OVERALL SIGNALING ARRANGEMENTS AND TESTING

DIAL PULSING TESTS ON INTERTOLL TRUNKS

CONTENTS PAGE

1. GENERAL

1.01 This section covers dial pulsing tests on intertoll trunks.

1.02 This section is reissued for the following reasons:

(a) To eliminate toll connecting trunks now covered in Section 333-124-500

(b) To simplify testing procedures for intertoll trunks to meet initial circuit layout order (CLO) requirements, and as a first step in signaling trouble investigation.

Because of the extensive revision, arrows generally used to mark changes are omitted.

1.03 This section is made up of pulsing requirements diagrams which are to be used in making circuit order tests and for trouble shooting on single and multilink signaling layouts used for intertoll trunks.

1.04 Test set application and testing methods to be used with the pulsing requirements diagrams in this section are covered in Section 333-122-501. The test values specified in the practice include the distortions introduced by the signaling systems and equipment, they do not include test set variations. The Western Electric Company (WECo) 4A Signaling Test Set is exceptionally accurate and will generate and measure the values given. Use of other E and M lead signaling test sets should recognize the test set accuracy. For example, the WECo 2B-1 Signaling Test Set has a ±2 percent break receiving and ±3 percent break sending circuit tolerance.

1.05 The pulsing requirements diagrams specify the percent break values to be sent and received. These values are at 10 PPS from the test set or at a normal 10 ±1.0 PPS from the sender.

1.06 In some cases, the test points shown (E or M leads) on the pulsing requirements diagrams may not physically exist in the form of jack circuits. In these cases, a decision must be made by the maintenance forces as to the best locations to make the desired pulsing tests (Section 333-121-500).

2. INTERTOLL TRUNKS

2.01 Intertoll trunks are message trunks which are provided between toll offices to carry toll message traffic. These trunks are pulsed directly by either senders or operator dials.

2.02 The percent break values given in the tables are based on the normal range of the various types of senders or operator dials. These pulsing tests at 10 PPS are specified to reduce the effort required to perform the initial circuit order tests and take into account the lower distortion which is encountered where pulses originate from loop or E- and M-type senders or operator dials.

2.03 Table A provides a legend of symbols used in the pulsing requirements diagrams. Table B provides the pulsing requirements diagram for intertoll trunks using a single link signaling system. Tables C-1 through C-5 provide the pulsing requirements diagrams for intertoll trunks using tandem signaling systems.

2.04 Where these overall limits are not met, the individual signaling systems should be tested as covered in the section on that particular signaling system.

NOTICE
Not for use or disclosure outside the
Bell System except under written agreement

CX or SX—Section 333-122-603, 333-122-605

DX—Section 333-122-607

O/ON/N—Section 362-305-515

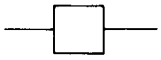
SF—Section 179-302-501 or 179-305-502

Digital—Section 365-115-501

2.05 Tandem connections of the signaling systems are shown in Fig. 1.

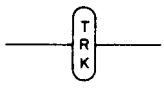
TABLE A

LEGEND OF SYMBOLS



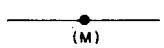
Signaling Unit — Type denoted is as follows:

CX or SX	—	Composite or Simplex
DX	—	Duplex
O/ON/N	—	Built-in out-of-band signaling of the O, ON, or N carrier systems
SF	—	Single Frequency
Digital	—	Built-in digital signaling of the digital carrier, D-type channel banks

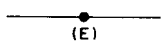


Trunk Circuit

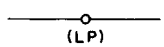
Pulse Link Repeater (relay type)



M Lead Testing Point



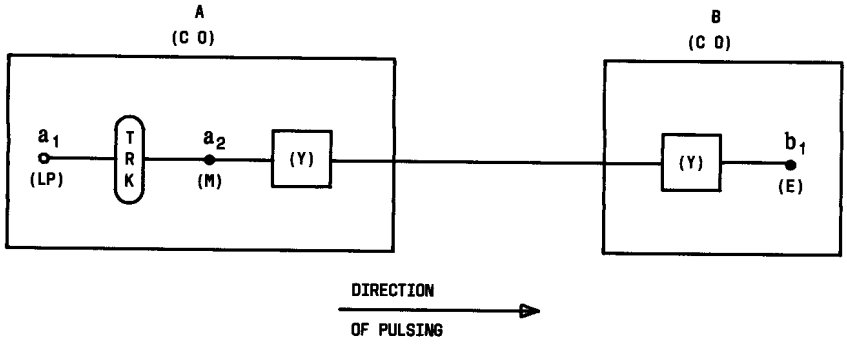
E Lead Testing Point



Loop Signaling Testing Point

TABLE B
SINGLE SIGNALING LINKS OF INTERTOLL TRUNKS

PULSING REQUIREMENTS DIAGRAM
INTERTOLL TRUNKS



SENDER OR OPERATOR DIAL

E AND M LEAD SIGNALING SYSTEM (Y)	SENDING 10±1.0 PPS		RECEIVING AT b_1
	a_1 (%BK)	a_2 (%BK)	(IN % BK)
CX OR SX	63.5±4%	57.5±4%	58.5±7.0%
DX			57.5±8.0%
O/ON/N CARRIER			59.0±7.5%
SF			56.0±8.5%
DIGITAL CARRIER			57.5±6.0%
SEE NOTES	1	2	2

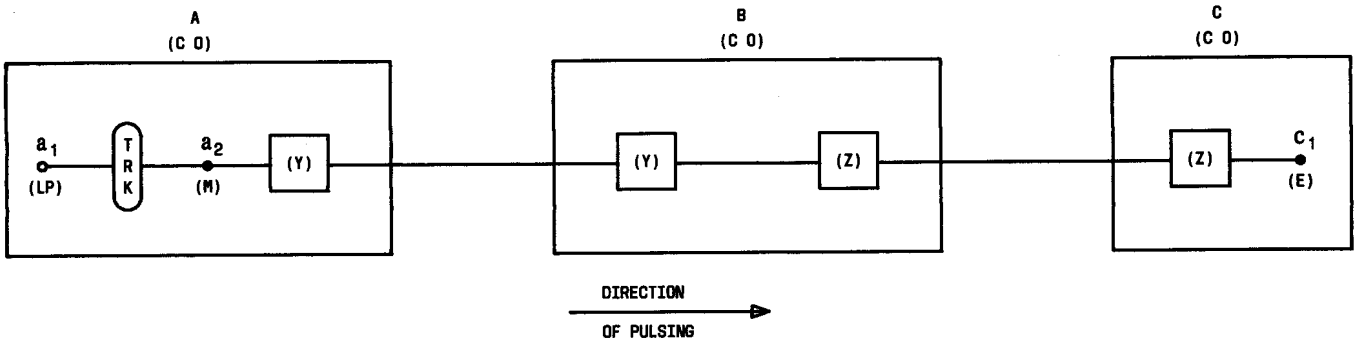
TEST SET (LOOP)

E AND M LEAD SIGNALING SYSTEM (Y)	SENDING 10±1.0 PPS		RECEIVING AT b_1
	a_1 (%BK)	a_2 (%BK)	(IN % BK)
CX OR SX	64	58.0±1.0%	59.0±4.0%
DX			58.0±5.0%
O/ON/N CARRIER			60.0±5.0%
SF			56.5±5.5%
DIGITAL CARRIER			58.0±3.0%
SEE NOTES	1	2	2

NOTES:
1. IF THE SIGNALING MODE AT THE FIRST TEST POINT IN OFFICE A IS OTHER THAN LOOP, SEND FROM THE FIRST (M) TEST POINT.
2. USE EITHER A 2B OR 2B-1 SIGNALING TEST SET. (WHEN SENDING PULSES IN EXCESS OF 75 PERCENT BREAK, SEE SECTION 333-122-501.)

TABLE C-1
TANDEM SIGNALING LINKS OF INTERTOLL TRUNKS

PULSING REQUIREMENTS DIAGRAM
INTERTOLL TRUNKS



SENDER OR OPERATOR DIAL

E AND M LEAD SIGNALING SYSTEM		SENDING 10±1.0 PPS		RECEIVING AT
(Y)	(Z)	a_1 (%BK)	a_2 (%BK)	c_1 (%BK)
CX OR SX	CX OR SX	63.5±4%	57.5±4%	59.5±10%
↓	DX	↓	↓	58.5±11%
↓	O/ON/N CXR	↓	↓	60.5±11.0%
↓	SF	↓	↓	57.0±11.5%
↓	DIG. CXR	↓	↓	58.5±9.0%
SEE NOTES		1	2	2

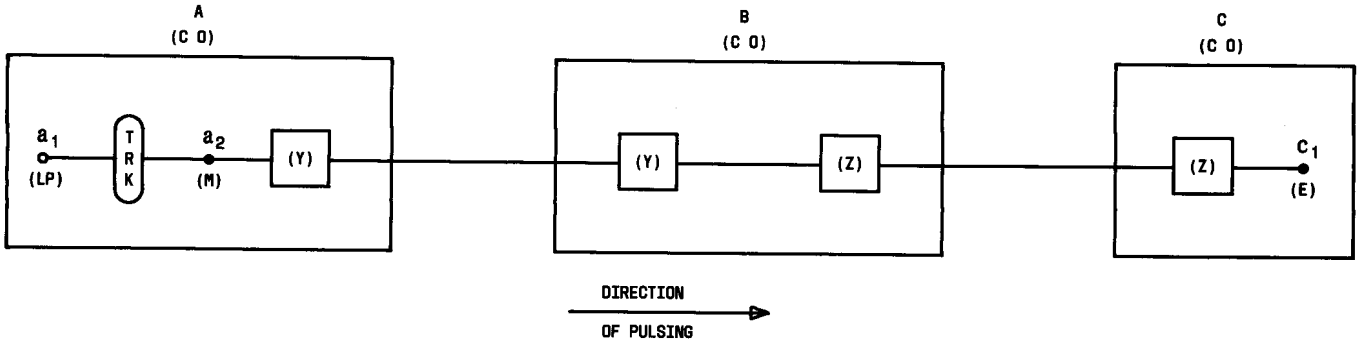
TEST SET (LOOP)

E AND M LEAD SIGNALING SYSTEM		SENDING 10±1.0 PPS		RECEIVING AT
(Y)	(Z)	a_1 (%BK)	a_2 (%BK)	c_1 (% BK)
CX OR SX	CX OR SX	64	58.0±1.0%	60±7%
↓	DX	↓	↓	59±8%
↓	O/ON/N CXR	↓	↓	61±8%
↓	SF	↓	↓	57.5±8.5%
↓	DIG. CXR	↓	↓	59±6%
SEE NOTES		1	2	2

NOTES:
1. IF THE SIGNALING MODE AT THE FIRST TEST POINT IN OFFICE A IS OTHER THAN LOOP, SEND FROM THE FIRST (M) TEST POINT.
2. USE EITHER A 2B OR 2B-1 SIGNALING TEST SET. (WHEN SENDING PULSES IN EXCESS OF 75 PERCENT BREAK, SEE SECTION 333-122-501.)

TABLE C-2
TANDEM SIGNALING LINKS OF INTERTOLL TRUNKS

PULSING REQUIREMENTS DIAGRAM
INTERTOLL TRUNKS



SENDER OR OPERATOR DIAL

E AND M LEAD SIGNALING SYSTEM		SENDING 10±1.0 PPS		RECEIVING AT
(Y)	(Z)	a_1 (%BK)	a_2 (%BK)	c_1 (%BK)
DX	CX OR SX	63.5±4%	57.5±4%	58.5±11%
↓	DX	↓	↓	57.5±12%
↓	O/ON/N CXR	↓	↓	59.5±12%
↓	SF	↓	↓	56.0±12.5%
↓	DIG. CXR	↓	↓	57.5±10%
		1	2	2

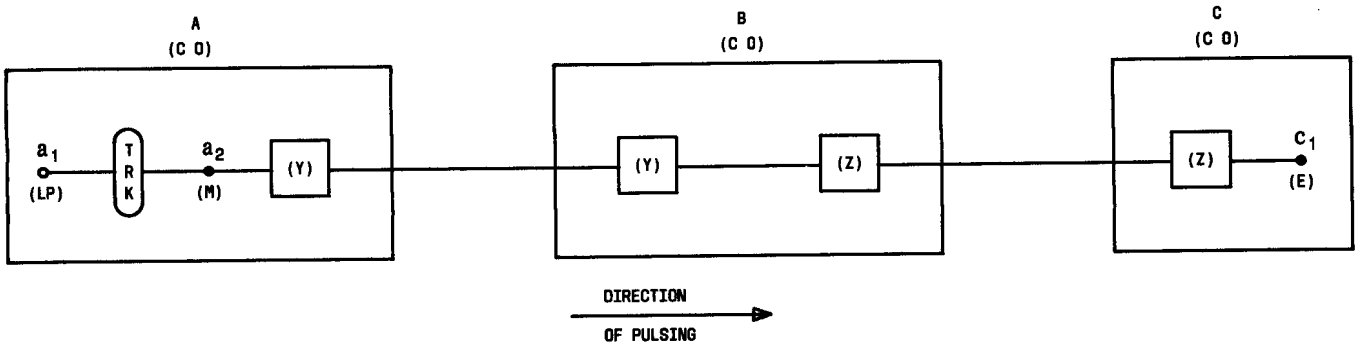
TEST SET (LOOP)

E AND M LEAD SIGNALING SYSTEM		SENDING 10±1.0 PPS		RECEIVING AT
(Y)	(Z)	a_1 (%BK)	a_2 (%BK)	c_1 (%BK)
DX	CX OR SX	64	58±1%	59.0±8%
↓	DX	↓	↓	58.0±9%
↓	O/ON/N CXR	↓	↓	60.0±9%
↓	SF	↓	↓	56.5±9.5%
↓	DIG. CXR	↓	↓	58.0±7%
		1	2	2

NOTES:
1. IF THE SIGNALING MODE AT THE FIRST TEST POINT IN OFFICE A IS OTHER THAN LOOP, SEND FROM THE FIRST (M) TEST POINT.
2. USE EITHER A 2B OR 2B-1 SIGNALING TEST SET. (WHEN SENDING PULSES IN EXCESS OF 75 PERCENT BREAK, SEE SECTION 333-122-501.)

TABLE C-3
TANDEM SIGNALING LINKS OF INTERTOLL TRUNKS

PULSING REQUIREMENTS DIAGRAM
INTERTOLL TRUNKS



SENDER OR OPERATOR DIAL

E AND M LEAD SIGNALING SYSTEM		SENDING 10±1.0 PPS		RECEIVING AT
(Y)	(Z)	a_1 (%BK)	a_2 (%BK)	c_1 (%BK)
O/ON/N CXR	CX OR SX	63.5±4%	57.5±4%	60.0±10.5%
	DX			59.0±11.5%
	O/ON/N CXR			61.0±11.5%
	SF			57.5±12%
	DIG. CXR			59.0±9.5%
SEE NOTES		1	2	2

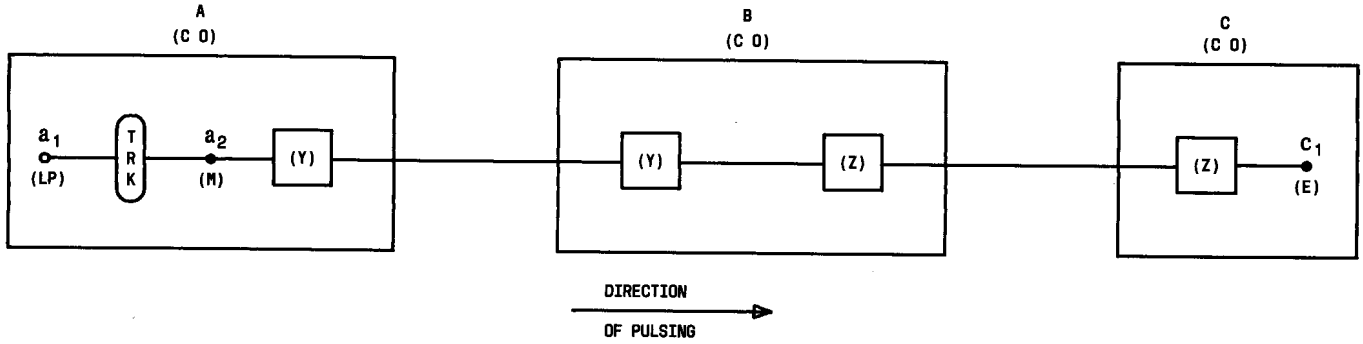
TEST SET (LOOP)

E AND M LEAD SIGNALING SYSTEM		SENDING 10±1.0 PPS		RECEIVING AT
(Y)	(Z)	a_1 (%BK)	a_2 (%BK)	c_1 (%BK)
O/ON/N CXR	CX OR SX	64	58±1%	61.0±8%
	DX			60.0±9%
	O/ON/N CXR			62.0±9%
	SF			58.5±9.5%
	DIG. CXR			60.0±7%
SEE NOTES		1	2	2

NOTES:
1. IF THE SIGNALING MODE AT THE FIRST TEST POINT IN OFFICE A IS OTHER THAN LOOP, SEND FROM THE FIRST (M) TEST POINT.
2. USE EITHER A 2B OR 2B-1 SIGNALING TEST SET. (WHEN SENDING PULSES IN EXCESS OF 75 PERCENT BREAK, SEE SECTION 333-122-501.)

TABLE C-4
TANDEM SIGNALING LINKS OF INTERTOLL TRUNKS

PULSING REQUIREMENTS DIAGRAM
INTERTOLL TRUNKS



SENDER OR OPERATOR DIAL

E AND M LEAD SIGNALING SYSTEM		SENDING 10±1.0 PPS		RECEIVING AT
(Y)	(Z)	a_1 (%BK)	a_2 (%BK)	c_1 (%BK)
SF	CX OR SX	63.5±4%	57.5±4%	57.0±11.5%
	DX			56.0±12.5%
	O/ON/N CXR			58.0±12.5%
	SF			SEE NOTE 3
↓	DIG. CXR	↓	↓	56.0±10.5%
SEE NOTES		1	2	2

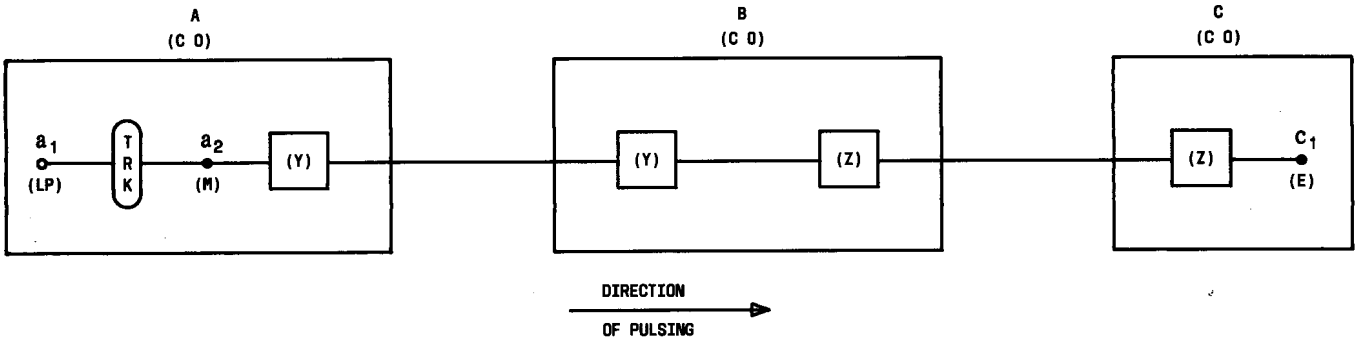
TEST SET (LOOP)

E AND M LEAD SIGNALING SYSTEM		SENDING 10±1.0 PPS		RECEIVING AT
(Y)	(Z)	a_1 (%BK)	a_2 (%BK)	c_1 (%BK)
SF	CX OR SX	64	58±1%	62.0±3%
	DX			61.0±4%
	O/ON/N CXR			58.5±3.5%
↓	DIG. CXR	↓	↓	61.5±2.5%
SEE NOTES		1	2	2

NOTES:
1. IF THE SIGNALING MODE AT THE FIRST TEST POINT IN OFFICE A IS OTHER THAN LOOP, SEND FROM THE FIRST (M) TEST POINT.
2. USE EITHER A 2B OR 2B-1 SIGNALING TEST SET. (WHEN SENDING PULSES IN EXCESS OF 75 PERCENT BREAK, SEE SECTION 333-122-501.)
3. THE ONLY ACCEPTABLE METHOD OF PROVIDING SF SIGNALING SYSTEMS IN TANDEM IS THE USE OF BY-PASS UNITS AT THE INTERMEDIATE OFFICE TO PROVIDE THE EQUIVALENT OF A SINGLE SF LINK, SEE TABLE B.

TABLE C-5
TANDEM SIGNALING LINKS OF INTERTOLL TRUNKS

PULSING REQUIREMENTS DIAGRAM
INTERTOLL TRUNKS



SENDER OR OPERATOR DIAL

E AND M LEAD SIGNALING SYSTEM		SENDING 10±1.0 PPS		RECEIVING AT
(Y)	(Z)	a_1 (%BK)	a_2 (%BK)	c_1 (%BK)
DIG. CXR	CX OR SX	63.5±4%	57.5±4%	58.5±9%
↓	DX	↓	↓	57.5±10%
↓	O/ON/N CXR	↓	↓	59.5±10%
↓	SF	↓	↓	56.0±10.5%
↓	DIG CXR	↓	↓	57.5±8%
SEE NOTES		1	2	2

TEST SET (LOOP)

E AND M LEAD SIGNALING SYSTEM		SENDING 10±1.0 PPS		RECEIVING AT
(Y)	(Z)	a_1 (%BK)	a_2 (%BK)	c_1 (%BK)
DIG. CXR	CX OR SX	64	58±1%	59.0±6%
↓	DX	↓	↓	58.0±7%
↓	O/ON/N CXR	↓	↓	60.0±7%
↓	SF	↓	↓	56.5±7.5%
↓	DIG. CXR	↓	↓	58.0±5%
SEE NOTES		1	2	2

NOTES:
1. IF THE SIGNALING MODE AT THE FIRST TEST POINT IN OFFICE A IS OTHER THAN LOOP, SEND FROM THE FIRST (M) TEST POINT.
2. USE EITHER A 2B OR 2B-1 SIGNALING TEST SET. (WHEN SENDING PULSES IN EXCESS OF 75 PERCENT BREAK, SEE SECTION 333-122-501.)

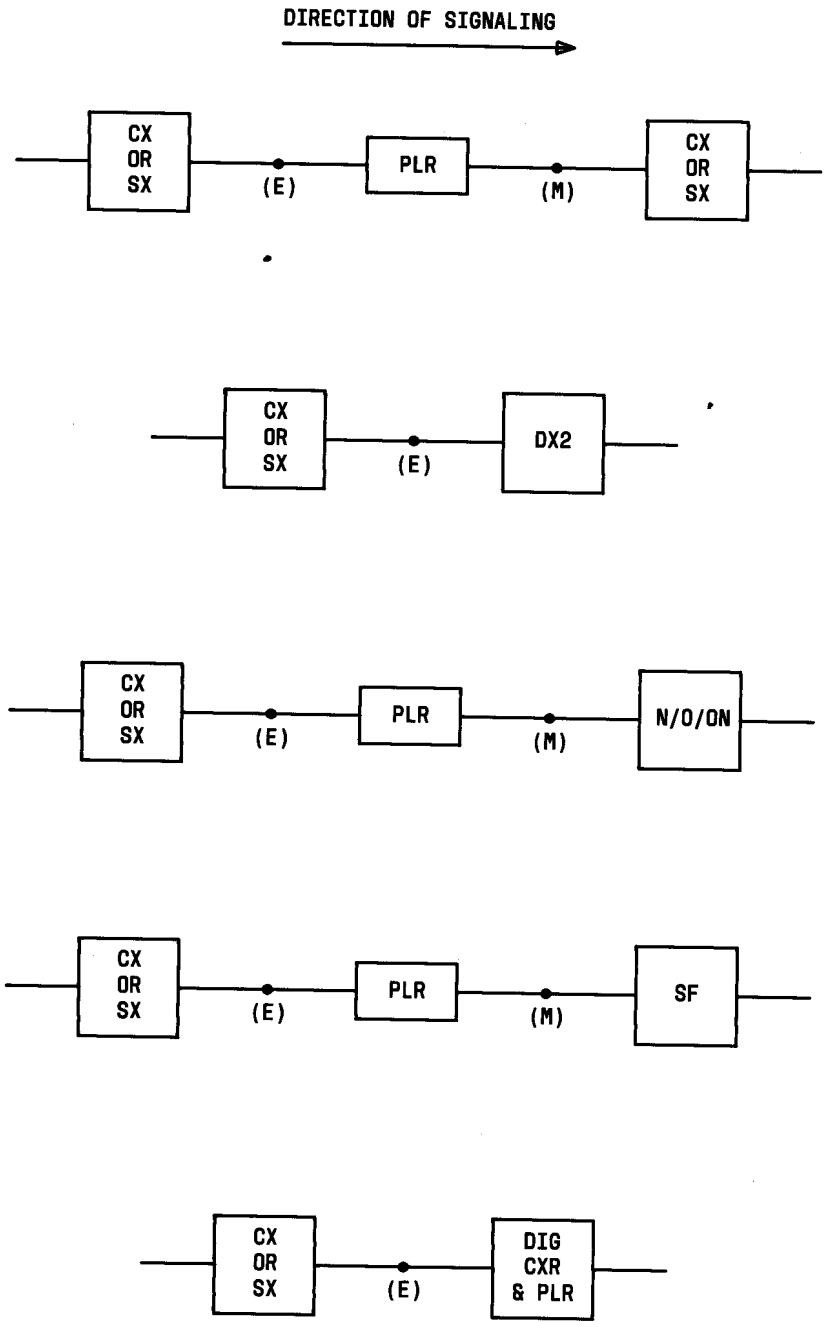


Fig. 1—Tandem Connection of Signaling Systems (Sheet 1 of 5)

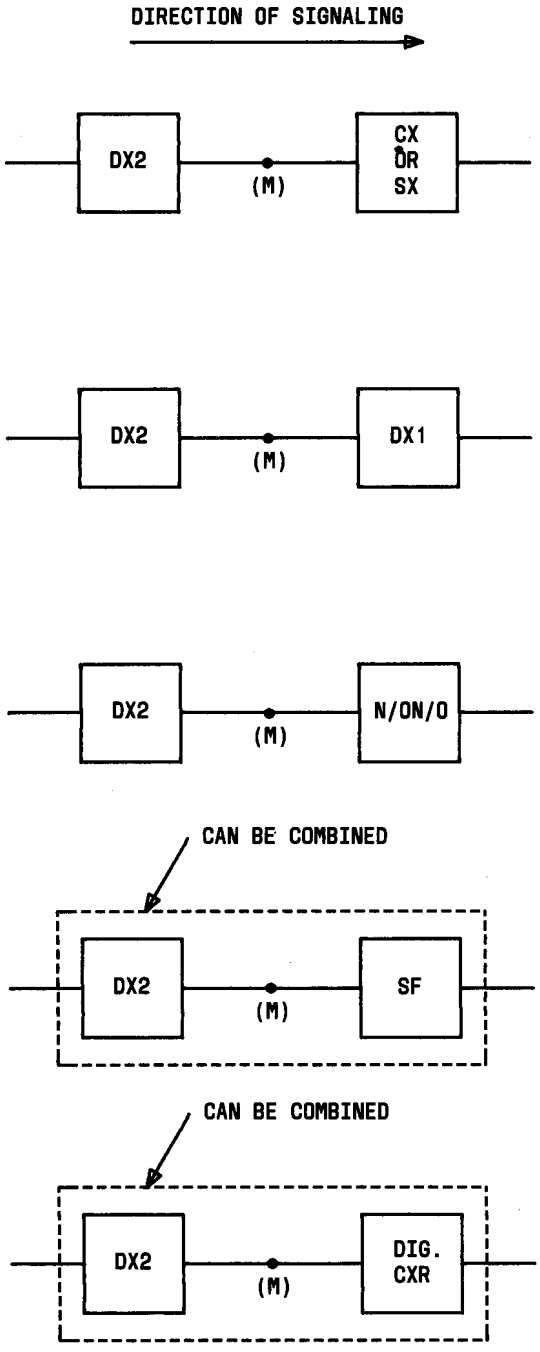


Fig. 1—Tandem Connection of Signaling Systems (Sheet 2 of 5)

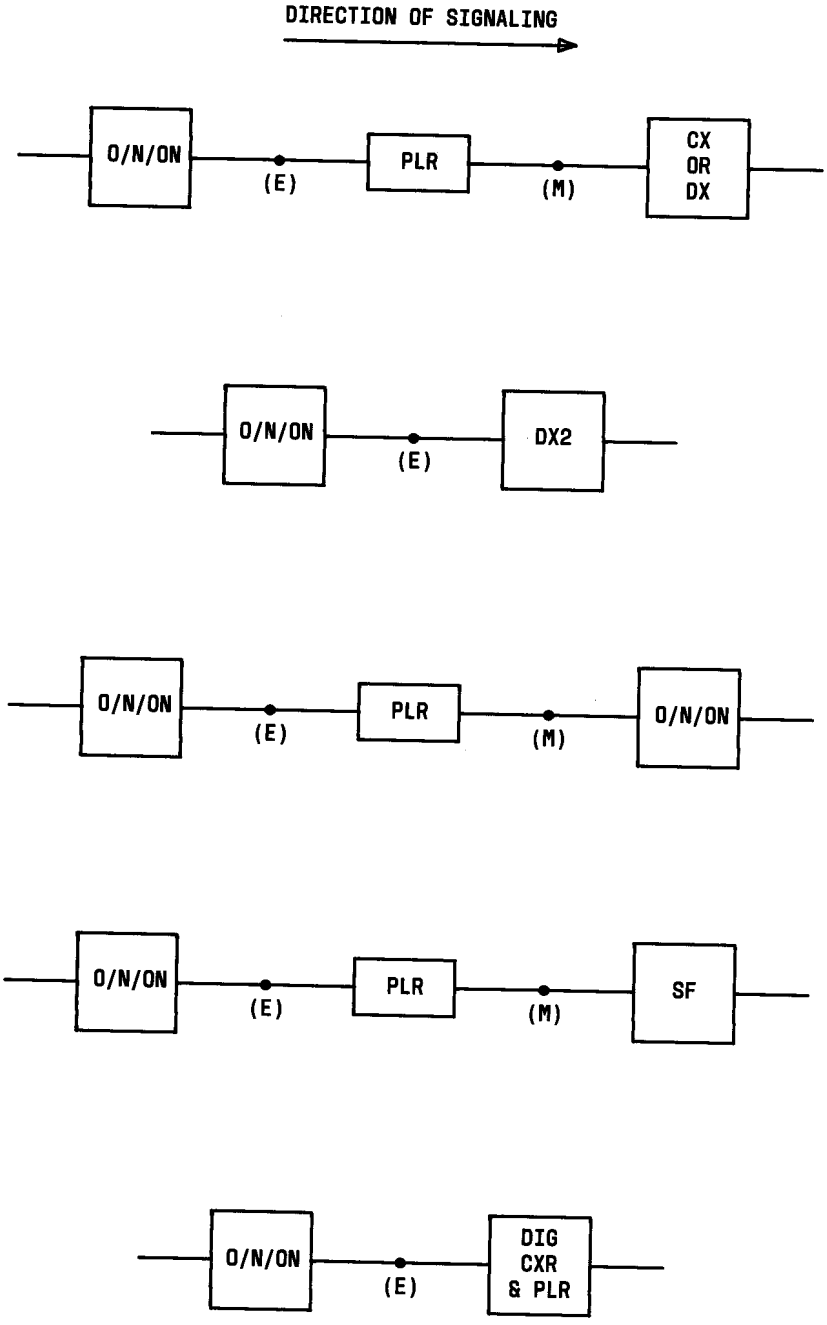


Fig. 1—Tandem Connection of Signaling Systems (Sheet 3 of 5)

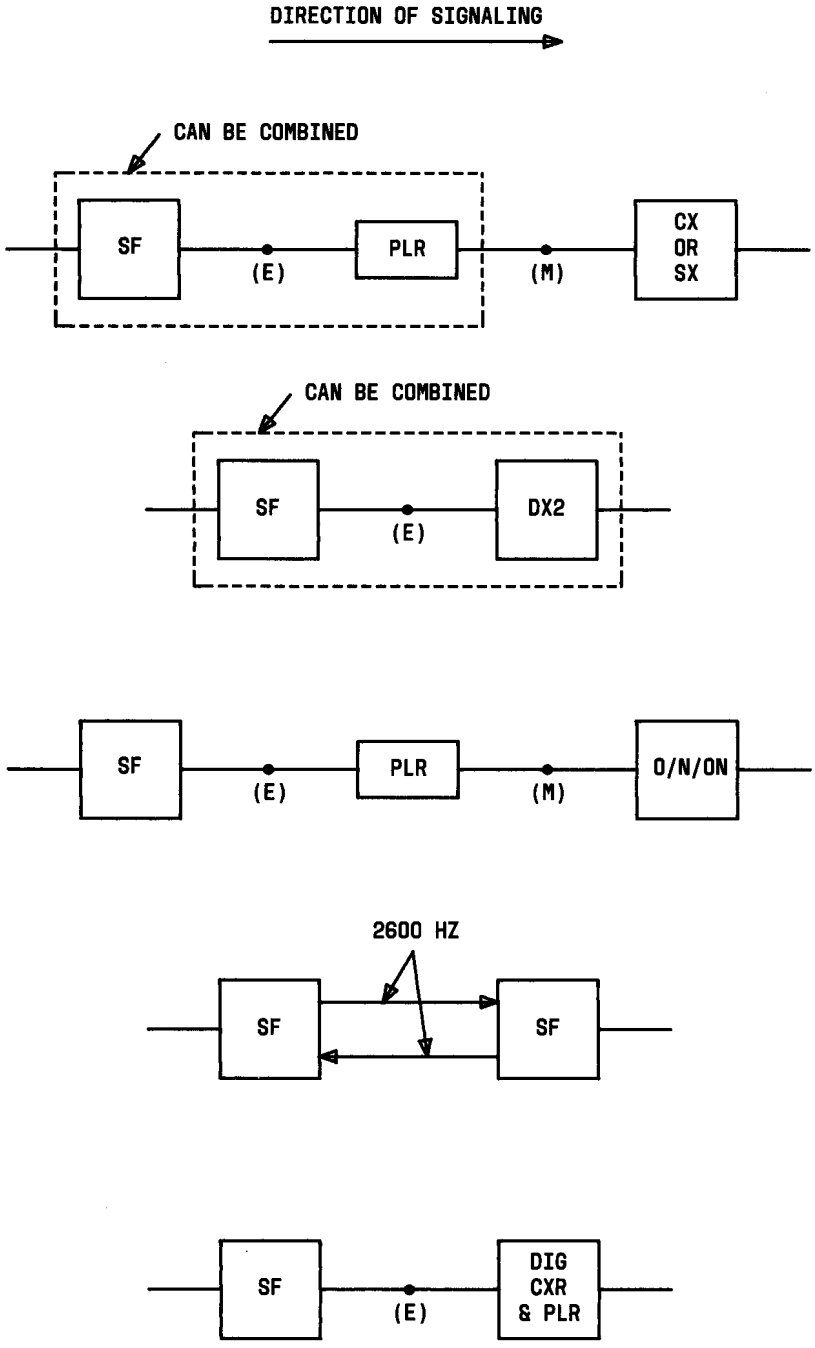


Fig. 1—Tandem Connection of Signaling Systems (Sheet 4 of 5)

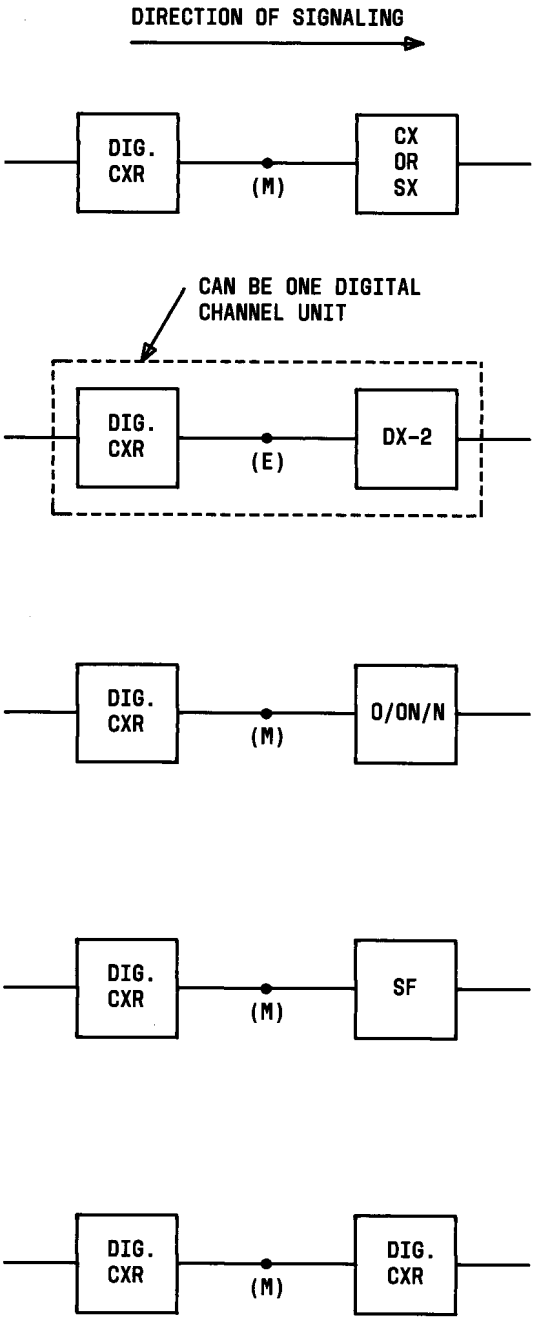


Fig. 1—Tandem Connection of Signaling Systems (Sheet 5 of 5)