk connector position within a housing (0-11) is the same as the switch level.

3.03 Each OLC can access any of the four link controllers serving the group. The link controller will serve several functions, one of which is to establish the linkage of the incoming trunk relay to an outpulser. This will be accomplished by an "A" and "B" preference arrangement to equalize distribution of attempts.

4. ASSIGNMENT CONSIDERATIONS

4.01 The assignmnt of trunk appearances on an OLC to a particular trunk group will be determined by how much incoming traffic or usage a given trunk will carry. A new office should be assigned using a theoretical balance procedure, which classifies trunks to a light (L), medium (M), or heavy (H) weighting. Proper trunk selection will result in an even distribution of L, M, and H weighted trunks across OLCs and switches.

4.02 The machine administrator should review the traffic order thoroughly to insure proper quantities and spread of equipment being installed. In many locations the traffic equipment engineer distributes a preliminary copy of the pending traffic orders for this purpose. Early communication between the traffic engineer and machine administrator will in most cases insure adequate provision and

arrangement rearrangements and provide for ord⅃rly assignments.

4.03 In reviewing of the traffic order for the outpulser link circuits, similar guidelines to those used for the sender link frame (SLF) will apply for the spread of relays on OLC and OLC groups, except:

(1) OLC attachment delay recording will not be a hardware measurement requiring an OLC termination, but instead will be a software measurement.

(2) Service observing capabilities are not provided for CCIS trunks terminating on sender link or outpulser link frames but may become an assignment consideration in the future.

4.04 Each subgroup in the outpulser link circuit terminates 12 trunk relays. These 12 trunk relays have four links to connect to one of the 48 outpulsers and these links will have an occupancy duration equal to the outpulser holding time. The spreading of L, M and H weighted trunk relays across all switches in the outpulser link circuits will help to insure adequate balance. In applying weighting to the incoming CCIS trunk groups, the following table may be used:

Type Trunk Groups		Light	Medium	Heavy
HU	1-way	None	None	ALL
F	1-way	None	1/4	3/4
HU	2-way	1/2	None	1/2
F	2-way	1/4	1/2	1/4

Note: On initial CCIS installations the access circuits for the CCIS intraoffice trunk (CIOT) frame, continuity retest circuits, and intertoll manual test frame (IMTF) appear on horizontal 11 of subgroups 2-9 of the first two OLC and should be assigned to heavy weighting. When more than four IMTF are required to

test CCIS trunks, another pair of OLC are similarly arranged.

4.05 Trunk group assignments to the OLC should be accomplished in a manner to insure each trunk group will be assigned an equal portion of its trunks to different OLCs in each OLC group and each equipped OLC group. This spread will divide the trunk group among various link paths on the OLCs. Using a worksheet (see Fig. 6) fill in the OLCs cabled to groups in your office. Fig. 6 is an example of a typical use of this form.

4.06 The sweep assignment method for distributing L, M, and H loaded trunks across all possible OLCs, and switches is recommended. If the work sheets (Fig. 6) were used, an adequate spread across the OLCs and equipped outpulser groups will have been made. Care should be taken to insure that first choice trunks (as selected from the distant end) are not bunched in any particular OLC and especially not in one switch within an OLC. Considerations should also be given to trunk group busy hours. While using the sweep method be sure to distribute am and pm busy hour groups equally across outpulser groups and frames.

4.07 When assigning trunks within an OLC, using the forms shown in Fig. 7, start with a predetermined location and continue the assignments in a rotation (eg, subgroup "0", horizontal "00" (S-H/0-00), then S-H/1-00, S-H/2-00, etc). This pattern can then be followed until an equal number of L, M, and H trunks are assigned by subgroups to all switches within each OLC.

4.08 When selecting trunk relays to establish a trunk group, discretion should be taken to insure adequate service protection. The trunk relays will be cabled to different (eg, "A" & "B") battery supplies as indicated on office cable drawings. Alternate selection of trunk relays in different battery supplies will diversify the trunk group, so as to prevent the loss of an entire trunk group due to the loss of one battery supply.

4.09 The CCIS trunk relays are plug-in type units which may be interchanged on the OLC at various locations. Due to this flexibility, the machine administrator must coordinate assignments with the maintenance personnel to insure that the trunk relay appearance is equipped.

4.10 All 4A-ET CCIS offices are equipped with the peripheral bus computer (PBC) as a data collection source. The PBC has the ability to measure incoming usage on non-CCIS incoming or 2-way trunks that are "hard cabled" to a traffic usage interface (TUI) frame or a supplemental TUI (STUI) frame. CCIS one-way incoming trunks may all have usage measured via software, if required. A total of 249 CCIS or non-CCIS trunk groups may have incoming usage measured. Non-CCIS trunks (maximum of 6912) can have one-way incoming usage measured regardless of whether the trunks are one-way or 2-way. CCIS trunks can only have one-way incoming usage measured on trunks operating as one-way incoming circuit.

4.11 The 2-way (2C) CCIS trunk relay will be provided to serve as a 2-way or one-way trunk. In addition, this 2-way trunk could be temporarily used as a one-way outgoing trunk due to a shortage of one-way outgoing (OC) CCIS trunks. However, the use of a 2-way trunk as a one-way outgoing trunk should be on a limited basis because this application will negate the future use of the specific OLC location associated with that trunk relay. When appropriate one-way outgoing trunk relays are available, the trunk can be moved to the correct type equipment.

5. OUTPULSER LINK CIRCUIT ASSIGNMENT RECORD

5.01 After completing the trunk group layout described in Section 4, outpulser link circuit assignment records can be completed (see Fig. 7). This form has entry lines for each subgroup and horizontal location on an OLC. Some possible entries are listed below.

Form Heading	Column Entries
(1) OLC	Actual number of outpulser link circuit (00-98).
(2) Group	Outpulser group designation for OLC (A, B or C).
(3) Trk Fr.	Trunk frame number cabled to this OLC.
(4) Subgroup and Horizontal	Preprinted subgroup and horizontal positions on OLC.
(5) Trunk Conn. (Relay)	The 120 trunk relays of a frame are associated with each OLC in a fixed assignment pattern.
(6) Trunk Group Information	
Group Name	CLLI—Common Language Location Identification (BSP 795-100-100)
NO.	Circuit Number (1001, 1002, Etc.)
Type	Trunk Group use F (Final), HU (High Usage), etc.
W	Weighting (L, M, H)
√	Reference Column
Trunk Distribution Center (TDC) (for offices so equipped)	See Division H, Section 13c(8) for assignments to incoming TDC.
BAY PNL JK	Enter the ITDC bay, panel, and jack number that this incoming relay is cabled to. Obtain from the office cable drawings.

5.02 Below each subgroup and at the bottom of the form there are weighting columns to record how many L, M, and H weighted trunks there are per subgroup and for the total OLC.

5.03 When the OLC assignments have been completed on the OLC assignment record they can be copied onto the trunk relay assignment record (see Fig. 8) so that remaining trunk relay assignment may be completed.

6. MAINTAINING OUTPULSER LINK CIRCUIT ASSIGNMENTS AND RECORDS

6.01 The PBC data acquisition system does not measure OLC usage by subgroup. Therefore, an in-service machine should maintain the individual trunk weighting for assignments. Adjustments may be made for trunk weighting after in-service

measurements have been obtained on trunk groups to determine if the theoretical weighting on trunk groups is being maintained.

6.02 Additions to the 4A-ET Switching System that involve activity with CCIS trunk relays and/or outpulser related items should be verified as discussed under assignment considerations. A major consideration of this examination would be the spread of trunk relays across all OLC and OLC groups.

6.03 If additions to the 4A-ET Switching System add additional OLC groups, then rearrangements of existing OLC group assignments should be considered to balance the incoming traffic load.

6.04 Future OLC assignments for incoming traffic will also require appropriate ETS-8075 form code entries.
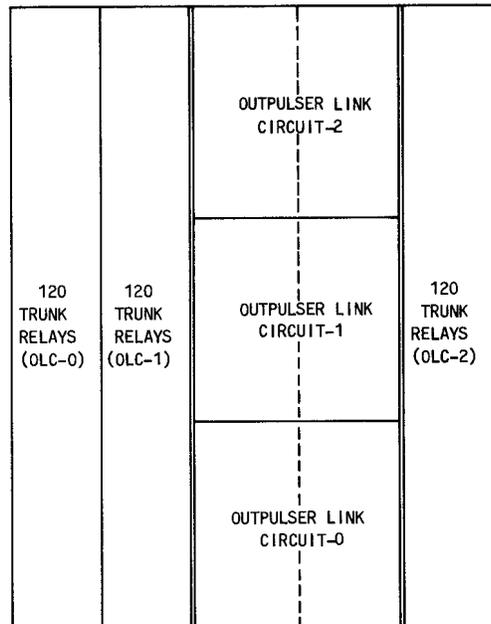
Fig. 1—Basic Outpulser Link Frame

Fig. 2—Basic Outpulser Link Circuit

PRIMARY SWITCHES   SECONDARY SWITCHES

| B1 | 3 |
| A1 | 2 |

TRUNKS ▷   ◁ OUTPULSERS

| B0 | 1 |
| A0 | 0 |

Fig. 3—Outpulser Link Circuit

REAR VIEW OF A REGULAR
6 CONTACT, 240 POINT CROSSBAR SWITCH
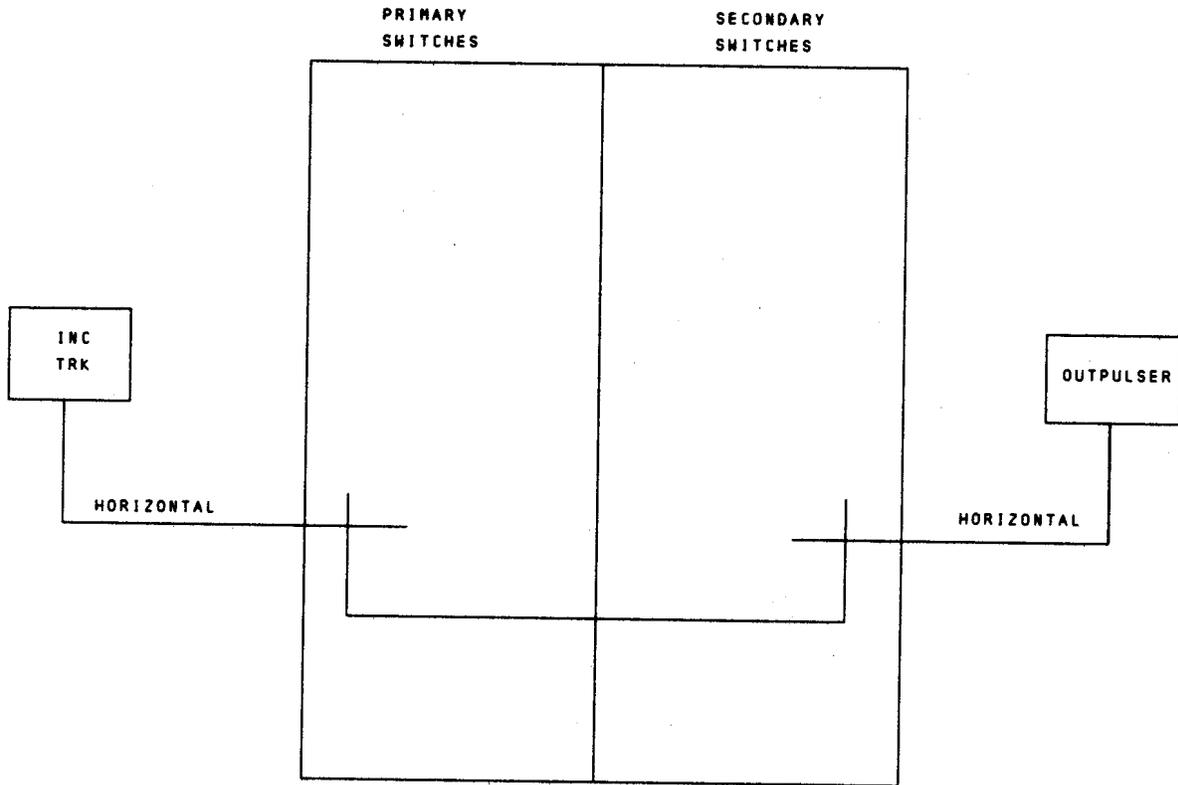
REAR VIEW OF 240 POINT CROSSBAR SWITCH
IN OLC'S THAT TERMINATE INCOMING TRUNKS
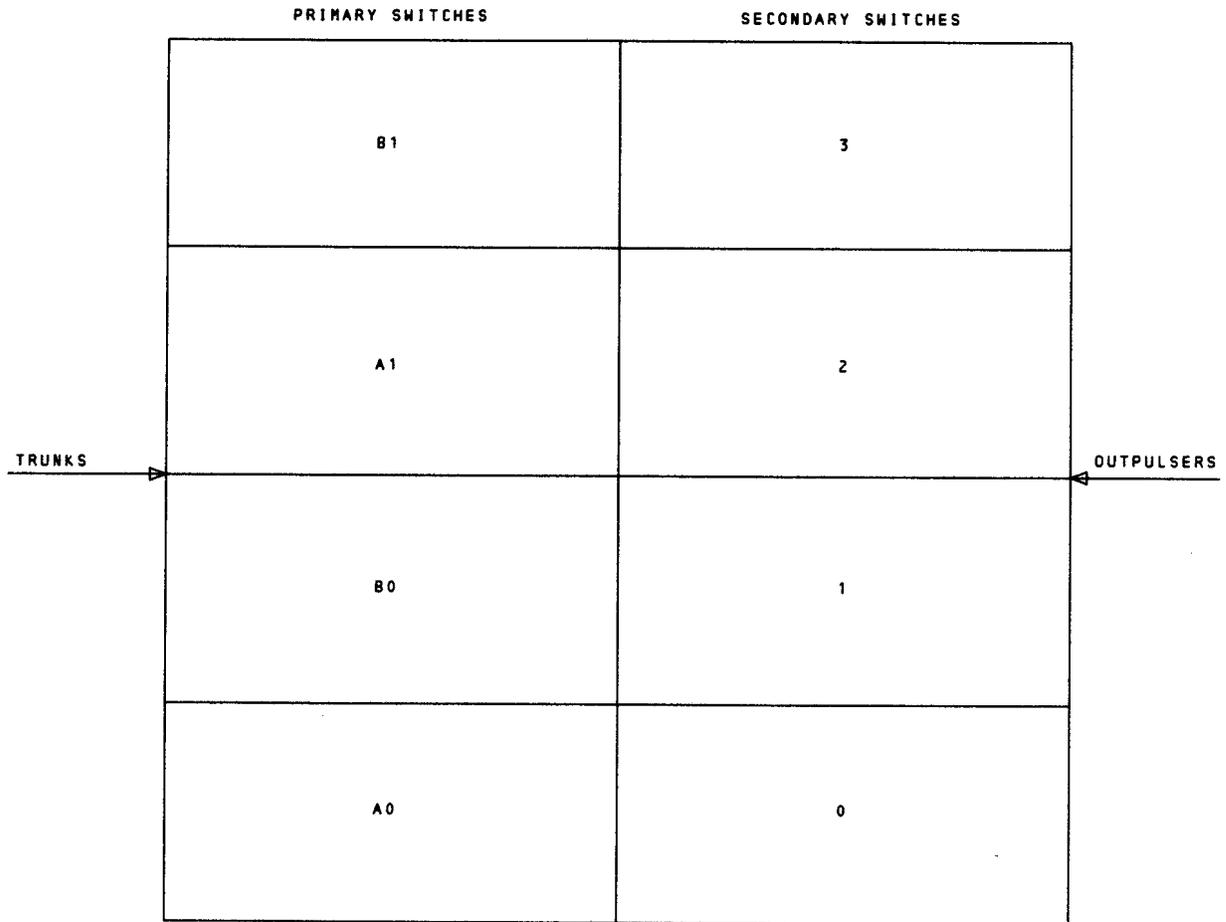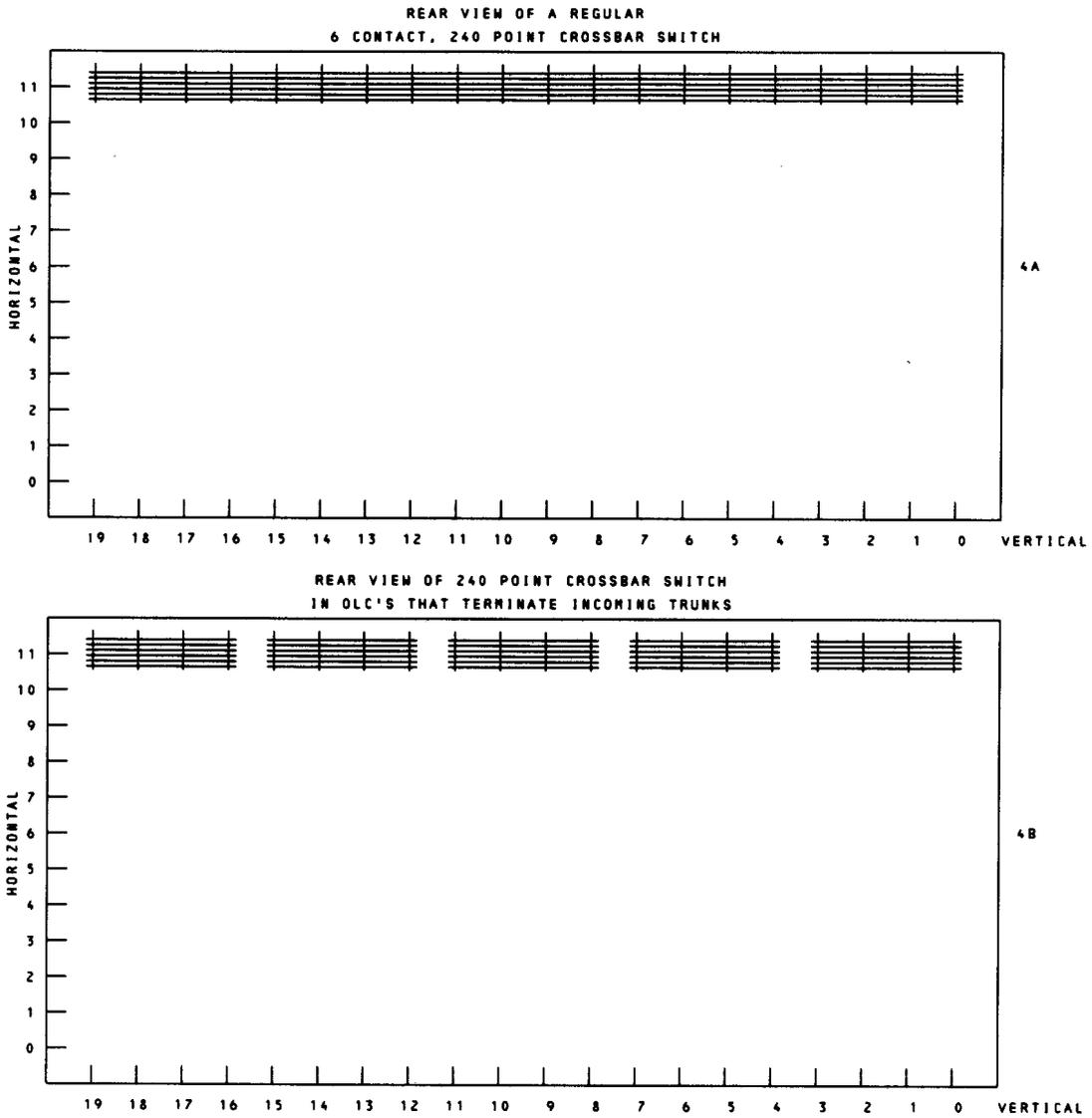
Fig. 4—Rear View of a Regular 6-Contact, 240-Point Crossbar Switch
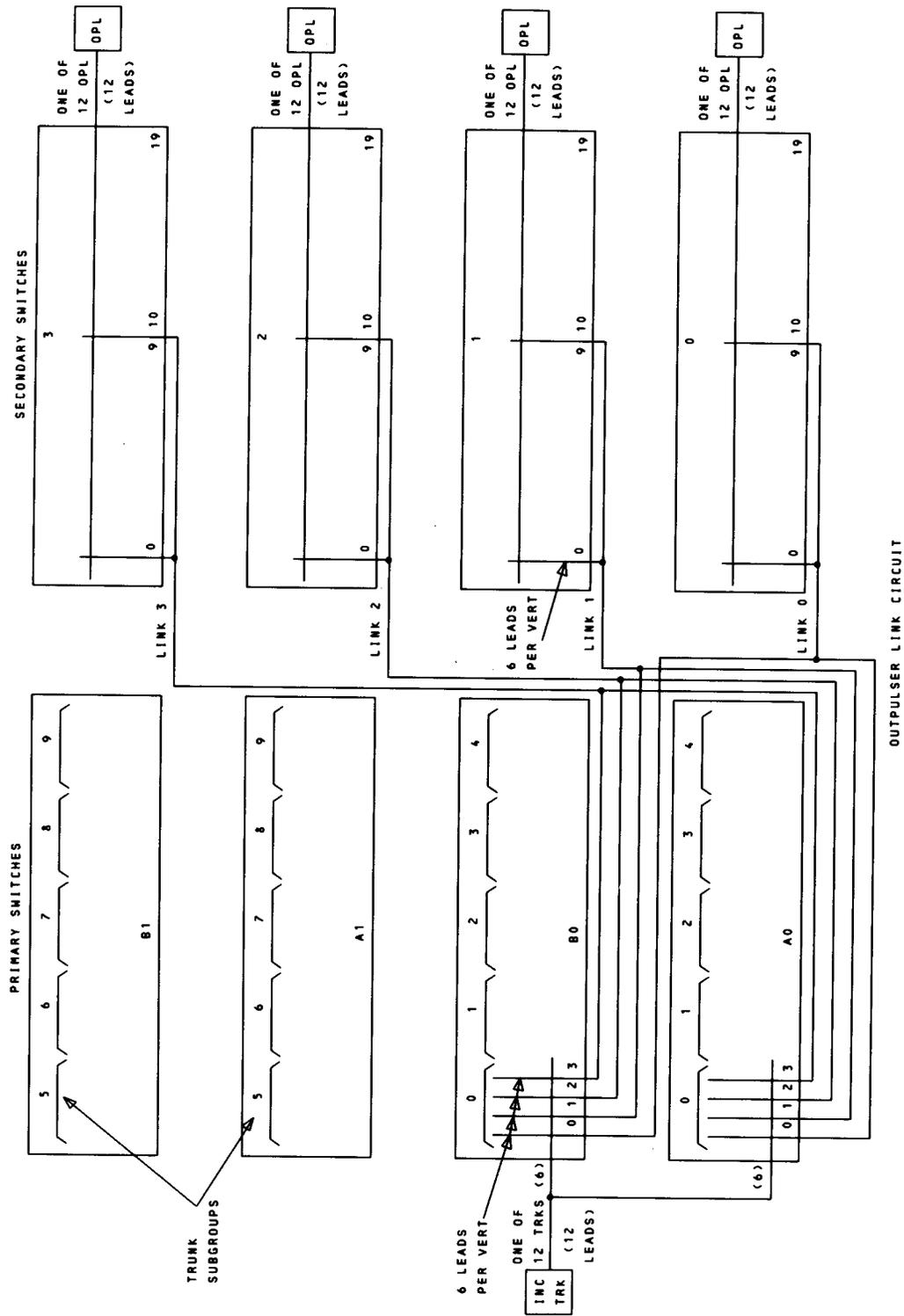
Fig. 5—Outpulser Link Circuit

S.N.-384
(4-58)

S.N.-384
(4-58)

TRUNK GROUP NAME: **QUANTITY:**

OLC GROUP		00	01	02	03	04	05	06	07	08	09	10	11	12
	OLC	00	01	02	03	04	05	06	07	08	09	10	11	12
A	OLC	13	14	15	16	17	18	19	20	21	22	23	24	25
	OLC	26	27	28	29	30	31	32						
	OLC	33	34	35	36	37	38	39	40	41	42	43	44	45
B	OLC	46	47	48	49	50	51	52	53	54	55	56	57	58
	OLC	59	60	61	62	63	64	65						
	OLC													
C	OLC													
	OLC													

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TRUNK GROUP NAME: CLLI ØF AN ØFC   **QUANTITY:** 16

OLC GROUP		00	01	02	03	04	05	06	07	08	09	10	11	12
	OLC	00 / 1001	01	02	03	04 / 1003	05	06	07	08 / 1005	09 / 1007	10	11	12
A	OLC	13 / 1009	14	15	16	17 / 1011	18 / 1013	19	20	21	22 / 1015	23	24	25
	OLC	26	27	28	29	30	31	32						
	OLC	33 / 1002	34	35	36	37 / 1004	38	39	40	41 / 1006	42 / 1008	43	44	45
B	OLC	46 / 1010	47	48	49	50 / 1012	51 / 1014	52	53	54	55 / 1016	56	57	58
	OLC	59	60	61	62	63	64	65						
	OLC													
C	OLC													
	OLC													

NOTE: For large groups it will be necessary to allow more spaces for OLC to list all circuit numbers.

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Fig. 6—Outpulser Link Circuit Assignment Work Sheet

4A-ET SWITCHING SYSTEM
OUTPULSER LINK CIRCUIT ASSIGNMENT RECORD

OLC _____
GROUP _____
TRK FR _____

SUBGROUP & HORIZ	TRK CONN	TRUNK GROUP INFORMATION					ITDC		
		GROUP NAME	NO.	TYPE	W	V	BAY	PAN	JK
4	11	114							
	10	104							
	09	094							
	08	084							
	07	074							
	06	064							
	05	054							
	04	044							
	03	034							
	02	024							
	01	014							
	00	004							
3	11	113							
	10	103							
	09	093							
	08	083							
	07	073							
	06	063							
	05	053							
	04	043							
	03	033							
	02	023							
	01	013							
	00	003							
2	11	112							
	10	102							
	09	092							
	08	082							
	07	072							
	06	062							
	05	052							
	04	042							
	03	032							
	02	022							
	01	012							
	00	002							
1	11	111							
	10	101							
	09	091							
	08	081							
	07	071							
	06	061							
	05	051							
	04	041							
	03	031							
	02	021							
	01	011							
	00	001							
0	11	110							
	10	100							
	09	090							
	08	080							
	07	070							
	06	060							
	05	050							
	04	040							
	03	030							
	02	020							
	01	010							
	00	000							

FRAME TOTALS H _____ M _____ L _____ TOTAL _____

SUBGROUP & HORIZ	TRK CONN	TRUNK GROUP INFORMATION					ITDC		
		GROUP NAME	NO.	TYPE	W	V	BAY	PAN	JK
9	11	119							
	10	109							
	09	099							
	08	089							
	07	079							
	06	069							
	05	059							
	04	049							
	03	039							
	02	029							
	01	019							
	00	009							
8	11	118							
	10	108							
	09	098							
	08	088							
	07	078							
	06	068							
	05	058							
	04	048							
	03	038							
	02	028							
	01	018							
	00	008							
7	11	117							
	10	107							
	09	097							
	08	087							
	07	077							
	06	067							
	05	057							
	04	047							
	03	037							
	02	027							
	01	017							
	00	007							
6	11	116							
	10	106							
	09	096							
	08	086							
	07	076							
	06	066							
	05	056							
	04	046							
	03	036							
	02	026							
	01	016							
	00	006							
5	11	115							
	10	105							
	09	095							
	08	085							
	07	075							
	06	065							
	05	055							
	04	045							
	03	035							
	02	025							
	01	015							
	00	005							

FRAME TOTALS H _____ M _____ L _____ TOTAL _____

Fig. 7—4A-ET Electronic Switching System Outpulser Link Circuit Assignment Record

NO. 4A/4M–CCIS SWITCHING SYSTEM
TRUNK RELAY ASSIGNMENT RECORD (CONT)

FORM E-4336A (PROV)

OFFICE _____ RELAY TYPE _____ TRK BAY _____

EQPD _____ ASSIGNED _____ TO _____

WKG _____ VACANT _____ SPARE _____

RE-LAY NO.	√	PRE-WIRE	OLC SLF NO.	S-H	WORKING TRUNK GROUP	NO.	PENDING TRUNK GROUP	NO.	ITDC BAY	PNL	JK	OTDC BAY	PNL	JK
50														
51														
52														
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NO. 4A/4M–CCIS SWITCHING SYSTEM
TRUNK RELAY ASSIGNMENT RECORD

FORM E-4336A (PROV)

OFFICE _____ RELAY TYPE _____ TRK BAY _____

EQPD _____ ASSIGNED _____ TO _____

WKG _____ VACANT _____ SPARE _____

RE-LAY NO.	√	PRE-WIRE	OLC SLF NO.	H	WORKING TRUNK GROUP	NO.	PENDING TRUNK GROUP	NO.	ITDC BAY	PNL	JK	OTDC BAY	PNL	JK
00														
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(CONT)

Fig. 8—4A/4M Switching System Trunk Relay Assignment Record