NO. 1/1A ESS OFFICES
WITH HILO 4-WIRE SWITCHING
TERMINAL BALANCE REQUIREMENTS

1. GENERAL

1.01 The terminal balance requirements for a toll switching office are specified in terms of the echo return loss (ERL) and the singing return loss (SRL). Table A gives the terminal balance measurement requirements for the various terminal balance connection paths in class 4 and higher ranking No. 1/1A Electronic Switching System (ESS) offices with HILO 4-wire switching feature. The diagrams in Table A show the simplified connections for which the requirements apply.

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

1.03 General information on through and terminal balance is given in Section 660-470-100. The terminal balance verification procedures are described in Section 660-470-502, and information concerning the test equipment and test terminations used in balancing a No. 1/1A ESS office with HILO 4-wire switching feature is given in Section 660-470-504. The results from the terminal balance verification procedures should be recorded on the forms specified in Section 660-470-010.

2. APPLICATIONS

2.01 Terminal balance requirements are applied to an office on the basis of trunk type. For each type of trunk group, the following rules apply:

(a) At least 50 percent of all the measurements must be equal to or greater than the median requirement given in Table A.

(b) Not more than 2 percent of the measurements for each trunk category (4-wire, 2-wire intrabuilding, 2-wire interbuilding) may be below the minimum requirement. Any trunk with a measurement below minimum should be investigated, and corrective action should be taken.

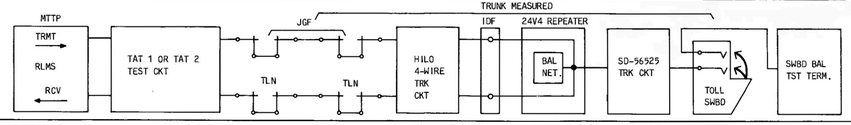
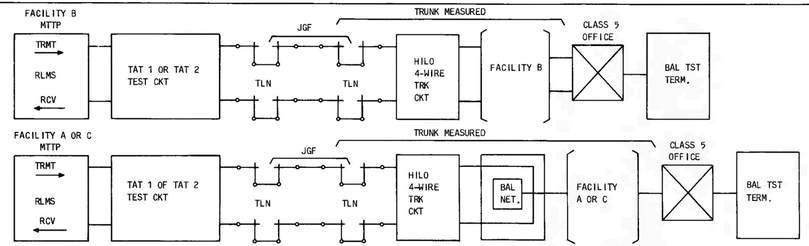
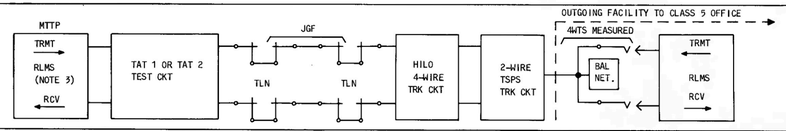
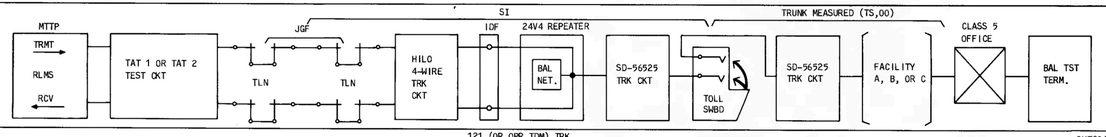
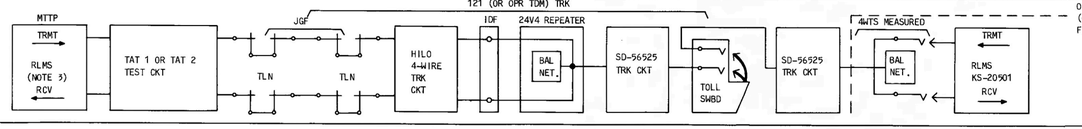
(c) No measurement may be equal to or less than the turndown limit specified in Table A. When this is the case, the trunk should be turned down until corrective action is taken.

2.02 All ERL and SRL measurements taken for trunks that require terminal balance should be recorded by plant maintenance personnel. When this process is completed, the results are given to the transmission engineer, who has the responsibility for office certification. (The requirements for certification are given in Section 853-500-110.) If all of the trunks that require balance meet the requirements given in this section and/or Section 660-470-300, certification can be obtained.

Note: A trunk should not be considered as balanced unless all modes meet the requirements.

3. INTERPRETING REQUIREMENTS

3.01 In the No. 1/1A ESS office with HILO 4-wire switching, the balance testing is performed at either TP2 (2-dB test pad) or TP0 (no test pad). The TP value is an office parameter and can be defined by trunk groups. When a toll connecting (TC) trunk is tested at TP2, 2-dB pads are included in the TAT 1 and TAT 2 test trunk circuits. If, at an operating company option, TP0 is defined, these pads are automatically removed from the TAT 1 and TAT 2 test circuits.

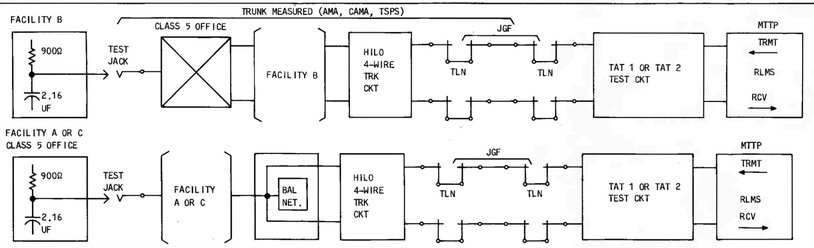
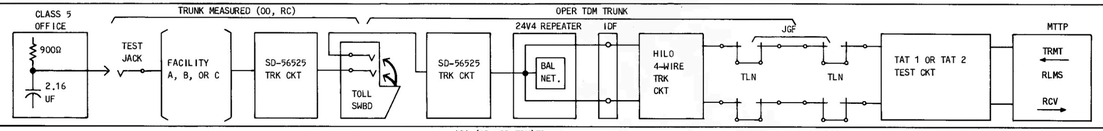
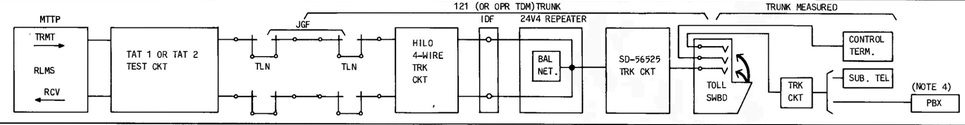
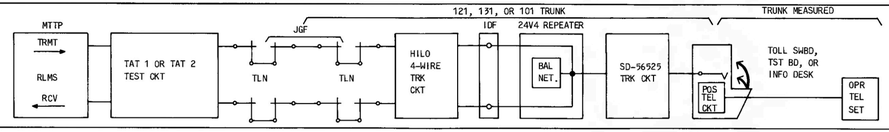
TEST NO.	TRUNK CLASSIFICATION	ERL AND SPL TEST CONDITIONS (BALANCE TEST CIRCUITS AND TEST EQUIPMENT ARE SPECIFIED IN SECTION 660-470-504. PROCEDURES TO OBTAIN TEST CONDITIONS ARE SPECIFIED IN SECTION 660-470-500 AND -502.)		ERL (DB) (NOTE 5) MEDIAN	ERL (DB) (NOTE 5) MINIMUM	ERL (DB) (NOTE 5) TURNDOWN LIMIT	SRL (DB) (NOTE 5) MEDIAN	SRL (DB) (NOTE 5) MINIMUM	SRL (DB) (NOTE 5) TURNDOWN LIMIT
1	CLASS 4 OFFICE SI TRUNK - INCOMING FROM INTERTOLL, OR OUTGOING TO INTERTOLL: 121, WH, TX, OPR TDM, OJ (NOTE 1)			31 (27)	25 (21)	22 (18)	24 (20)	18 (14)	15 (11)
2	TC TRUNK - PATH FROM IT TO TC VIA MACHINE: TOLL COMPLETING, OO, TM, ETC.		A. 2-WIRE INTERBUILDING	22 (18)	17 (13)	14.5 (10.5)	14 (10)	10 (6)	8 (4)
			B. 4-WIRE INTERBUILDING	26 (22)	20 (16)	14.5 (10.5)	19 (15)	15 (11)	8 (4)
			C. 2-WIRE IN SAME OR ADJACENT BLDG	26 (22)	20 (16)	14.5 (10.5)	18 (14)	14 (10)	8 (4)
3	4WTS OF TOLL CONNECTING TRUNKS NOT PART OF ESS TRUNK EQPT (NOTE 2)			-	18 (14)	18 (14)	-	10 (6)	10 (6)
4	TC TRUNK - PATH FROM IT TO TC VIA TOLL SWITCHBOARD: TS, OO, TM, ETC.		A. 2-WIRE INTERBUILDING	22 (18)	17 (13)	14.5 (10.5)	14 (10)	10 (6)	8 (4)
			B. 4-WIRE INTERBUILDING	26 (22)	20 (16)	14.5 (10.5)	19 (15)	15 (11)	8 (4)
			C. 2-WIRE IN SAME OR INTERBUILDING	26 (22)	22 (18)	14.5 (10.5)	18 (14)	14 (10)	8 (4)
5	4WTS OF TOLL CONNECTING TRUNK NOT PART OF ESS TRUNK EQPT (NOTE 2)			-	18 (14)	18 (14)	-	10 (6)	10 (6)

NOTES:
1. IN CLASS 3 OR HIGHER OFFICES, SOME OF THESE TRUNKS ARE TESTED AS PART OF THROUGH BALANCE. WH AND TX ARE TESTED AS PART OF TERMINAL BALANCE.
2. THIS MEASUREMENT IS MADE TO VERIFY THE COMP NET. AND, WHERE NECESSARY, THE NBOC SETTINGS, AND IT SHOULD EQUAL OR EXCEED THE MINIMUM REQUIREMENT.
3. 600-OHM TERMINATIONS ARE PROVIDED FOR THE TATI CIRCUIT WHEN THE TEST TYPE SWITCH OF THE KS-20501, L2 RLMS IS SET TO THE EXT OSC. POSITION.
4. WHEN PBX IS EQUIPPED WITH A TEST TERMINATION FOR BALANCE TESTING (600-OR 900-OHM PLUS 2.16 UF, DEPENDING ON THE NOMINAL IMPEDANCE OF PBX) THE TEST CONDITION IS SIMILAR TO A CLASS 5 OFFICE. IN THESE PBX'S THE REQUIREMENTS OF EITHER TEST 4 OR 6 APPLY.
5. VALUES IN PARENTHESES ARE FOR TPO TESTING WHEN THE TP2 PADS IN THE TAT 1 AND TAT 2 TEST CIRCUITS ARE SWITCHED OUT OF THE CIRCUIT (SEE 3.01).

ABBREVIATIONS

AMA - AUTOMATIC MESSAGE ACCOUNTING
BAL NET. - BALANCE NETWORK
BAL TST TERM. - BALANCE TEST TERMINATION
CAMA - CENTRALIZED AUTOMATIC MESSAGE ACCOUNTING
COMP NET. - COMPROMISE NETWORK
DLL - DIAL LONG LINES
EQPT - EQUIPMENT
4WTS - 4-WIRE TERMINATING SET
IDF - INTERMEDIATE DISTRIBUTING FRAME
INFO - INFORMATION
IT - INTERTOLL
JGF - JUNCTOR GROUPING FRAME
LO - LONG DISTANCE
LLN - LINE LINK NETWORK
MDF - MISCELLANEOUS DISTRIBUTING FRAME
OO - OPERATOR OFFICE
OJ - OPERATOR JUNCTOR
OPR TDM - OPERATOR TANDEM
OPR TEL - OPERATOR TELEPHONE
PBX - PRIVATE BRANCH EXCHANGE
POS TEL CKT - POSITION TELEPHONE CIRCUIT
RC - RECORDING COMPLETING
RCV - RECEIVE
RLMS - RETURN LOSS MEASURING SET
SUB TEL - SUBSCRIBER TELEPHONE
SWBD - SWITCHBOARD
SWBD BAL TST TERM. - SWITCHBOARD BALANCE TEST TERMINATION
TAT 1 OR TAT 2 TST CKT - TEST ACCESS TRUNK TEST CIRCUITS
TC - TOLL CONNECTING
TLN - TRUNK LINK NETWORK
TM - TOLL COMPLETING AND TOLL SWITCHING COMBINED
TP - TEST PAD
TRK CKT - TRUNK CIRCUIT
TRMT - TRANSMIT
TS - TOLL SWITCHING
TSPS - TRAFFIC SERVICE POSITION SYSTEM
TST BD - TEST BOARD
TX - OUTGOING DELAY
VFPB - VOICE-FREQUENCY PATCH BAY
WATS - WIDE AREA TELEPHONE SERVICE
WH - WILL HOLD
HILO 4-WIRE TRK CKT - 4-WIRE TRUNKS (EG. SD-1A362.01)

Table A—Class 4 and Higher No. 1/1A ESS Offices With HILO 4-Wire Switching Feature—Terminal Balance Requirements (Sheet 1 of 2)

TEST NO.	TRUNK CLASSIFICATION	ERL AND SRL TEST CONDITIONS (BALANCE TEST CIRCUITS AND TEST EQUIPMENT ARE SPECIFIED IN SECTION 660-470-504. PROCEDURES TO OBTAIN TEST CONDITIONS ARE SPECIFIED IN SECTION 660-470-500 AND -502.)		ERL (DB) (NOTE 5)			SRL (DB) (NOTE 5)		
				MEDIAN	MINIMUM	TURNDOWN LIMIT	MEDIAN	MINIMUM	TURNDOWN LIMIT
6	TC TRUNK – PATH FROM TC TO IT VIA MACHINE: AMA, CAMA, TSPS		A. 2-WIRE INTERBUILDING	22 (18)	17 (13)	14.5 (10.5)	14 (10)	10 (6)	8 (4)
			B. 4-WIRE INTERBUILDING	26 (22)	20 (16)	14.5 (10.5)	19 (15)	15 (11)	8 (4)
			C. 2-WIRE IN SAME OR ADJACENT BLDG	26 (22)	22 (18)	14.5 (10.5)	18 (14)	14 (10)	8 (4)
7	TC TRUNK – PATH FROM TC TO IT VIA TOLL SWITCHBOARD: OO, RC		A. 2-WIRE INTERBUILDING	22 (18)	17 (13)	14.5 (10.5)	14 (10)	10 (6)	8 (4)
			B. 4-WIRE INTERBUILDING	26 (22)	20 (16)	14.5 (10.5)	19 (15)	15 (11)	8 (4)
			C. 2-WIRE IN SAME OR ADJACENT BLDG	26 (22)	22 (18)	14.5 (10.5)	18 (14)	14 (10)	8 (4)
8	MOBILE RADIO SERVICE OR COASTAL HARBOR SERVICE VIA TOLL SWBD. INCOMING OR OUTGOING SPECIAL SERVICES – WATS, LD, DID, DDD			19 (15)	13 (9)	10 (6)	14 (10)	10 (6)	8 (4)
9	POSITION TELEPHONE CIRCUIT TERMINATED WITH OPERATOR TELEPHONE SET AT TOLL SWBD, TOLL TST BD, OR TOLL INFO DESK		TOLL SWBD OR TOLL TST BD	15 (11)	11 (7)	9 (5)	12 (8)	8 (4)	6 (2)
			TOLL INFO DESK	19 (15)	15 (11)	13 (9)	16 (12)	12 (8)	10 (6)

NOTES:
1. IN CLASS 3 OR HIGHER OFFICES, THIS TEST IS PART OF THROUGH BALANCE.
2. THIS MEASUREMENT IS MADE TO VERIFY THE COMP NET, AND, WHERE NECESSARY, THE NBOC SETTINGS, AND IT SHOULD EQUAL OR EXCEED THE MINIMUM REQUIREMENT.
3. 600-OHM TERMINATIONS ARE PROVIDED FOR THE TATI CIRCUIT WHEN THE TEST TYPE SWITCH OF THE KS-20901, L2 RLMS IS SET TO THE EXT OSC POSITION.
4. WHEN PBX IS EQUIPPED WITH A TEST TERMINATION FOR BALANCE TESTING (600- OR 900-OHM PLUS 2.16 UF, DEPENDING ON THE NOMINAL IMPEDANCE OF PBX) THE TEST CONDITION IS SIMILAR TO A CLASS 5 OFFICE. IN THESE PBX'S THE REQUIREMENTS OF EITHER TEST 4 OR 6 APPLY.
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WATS – WIDE AREA TELEPHONE SERVICE
WH – WILL HOLD
HILO 4-WIRE TRK CKT – 4-WIRE TRUNKS (EG, SD-1A362-01)

Table A—Class 4 and Higher No. 1/1A ESS Offices With HILO 4-Wire Switching Feature—Terminal Balance Requirements (Sheet 2 of 2)