

DIGITAL SIGNALING JOB AID

SA 0540D

**DEVELOPED BY:
NETWORK OPERATIONS EDUCATION and TRAINING**



DIGITAL SIGNALING

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AT&T - PROPRIETARY INFORMATION
USE PURSUANT TO COMPANY INSTRUCTIONS

DIGITAL SIGNALING JOB AID

INTRODUCTION

This Job Aid has been developed to assist technicians in determining:

Analog and digital signaling conditions present at different points of an AT&T circuit

Optioning of Digital Central Office equipment for particular circuit applications

and

The application of the job aid indications when using the aid with a variety of Testing Vehicles.

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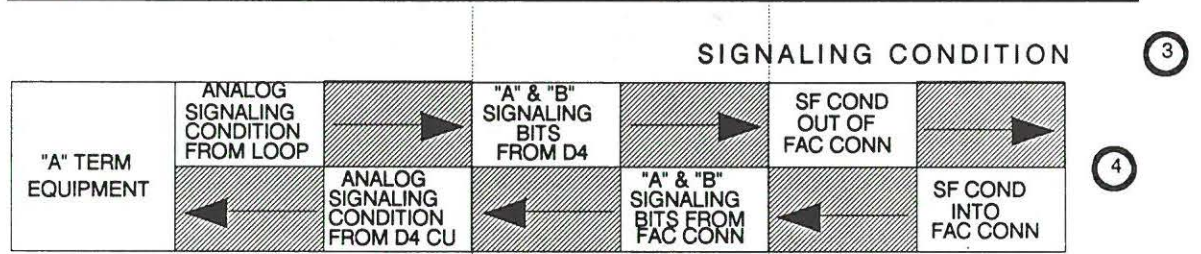
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USER GUIDE

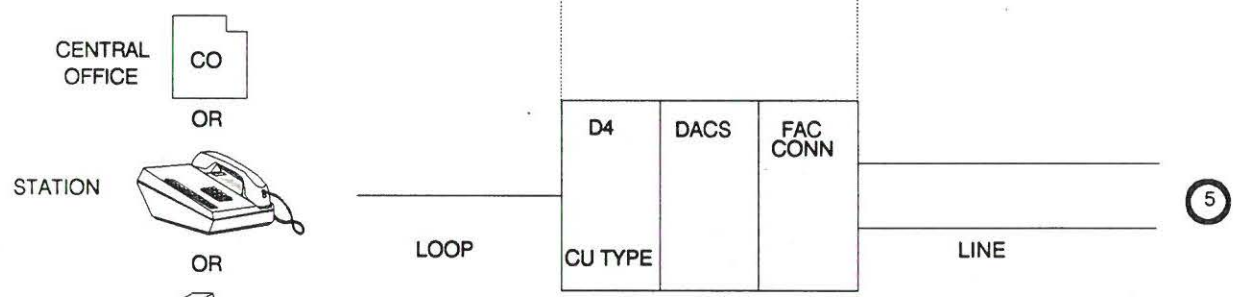
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CIRCUIT TYPE 1

A TERM	LOOP	SIG UNIT	AB SIG BITS	AB SIG BITS	SF	SF
-----------	------	-------------	-------------------	-------------------	----	----

2


Logic Levels for "A&B"
Signaling bits are shown
at the DS-1



SIGNALING OPTIONS

D4 SIG UNIT	
DACS	TC(aabb,ccdd),TRB
FAC CONNS	
LT1B	
M2&M3	
M4<2	

6

DIGITAL SIGNALING JOB AID

USER GUIDE

The diagram on the opposite page is a typical chart layout used in this Job Aid. Descriptions of pertinent areas of the chart can be found below. Descriptions apply to all charts of this Job Aid.

- | | |
|---|--|
| 1) CIRCUIT TYPE | Identifies the signaling application for the chart |
| 2) CHARTHEADER | Identifies type of information contained in each column

Identifies the standard "A" and "Z" Terminations as related to a WORD Document |
| 3) SIGNALING CONDITIONS | Identifies particular state of circuit to which the following information applies |
| 4) SIGNALING CHART | Identifies signals at different points of circuit

Signals are divided into rows, where a signal originating at the left side (indicated by arrow pointing to right) causes each succeeding signal to occur in that row. Same is true for signal originating at the right (indicated by arrow pointing to the left). |
| 5) DCO BLOCK DIAGRAM | Identifies digital vs. analog points of the circuit |
| 6) OPTIONS CHART | Lists typical option settings for DACS and Facility Connectors (Granger M2, M3, M4, LT1B, and LT2 types). Options for D4 Channel Units can be found on page opposite Signaling Chart. |
| 7) SIGNALING TO LOGIC LEVEL TABLE (found on page opposite Signaling Charts) | Provides the logic level signaling bits are driven to by changes in analog signals. |

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SIGNALING CHARTS

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D4 CHANNEL UNIT OPTION TABLE

OPEN END FX Channel Units (LOOP START OPTIONS)

UNIT	CLEI #	ACP #	OPTIONS	INFORMATION
2FXO	D4CX200	ACP 365-005-010	NBO(J2)	Option per circuit requirements
2FXO	D4CX235	ACP 365-005-056	LX1,LX2(J3) = W/S LX1,LX2(J3) = B/S CN9(J3) = W/S GS(J4) = B/S LS(J4) = W/S, RG(J4) = B/S	Loop Resistance > 600 ohm Loop Resistance < or = 600 ohm 900 ohm Comp Net Loop Start Provide short toward drop on CGA
2FXO/GT	D4CX401 D4CX403	ACP 365-005-014	PBN/CBN (J6) = W/S PBN/CBN (J6) = B/S LX(J6) = W/S LX(J6) = B/S GS(J4) = B/S LS(J4) = W/S, RG(J4) = B/S PBN	Using Precision Balance Net Using Comp Balance Net Loop Resistance > 600 ohm Loop Resistance < or = 600 ohm Loop Start Provide short toward drop on CGA Option per circuit requirements
2FXOLS	D4CX800	ACP 365-005-012	NBO(J2)	Option per circuit requirements
	D4CX804	ACP 365-005-064	LX1,LX2(J3) = W/S	Loop Resistance > 600 ohm
2FXO/LSN	D4CX810	ACP 365-005-063	LX1,LX2(J3) = B/S CN9(J3) = W/S LS(J4) = W/S 4ESS(J5) = B/S	Loop Resistance < or = 600 ohm 900 ohm Comp Net Provides loop start trunk conditioning If circuit does not interface w/ 4ESS
4FXO	D4CX600 D4CX610 D4CX611	ACP 365-005-016	LX1(J2) = W/S LX1(J2) = B/S GS(J4) = B/S LS(J3) = W/S, RG(J3) = B/S N/R(J4,J5) = W/S N/R(J4,J5) = B/S	Loop Resistance > 600 ohm Loop Resistance < or = 600 ohm Loop Start Provides loop start trunk conditioning Normal Simplex T=TR, R=T1R1 Reversed Simplex T=T1R1, R=TR

CLOSED END FX Channel Units (LOOP START OPTIONS)

UNIT	CLEI #	ACP #	OPTIONS	INFORMATION
2FXS	D4CX100	ACP 365-005-011	NBO(J2) SL1,SL2(J3) = W/S SL1,SL2(J3) = B/S CN9(J4) = W/S (must select one CN6(J4) = W/S of these options) SD(J5) = W/S	Option per circuit requirements Loop Resistance > 300 ohm Loop Resistance < or = 300 ohm 900 ohm Comp Net 600 ohm Comp Net Provide trunk conditioning for CGA
2FXS/GT	D4CX301	ACP 365-005-015	PBN/CBN (J3) = W/S PBN/CBN (J3) = B/S SL1,SL2(J2) = W/S SL1,SL2(J2) = B/S SD(J5) = W/S PBN	Using Precision Balance Net Using Comp Balance Net Loop Resistance > 300 ohm Loop Resistance < or = 300 ohm Provide trunk conditioning for CGA Option per circuit requirements
2FXSLS	D4CX700 D4CX704	ACP 365-005-013 ACP 365-005-068	NBO(J2) SL1,SL2(J2) = W/S SL1,SL2(J2) = B/S CN9(J4) = W/S (must select one CN6(J4) = W/S of these options) LS(J4) = W/S 4ESS(J5) = B/S STA(J4)	Option per circuit requirements Loop Resistance > 300 ohm Loop Resistance < or = 300 ohm 900 ohm Comp Net 600 ohm Comp Net Provides loop start trunk conditioning If circuit does not interface w/ 4ESS Option per circuit requirements
4FXS	D4CX500 D4CX510 D4CX511 D4CX525	ACP 365-005-017 ACP 365-005-075	72V(J2)=B/S S1/S2 S3/S4/S5 SD(J2) = W/S N/R(J6,J7) = W/S N/R(J6,J7) = B/S J3, J4 = B/S J3, J4 = W/S	48 Volt Selected Xmit/Rcv impedance (option per requirement) Equalization (option per requirements) Provide trunk conditioning for CGA Normal Simplex T=TR, R=T1R1 Reversed Simplex T=T1R1, R=TR Loop Resistance > 465 ohm Loop Resistance < or = 465 ohm

SIGNALING TO LOGIC LEVEL TABLE - FX

FROM CLOSED END		
SIG BIT	LOGIC LEVEL	CONDITION
A	0	LOOP OPEN
	1	LOOP SHORT
B	0	RING GRND
	1	RING OPEN

FROM OPEN END		
SIG BIT	LOGIC LEVEL	CONDITION
A	0	TIP GROUND
	1	TIP OPEN
B	0	RINGING
	1	NO RINGING

FX / LOOP START

A TERM	LOOP	SIG UNIT	AB SIG BITS	AB SIG BITS	SF	SF	AB SIG BITS	AB SIG BITS	SIG UNIT	LOOP	Z TERM
-----------	------	-------------	-------------------	-------------------	----	----	-------------------	-------------------	-------------	------	-----------

NOTE 1

IDLE CONDITIONS

NOTE 1

C.O.	T=GRD R=BAT	→	A=0 B=1	→	SF OFF	→	A=0 B=1	→	T=GND R=BAT	→	STA
	←	T=30V R=30V TR=H RES	←	A=0 B=1	←	SF ON	←	A=0 B=1	←	TR=OPEN	

STATION OFF HOOK / DRAW DIAL TONE

C.O.	DIAL TONE T=GRD R=BAT	→	A=0 B=1	→	DIAL TONE SF OFF	→	A=0 B=1	→	DIAL TONE T=GND R=BAT	→	STA
	←	T=30V R=30V TR=L RES	←	A=1 B=1	←	SF OFF	←	A=1 B=1	←	TR=SHORT	

CENTRAL OFFICE RINGING STATION

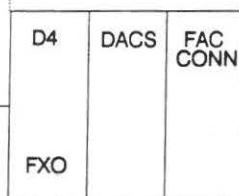
C.O.	T=GND R=BAT R=20 HZ	→	A=0 B=0	→	SF ON	→	A=0 B=0	→	T=GND R=BAT R=20HZ	→	STA
	←	T=30V R=30V TR=H RES	←	A=0 B=1	←	SF ON	←	A=0 B=1	←	TR=OPEN	

BUSY CONDITION

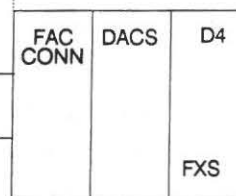
C.O.	T=GND R=BAT	→	A=0 B=1	→	SF OFF	→	A=0 B=1	→	T=GND R=BAT	→	STA
	←	T=30V R=30V TR=L RES	←	A=1 B=1	←	SF OFF	←	A=1 B=1	←	TR=SHORT	



LOOP



LINE



LOOP



SIGNALING OPTIONS

D4 SIG UNIT See Applicable FXO Channel Units and Options on opposite page	
DACS	TC(0000,0101),TRB
FAC CONNS	
LT1B	68C & S2=2
M2&M3	FXOL
M4<2	PL

SIGNALING OPTIONS

D4 SIG UNIT See Applicable FXS Channel Units and Options on opposite page	
DACS	TC(0000,0101),TRB
FAC CONNS	
LT1B	68D & S2=2
M2&M3	FXSL
M4<2	RL

NOTE 1

4W FX UNITS (Optioned for NORMAL SIMPLEX)

"T" CONDITIONS WILL APPEAR ON "TR" SIMPLEX

"R" CONDITIONS WILL APPEAR ON "T1R1" SIMPLEX

"TR" CONDITIONS WILL APPEAR ACROSS "TR & T1R1" SIMPLEX

D4 CHANNEL UNIT OPTION TABLE

TDM Channel unit with OPEN END on digital side (LOOP START OPTIONS)

UNIT	CLEI #	ACP #	OPTIONS
4TDM	D4CE500	ACP 365-005-021	E(J6) = W/S S, R (J7) = B/S V(J5) = W/S W(J4) = W/S Y(J8) = B/S

SIGNALING TO LOGIC LEVEL TABLE - FX

FROM CLOSED END		
SIG BIT	LOGIC LEVEL	CONDITION
A	0	LOOP OPEN
	1	LOOP SHORT
B	0	RING GRND
	1	RING OPEN

FROM OPEN END		
SIG BIT	LOGIC LEVEL	CONDITION
A	0	TIP GROUND
	1	TIP OPEN
B	0	RINGING
	1	NO RINGING

FX / LOOP START (TDM) DIGITAL SIDE TOWARD OPEN END

A TERM	SF	SF	AB SIG BITS	AB SIG BITS	SIG UNIT	SIG UNIT	LOOP	LOOP	Z TERM
-----------	----	----	-------------------	-------------------	-------------	-------------	------	------	-----------

IDLE CONDITIONS

TO OPEN END	SF OFF	→	A=0 B=1	→	E=GND TR=OPEN	→	M=GND T1R1=OPEN	→	LEC CKT	NOTE 1
	←	SF ON	←	A=0 B=1	←	M=OPEN TR=OPEN	←	E=OPEN TR=OPEN		

STATION OFF HOOK / DRAW DIAL TONE

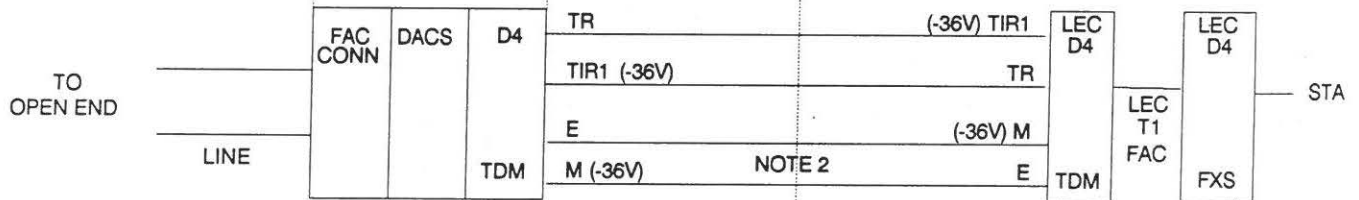
TO OPEN END	SF OFF DIAL TONE	→	A=0 B=1	→	E=GND TR=OPEN DIAL TONE	→	M=GND T1R1=OPEN DIAL TONE	→	LEC CKT	NOTE 1
	←	SF OFF	←	A=1 B=1	←	M=GND TR=OPEN	←	E=GND TR=OPEN		

CENTRAL OFFICE RINGING STATION

TO OPEN END	SF ON	→	A=0 B=0	→	E=GND TR=GND	→	M=GND T1R1=GND	→	LEC CKT	NOTE 1
	←	SF ON	←	A=0 B=1	←	M=OPEN TR=OPEN	←	E=OPEN TR=OPEN		

BUSY CONDITION

TO OPEN END	SF OFF	→	A=0 B=1	→	E=GND TR=OPEN	→	M=GND T1R1=OPEN	→	LEC CKT	NOTE 1
	←	SF OFF	←	A=1 B=1	←	M=GND TR=OPEN	←	E=GND TR=OPEN		



SIGNALING OPTIONS

D4 SIG UNIT See Applicable Units & Options on opposite page	
DACS	TC(0001,0101), TRB
FAC CONNS	
LT1B	68C & S2=2
M2&M3	FXOL
M4<2	PL

NOTES:

NOTE 1

TR = Simplex Potential on TR Pair
T1R1 = Simplex Potential on T1R1 Pair

NOTE 2

Do not apply normal E&M Signaling to a TDM Unit. 48v dc could destroy the unit if applied.

D4 CHANNEL UNIT OPTION TABLE

TDM Channel unit with CLOSED END on digital side (LOOP START OPTIONS)

UNIT	CLEI #	ACP #	OPTIONS
4TDM	D4CE500	ACP 365-005-021	E(J6) = W/S T(J7) = W/S, R (J7) = B/S V(J5) = W/S W(J4) = W/S Z(J8) = W/S

SIGNALING TO LOGIC LEVEL TABLE - FX

FROM CLOSED END		
SIG BIT	LOGIC LEVEL	CONDITION
A	0	LOOP OPEN
	1	LOOP SHORT
B	0	RING GRND
	1	RING OPEN

FROM OPEN END		
SIG BIT	LOGIC LEVEL	CONDITION
A	0	TIP GROUND
	1	TIP OPEN
B	0	RINGING
	1	NO RINGING

FX / LOOP START (TDM) DIGITAL SIDE TOWARD CLOSED END

A TERM	LOOP	LOOP	SIG UNIT	SIG UNIT	AB SIG BITS	AB SIG BITS	SF	SF	Z TERM
-----------	------	------	-------------	-------------	-------------------	-------------------	----	----	-----------

IDLE CONDITIONS

LEC CKT	E=GND TR=OPEN	→	M=GND T1R1=OPEN	→	A=0 B=1	→	SF OFF	→	TO CLOSED END
	←	M=OPEN T1R1=OPEN	←	E=OPEN TR=OPEN	←	A=0 B=1	←	SF ON	

NOTE 1

STATION OFF HOOK / DRAW DIAL TONE

LEC CKT	E=GND TR=OPEN DIAL TONE	→	M=GND T1R1=OPEN DIAL TONE	→	A=0 B=1	→	SF OFF DIAL TONE	→	TO CLOSED END
	←	M=GND T1R1=OPEN	←	E=GND TR=OPEN	←	A=1 B=1	←	SF OFF	

NOTE 1

CENTRAL OFFICE RINGING STATION

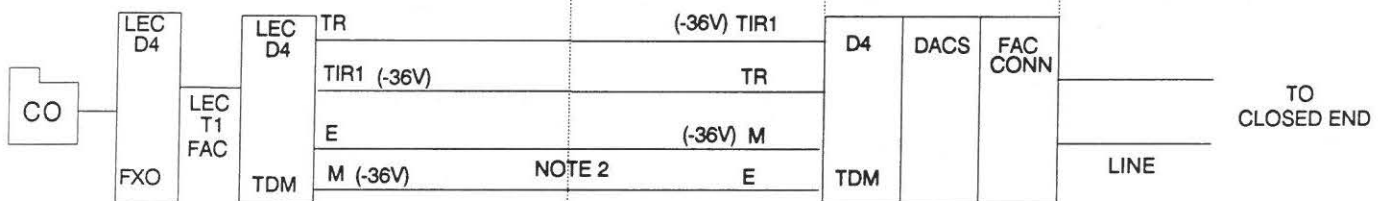
LEC CKT	E=GND TR=GND	→	M=GND T1R1=GND	→	A=0 B=0	→	SF ON	→	TO CLOSED END
	←	M=OPEN T1R1=OPEN	←	E=OPEN TR=OPEN	←	A=0 B=1	←	SF ON	

NOTE 1

BUSY CONDITION

LEC CKT	E=GND TR=OPEN	→	M=GND T1R1=OPEN	→	A=0 B=1	→	SF OFF	→	TO CLOSED END
	←	M=GND T1R1=OPEN	←	E=GND TR=OPEN	←	A=1 B=1	←	SF OFF	

NOTE 1



NOTES:

NOTE 1

TR = Simplex Potential on TR Pair
T1R1 = Simplex Potential on T1R1 Pair

NOTE 2

Do not apply normal E&M Signaling to a TDM Unit. 48v dc could destroy the unit if applied.

SIGNALING OPTIONS

D4 SIG UNIT	See Applicable Units & Options on opposite page
DACS	TC(0001,0101), TRB
FAC CONNS	
LT1B	68C & S2=2
M2&M3	FXOL
M4<2	PL

D4 CHANNEL UNIT OPTION TABLE

OPEN END FX Channel Units (GROUND START OPTIONS)

UNIT	CLEI #	ACP #	OPTIONS	INFORMATION
2FXO	D4CX200	ACP 365-005-010	NBO(J2) LX1,LX2(J3) = W/S LX1,LX2(J3) = B/S CN9(J3) = W/S GS(J4) = W/S LS(J4) = B/S, RG(J4) = W/S	Option per circuit requirements Loop Resistance > 600 ohm Loop Resistance < or = 600 ohm 900 ohm Comp Net Ground Start Provide ring ground toward drop on CGA
2FXO	D4CX235	ACP 365-005-056	Option same as D4CX200 No limitation requiring loop closure be received from station end a certain time after tip ground detection	
2FXO/GT	D4CX401 D4CX403	ACP 365-005-014	PBN/CBN (J6) = W/S PBN/CBN (J6) = B/S LX(J6) = W/S LX(J6) = B/S GS(J4) = W/S LS(J4) = B/S, RG(J4) = W/S PBN	Using Precision Balance Net Using Comp Balance Net Loop Resistance > 600 ohm Loop Resistance < or = 600 ohm Ground Start Provide ring ground toward drop on CGA Option per circuit requirements
4FXO	D4CX600 D4CX610 D4CX611	ACP 365-005-016	LX1(J2) = W/S LX1(J2) = B/S GS(J4) = W/S LS(J4) = B/S, RG(J4) = W/S N/R(J4,J5) = W/S N/R(J4,J5) = B/S	Loop Resistance > 600 ohm Loop Resistance < or = 600 ohm Ground Start Provide ring ground toward drop on CGA Normal Simplex T=TR, R=T1R1 Reversed Simplex T=T1R1, R=TR

CLOSED END FX Channel Units (GROUND START OPTIONS)

UNIT	CLEI #	ACP #	OPTIONS	INFORMATION
2FXS	D4CX100	ACP 365-005-011	NBO(J2) SL1,SL2(J3) = W/S SL1,SL2(J3) = B/S CN9(J4) = W/S (must select one CN6(J4) = W/S of these options) SD(J5) = W/S	Option per circuit requirements Loop Resistance > 300 ohm Loop Resistance < or = 300 ohm 900 ohm Comp Net 600 ohm Comp Net Provide trunk conditioning for CGA
2FXS/GT	D4CX301	ACP 365-005-015	PBN/CBN (J3) = W/S PBN/CBN (J3) = B/S SL1,SL2(J2) = W/S SL1,SL2(J2) = B/S SD(J5) = W/S PBN	Using Precision Balance Net Using Comp Balance Net Loop Resistance > 300 ohm Loop Resistance < or = 300 ohm Provide trunk conditioning for CGA Option per circuit requirements
4FXS	D4CX500 D4CX510 D4CX511 D4CX525	ACP 365-005-017 ACP 365-005-075	72V(J2) = B/S S1/S2 S3/S4/S5 SD(J2) = W/S N/R(J6,J7) = W/S N/R(J6,J7) = B/S J3, J4 = B/S J3, J4 = W/S	48 Volt Selected Xmit/Rcv impedance (option per requirement) Equalization (option per requirements) Provide trunk conditioning for CGA Normal Simplex T=TR, R=T1R1 Reversed Simplex T=T1R1, R=TR Loop Resistance > 465 ohm Loop Resistance < or = 465 ohm

SIGNALING TO LOGIC LEVEL TABLE - FX

FROM CLOSED END		
SIG BIT	LOGIC LEVEL	CONDITION
A	0	LOOP OPEN
	1	LOOP SHORT
B	0	RING GRND
	1	RING OPEN

FROM OPEN END		
SIG BIT	LOGIC LEVEL	CONDITION
A	0	TIP GROUND
	1	TIP OPEN
B	0	RINGING
	1	NO RINGING

FX / GROUND START

A TERM	LOOP	SIG UNIT	AB SIG BITS	AB SIG BITS	SF	SF	AB SIG BITS	AB SIG BITS	SIG UNIT	LOOP	Z TERM
-----------	------	-------------	-------------------	-------------------	----	----	-------------------	-------------------	-------------	------	-----------

NOTE 1

IDLE CONDITIONS

NOTE 1

C.O.	T=OPEN R=BAT		A=1 B=1		SF ON		A=1 B=1		T=OPEN R=BAT		STA
		T=48V R=30V TR=OPEN		A=0 B=1		SF ON		A=0 B=1		T=BAT R=OPEN	

STATION OFF HOOK / DRAW DIAL TONE

STATION APPLIES RING GND

C.O.	T=48V R=GND		A=0 B=0		SF OFF		A=0 B=0		T=48V R=GND		STA
------	----------------	--	------------	--	--------	--	------------	--	----------------	--	-----

C.O. RETURNS TIP GROUND & DIAL TONE

C.O.	T=GRD R=BAT DIAL TONE		A=0 B=1		SF OFF DIAL TONE		A=0 B=1		T=GND R=BAT DIAL TONE		STA
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STATION APPLIES LOOP CLOSURE & REMOVES RING GND

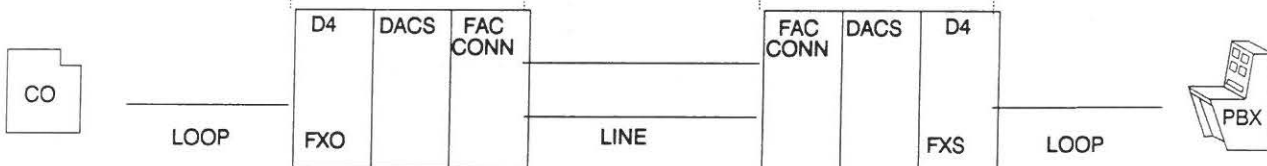
C.O.		T=30V R=30V TR=L RES		A=1 B=1		SF OFF		A=1 B=1		TR=SHORT	STA
------	--	----------------------------	--	------------	--	--------	--	------------	--	----------	-----

CENTRAL OFFICE RINGING STATION

C.O.	T=GND R=BAT R=20 HZ		A=0 B=0		MOD SF ON		A=0 B=0		T=GND R=BAT R=20HZ		STA
		T=48V R=30V TR=H RES		A=0 B=1		SF ON		A=0 B=1		T=BAT R=OPEN TR=OPEN	

BUSY CONDITION

C.O.	T=GND R=BAT		A=0 B=1		SF OFF		A=0 B=1		T=GND R=BAT		STA
		T=30V R=30V TR=L RES		A=1 B=1		SF OFF		A=1 B=1		TR=SHORT	



SIGNALING OPTIONS

D4 SIG UNIT	See applicable FXS Units & Optionson opposite page
DACS	TC(0101,1101),TRB
FAC CONNS	
LT1B	68C & S2=1
M2&M3	FXOG
M4<2	PG

SIGNALING OPTIONS

D4 SIG UNIT	See applicable FXS Units & Optionson opposite page
DACS	TC(0101,1101),TRB
FAC CONNS	
LT1B	68D & S2=1
M2&M3	FXSG
M4<2	RG

** NOTES **

NOTE 1 4W FX UNITS (Optioned for SIMPLEX NORMAL)

"T" CONDITIONS WILL APPEAR ON "TR" SIMPLEX

"R" CONDITIONS WILL APPEAR ON "T1R1" SIMPLEX

"TR" CONDITIONS WILL APPEAR ACROSS "TR & T1R1" SIMPLEX

D4 CHANNEL UNIT OPTION TABLE

TDM Channel unit with OPEN END on digital side (GROUND START OPTIONS)

<u>UNIT</u>	<u>CLEI #</u>	<u>ACP #</u>	<u>OPTIONS</u>
4TDM	D4CE500	ACP 365-005-021	E(J6) = W/S S, R (J7) = B/S V(J5) = W/S W(J4) = W/S Y(J8) = B/S

SIGNALING TO LOGIC LEVEL TABLE - FX

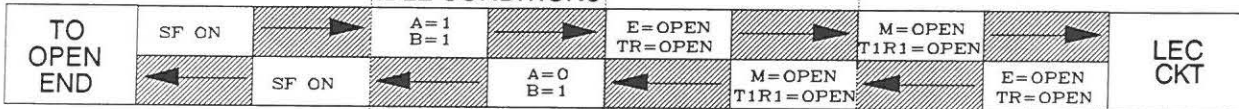
FROM CLOSED END		
SIG BIT	LOGIC LEVEL	CONDITION
A	0	LOOP OPEN
	1	LOOP SHORT
B	0	RING GRND
	1	RING OPEN

FROM OPEN END		
SIG BIT	LOGIC LEVEL	CONDITION
A	0	TIP GROUND
	1	TIP OPEN
B	0	RINGING
	1	NO RINGING

FX / GROUND START (TDM) DIGITAL SIDE TOWARD OPEN END



IDLE CONDITIONS



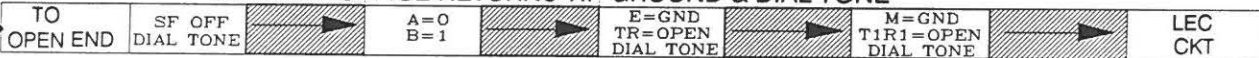
NOTE 1

STATION OFF HOOK / DRAW DIAL TONE

STATION APPLIES RING GROUND



CENTRAL OFFICE RETURNS TIP GROUND & DIAL TONE

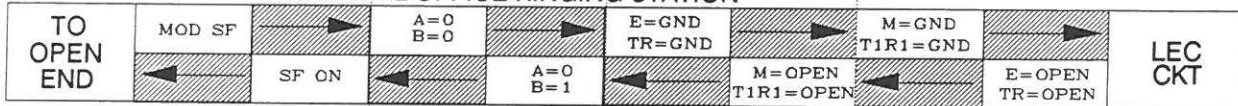


STATION APPLIES LOOP CLOSURE & REMOVES RING GROUND



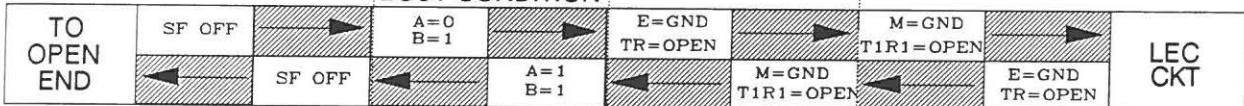
NOTE 1

CENTRAL OFFICE RINGING STATION

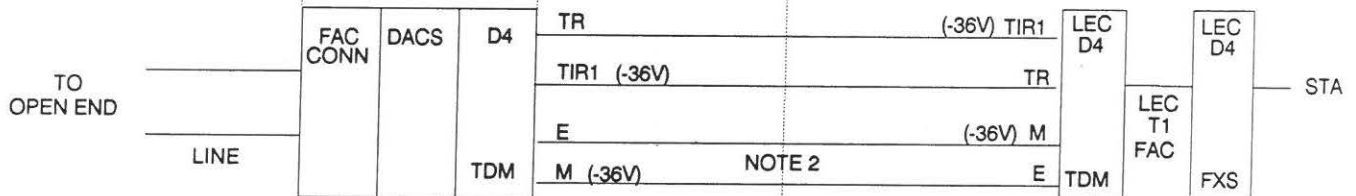


NOTE 1

BUSY CONDITION



NOTE 1



SIGNALING OPTIONS

D4 SIG UNIT See Applicable Units & Options on opposite page	
DACS	TC(0101,1101),TRB
FAC CONNS	
LT1B	68D & S2=1
M2&M3	FXSG
M4<2	RG

NOTES:

NOTE 1

TR = Simplex Potential on TR Pair
T1R1 = Simplex Potential on T1R1 Pair

NOTE 2

Do not apply normal E&M Signaling to a TDM Unit. 48v dc could destroy the unit if applied.

D4 CHANNEL UNIT OPTION TABLE

TDM Channel unit with CLOSED END on digital side (GROUND START OPTIONS)

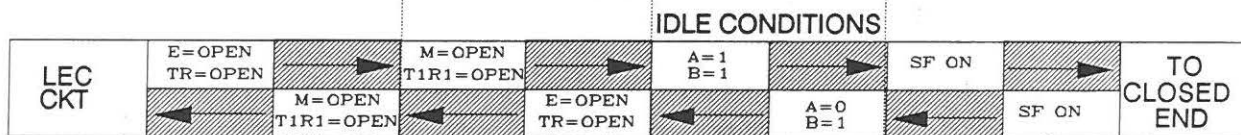
UNIT	CLEI #	ACP #	OPTIONS
4TDM	D4CE500	ACP 365-005-021	E(J6) = W/S T(J7) = W/S, R (J7) = B/S V(J5) = W/S W(J4) = W/S Z(J8) = W/S

SIGNALING TO LOGIC LEVEL TABLE - FX

FROM CLOSED END		
SIG BIT	LOGIC LEVEL	CONDITION
A	0	LOOP OPEN
	1	LOOP SHORT
B	0	RING GRND
	1	RING OPEN

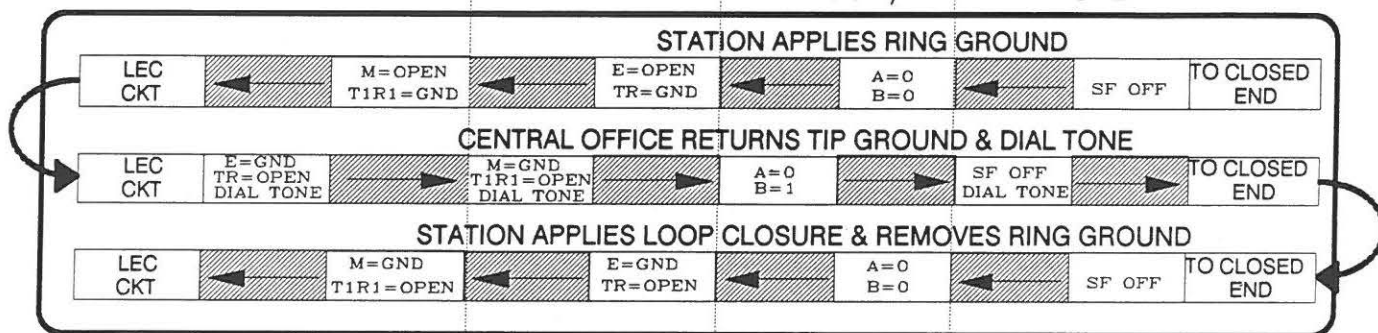
FROM OPEN END		
SIG BIT	LOGIC LEVEL	CONDITION
A	0	TIP GROUND
	1	TIP OPEN
B	0	RINGING
	1	NO RINGING

FX / GROUND START (TDM) DIGITAL SIDE TOWARD CLOSED END



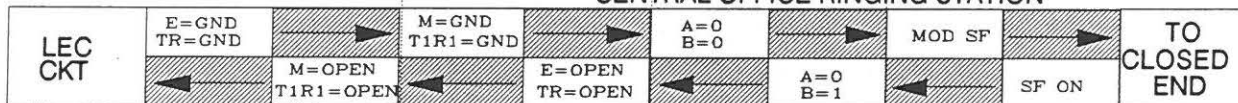
NOTE 1

STATION OFF HOOK / DRAW DIAL TONE



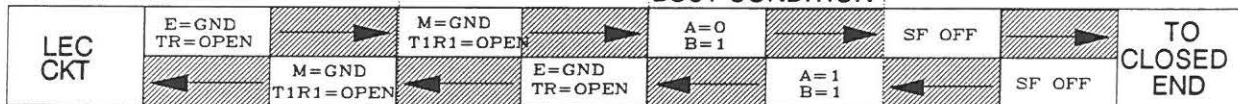
NOTE 1

CENTRAL OFFICE RINGING STATION

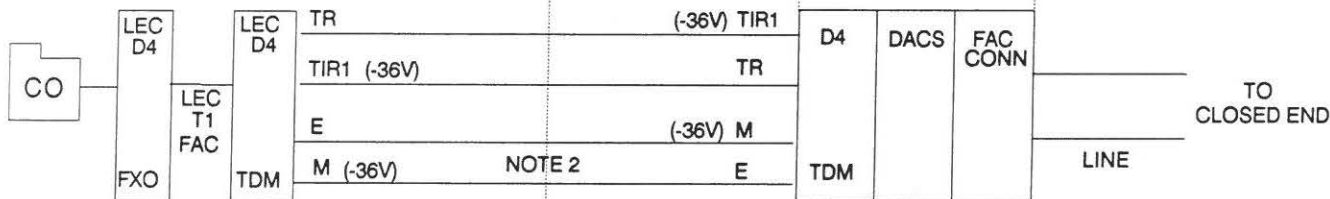


NOTE 1

BUSY CONDITION



NOTE 1



NOTES:

NOTE 1

TR = Simplex Potential on TR Pair
T1R1 = Simplex Potential on T1R1 Pair

NOTE 2

Do not apply normal E&M Signaling to a TDM Unit. 48v dc could destroy the unit if applied.

SIGNALING OPTIONS

D4 SIG UNIT See Applicable Units & Options on opposite page	
DACS	TC(0101,1101),TRB
FAC CONNS	
LT1B	68C & S2=1
M2&M3	FXOG
M4<2	PG

D4 CHANNEL UNIT OPTION TABLE

<u>UNIT</u>	<u>CLEI #</u>	<u>ACP #</u>	<u>OPTIONS</u>	<u>INFORMATION</u>
2E&M9	D4CE200	ACP 365-005-001	NBO(J2)	Option per circuit requirements
2E&M6	D4CE600	ACP 365-005-002	Z,X,Y,CN,1G(J3)	Option per circuit requirements
			EG(J4) = W/S	Type I and Type III interface
			EG(J4) = B/S	Type II interface
			EPD, EPI(J4)	Provide trunk conditioning for CGA
				Option per circuit requirements
4E&M	D4CE100	ACP 365-005-003	1G(J2)	Option per circuit requirements
4E&MER	D4CE600	ACP 365-005-002	EG(J2) = W/S	Type I and Type III interface
			EG(J2) = B/S	Type II interface
			EPD, EPI(J2)	Provide trunk conditioning for CGA
				Option per circuit requirements

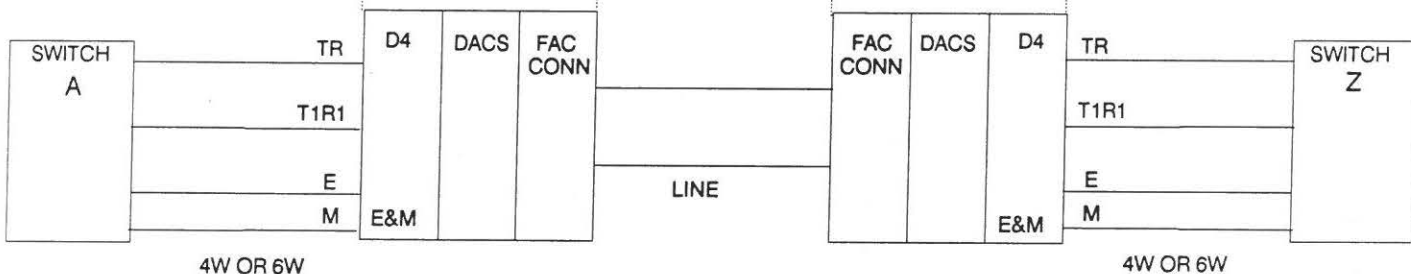
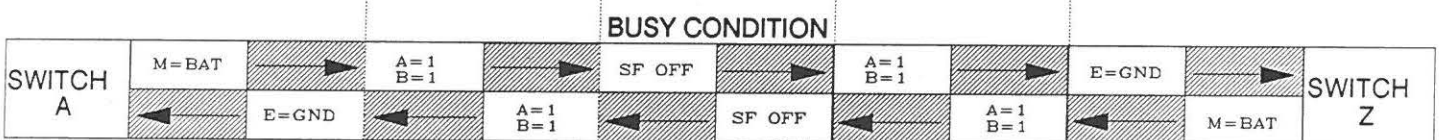
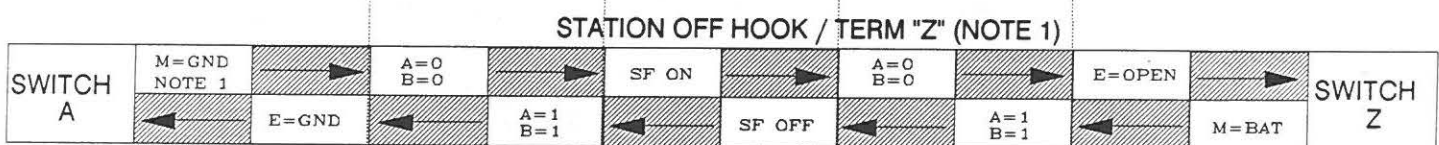
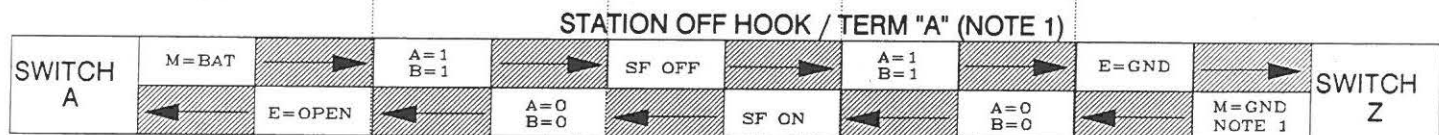
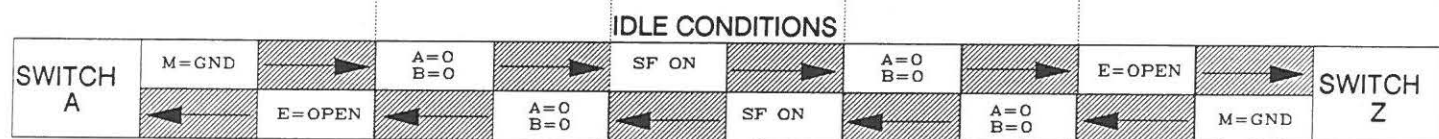
SIGNALING TO LOGIC LEVEL TABLE - E&M, DX, PLR

FROM NEAR END		
SIG BIT	LOGIC LEVEL	CONDITION
A	0	TRUNK IDLE
	1	TRUNK BUSY
B		FOLLOWS "A"

FROM FAR END		
SIG BIT	LOGIC LEVEL	CONDITION
A	0	TRUNK IDLE
	1	TRUNK BUSY
B		FOLLOWS "A"

EM SIGNALING

A TERM	LOOP	SIG UNIT	AB SIG BITS	AB SIG BITS	SF	SF	AB SIG BITS	AB SIG BITS	SIG UNIT	LOOP	Z TERM
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SIGNALING OPTIONS

D4 SIG UNIT See applicable Units on opposite page	
DACS	TC(0011,0011),TRB
FAC CONNS	
LT1B	68B
M2&M3	E/M
M4<2	EM

NOTE 1

WHEN AN "OFF HOOK" SIGNAL IS RECEIVED AT EITHER END, THAT END WILL NORMALLY RESPOND WITH EITHER A WINK SIGNAL (ON HOOK TO OFF HOOK BACK TO ONHOOK) OR DIAL TONE TO SIGNAL THE ORIGINATING END IT IS READY TO RECEIVE DIALING INFORMATION.

D4 CHANNEL UNIT OPTION TABLE

<u>UNIT</u>	<u>CLEI #</u>	<u>ACP #</u>	<u>OPTIONS</u>	<u>INFORMATION</u>
PLR	D4CE700	ACP 365-005-020	MPD(J2) = W/S MG(J2) = W/S , MB(J2) = W/S MG(J2) = B/S , MB(J2) = B/S MG(J2) = W/S , MB(J2) = B/S	Provide trunk conditioning for CGA Type I interface Type II interface Type II interface

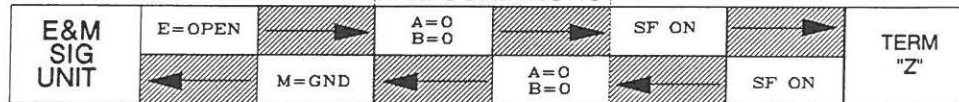
SIGNALING TO LOGIC LEVEL TABLE - E&M, DX, PLR

FROM NEAR END			FROM FAR END		
SIG BIT	LOGIC LEVEL	CONDITION	SIG BIT	LOGIC LEVEL	CONDITION
A	0	TRUNK IDLE	A	0	TRUNK IDLE
	1	TRUNK BUSY		1	TRUNK BUSY
B		FOLLOWS "A"	B		FOLLOWS "A"

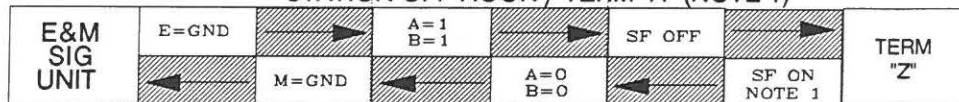
EM SIGNALING (PLR)



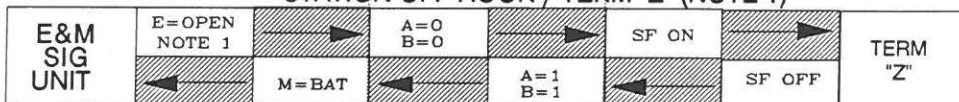
IDLE CONDITIONS



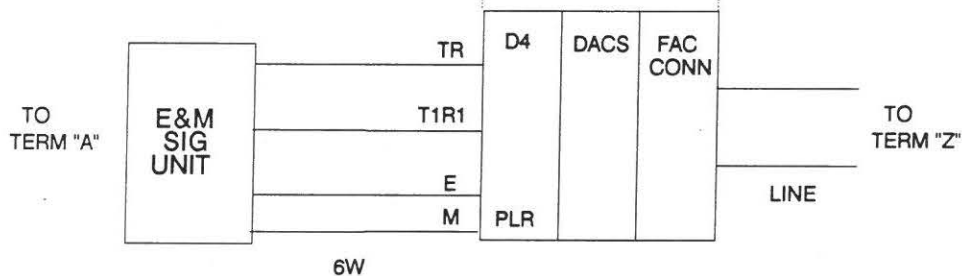
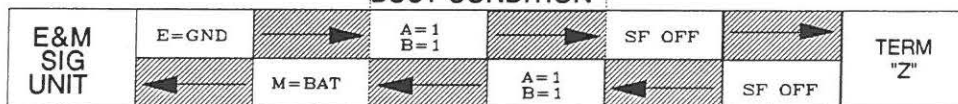
STATION OFF HOOK / TERM "A" (NOTE 1)



STATION OFF HOOK / TERM "Z" (NOTE 1)



BUSY CONDITION



SIGNALING OPTIONS

D4 SIG UNIT See applicable Units and Options on opposite page	
DACS	TC(0011,0011),TRB
FAC CONNS	
LT1B	68B
M2&M3	E/M
M4<2	EM

NOTE 1

WHEN AN "OFF HOOK" SIGNAL IS RECEIVED AT EITHER END, THAT END WILL NORMALLY RESPOND WITH EITHER A WINK SIGNAL (ON HOOK TO OFF HOOK BACK TO ONHOOK) OR DIAL TONE TO SIGNAL THE ORIGINATING END IT IS READY TO RECEIVE DIALING INFORMATION.

D4 CHANNEL UNIT OPTION TABLE

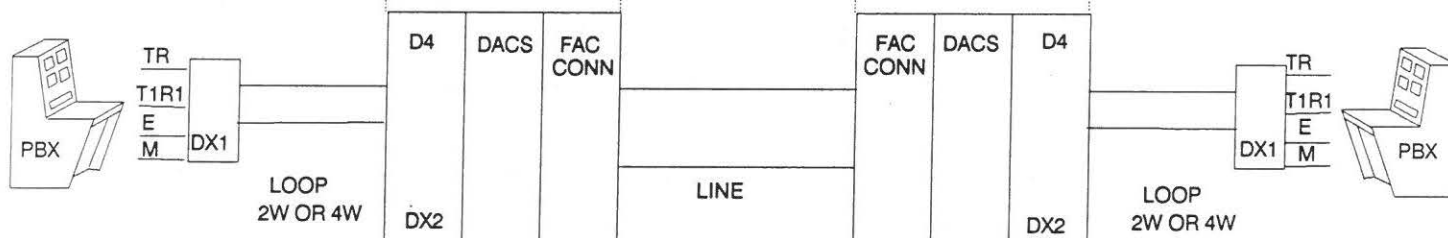
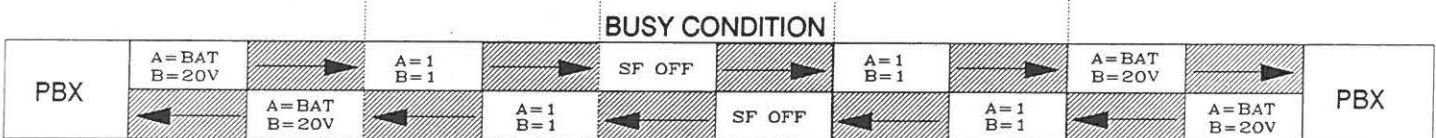
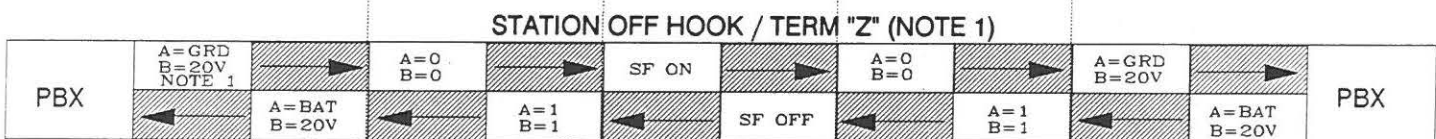
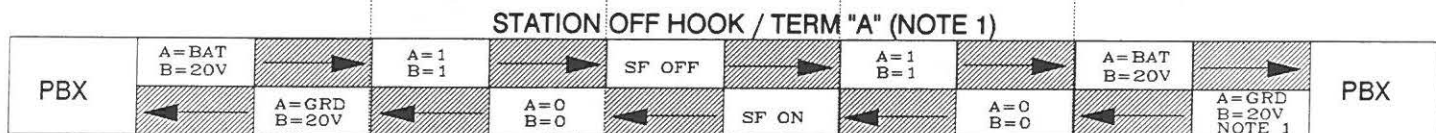
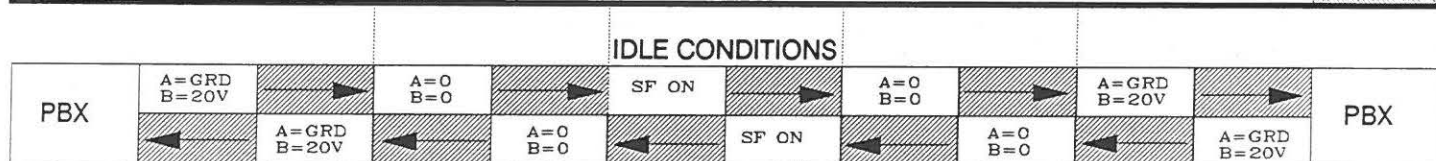
UNIT	CLEI #	ACP #	OPTIONS	INFORMATION
2DX/GT	D4CE331	ACP 365-005-018	(J4) = W/S PBN/CBN (J6) = W/S PBN/CBN (J6) = B/S PBN N/R(S7) RLP (R57)	Provide trunk conditioning for CGA Using Precision Balance Net Using Comp Balance Net Option per circuit requirements Used to reverse signaling leads on T & R Set to customer Loop Resistance + or - 250 ohms
4DX	D4CE411 D4CE451 D4CE456TAA	ACP 365-005-018	C = W/S T(S1), R(S5) N/R(S6) RLP (R27) Balancing Network	Provide trunk conditioning for CGA Set to match terminating impedance of cable pair Used to reverse signaling leads on TR & T1R1 Set to metallic Loop Resistance + or - 250 ohms Option per circuit requirements

SIGNALING TO LOGIC LEVEL TABLE - E&M, DX, PLR

FROM NEAR END			FROM FAR END		
SIG BIT	LOGIC LEVEL	CONDITION	SIG BIT	LOGIC LEVEL	CONDITION
A	0	TRUNK IDLE	A	0	TRUNK IDLE
	1	TRUNK BUSY		1	TRUNK BUSY
B		FOLLOWS "A"	B		FOLLOWS "A"

DX SIGNALING

A TERM	LOOP NOTE 2	SIG UNIT	AB SIG BITS	AB SIG BITS	SF	SF	AB SIG BITS	AB SIG BITS	SIG UNIT	LOOP NOTE 2	Z TERM
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SIGNALING OPTIONS

D4 SIG UNIT See applicable Units and Options on opposite page	
DACS	TC(0011,0011),TRB
FAC CONNS	
LT1B	68B
M2&M3	E/M
M4<2	EM

NOTE 1 WHEN AN "OFF HOOK" SIGNAL IS RECEIVED AT EITHER END, THAT END WILL NORMALLY RESPOND WITH EITHER A WINK SIGNAL (ON HOOK TO OFF HOOK BACK TO ONHOOK) OR DIAL TONE TO SIGNAL THE ORIGINATING END IT IS READY TO RECEIVE DIALING INFORMATION.

NOTE 2 DX UNITS (WITH NORM/REV = NORMAL)

"A" LEAD CONDITIONS WILL APPEAR ON "T" (2W) OR "TR" SIMPLEX (4W)

"B" LEAD CONDITIONS WILL APPEAR ON "R" (2W) OR "T1R1" SIMPLEX (4W)

D4 CHANNEL UNIT OPTION TABLE

UNIT	CLEI #	ACP #	OPTIONS	INFORMATION
2RD/PLAR	D4C2300	ACP 365-005-044	PLAR/RD (J3,J4,J8,J9) = W/S M1,M2 (S6) M1(W/S), M2(W/S) M1(R/S or B/S),M2(W/S) M1(R/S or B/S),M2(R/S or B/S) M1(W/S),M2(R/S or B/S) F(J6) = W/S S7,S8 DA(J2) = W/S DA(J2) = B/S (see S(J2) option) S(J2) = W/S S(J2) = B/S	RD Application Code Select Ringing (1ring for 2 sec) No Code (1 ring when signal logic changes from 0 to 1) Repeat Input Timing No Limit (for sig logic = 0) Repeat Input Timing 2 Second Limit (for sig logic = 0) Selects 48V Talk battery In Code Select Mode, expose white # of selected code Cover white #s for all other RD modes Used for AC(20 Hz) application Used for DC(signaling pulse) application For DC sig nonlooped application (provides internal ground) For DC sig looped application
4RD/PLAR	D4C2400	ACP 365-005-045	PLAR/RD (J3,J4,J8) = W/S M1,M2 (S6) M1(W/S), M2(W/S) M1(R/S or B/S),M2(W/S) M1(R/S or B/S),M2(R/S or B/S) M1(W/S),M2(R/S or B/S) S7,S8 DA(J2) = W/S DA(J2) = B/S (see S(J2) option) S(J2) = W/S S(J2) = W/S	RD Application Code Select Ringing (1ring for 2 sec) No Code (1 ring when signal logic changes from 0 to 1) Repeat Input Timing No Limit (during sig logic = 0) Repeat Input Timing 2 Second Limit (during sig logic = 0) In Code Select Mode, expose white # of selected code Cover white #s for all other RD modes Used for AC(20 Hz) application Used for DC(signaling pulse) application For DC sig nonlooped application (provides internal ground) For DC sig looped application

SIGNALING TO LOGIC LEVEL TABLE - MANUAL RINGDOWN

FROM NEAR END		
SIG BIT	LOGIC LEVEL	CONDITION
A	0	RINGING
	1	NO RINGING
B		FOLLOWS "A"

FROM FAR END		
SIG BIT	LOGIC LEVEL	CONDITION
A	0	RINGING
	1	NO RINGING
B		FOLLOWS "A"

MANUAL RINGDOWN SIGNALING

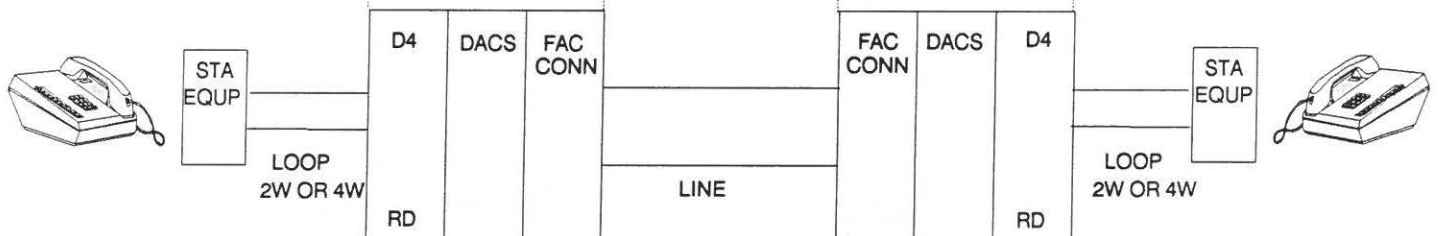
A TERM	LOOP	SIG UNIT	AB SIG BITS	AB SIG BITS	SF	SF	AB SIG BITS	AB SIG BITS	SIG UNIT	LOOP	Z TERM
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IDLE CONDITIONS											
STA	NO RINGING	NO RINGING	A=1 B=1	A=1 B=1	SF OFF	SF OFF	A=1 B=1	A=1 B=1	NO RINGING	NO RINGING	STA

RINGING / TERM "A" TOWARD TERM "Z"											
STA	RINGING		A=0 B=0		SF ON		A=0 B=0		RINGING		STA
		NO RINGING		A=1 B=1		SF OFF		A=1 B=1		NO RINGING	

RINGING / TERM "Z" TOWARD TERM "A"										
STA	NO RINGING		A = 1 B = 1		SF OFF		A = 1 B = 1		NO RINGING	STA
		RINGING		A = 0 B = 0		SF ON		A = 0 B = 0		

BUSY CONDITION											
STA	NO RINGING		A=1 B=1		SF OFF		A=1 B=1		NO RINGING		STA
		NO RINGING		A=1 B=1		SF OFF		A=1 B=1		NO RINGING	



SIGNALING OPTIONS - MANUAL RINGDOWN (RD) APPLICATION

D4 SIG UNIT SEE APPLICABLE UNITS & OPTIONS ON OPPOSITE PAGE	
DACS	TC(1111,1111),TRB
FAC CONNS	
LT1B	68B
M2&M3	E/M
M4<2	EM

D4 CHANNEL UNIT OPTION TABLE

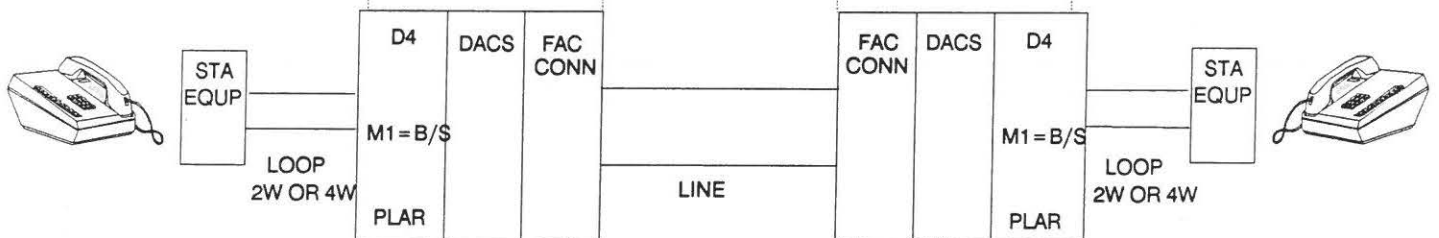
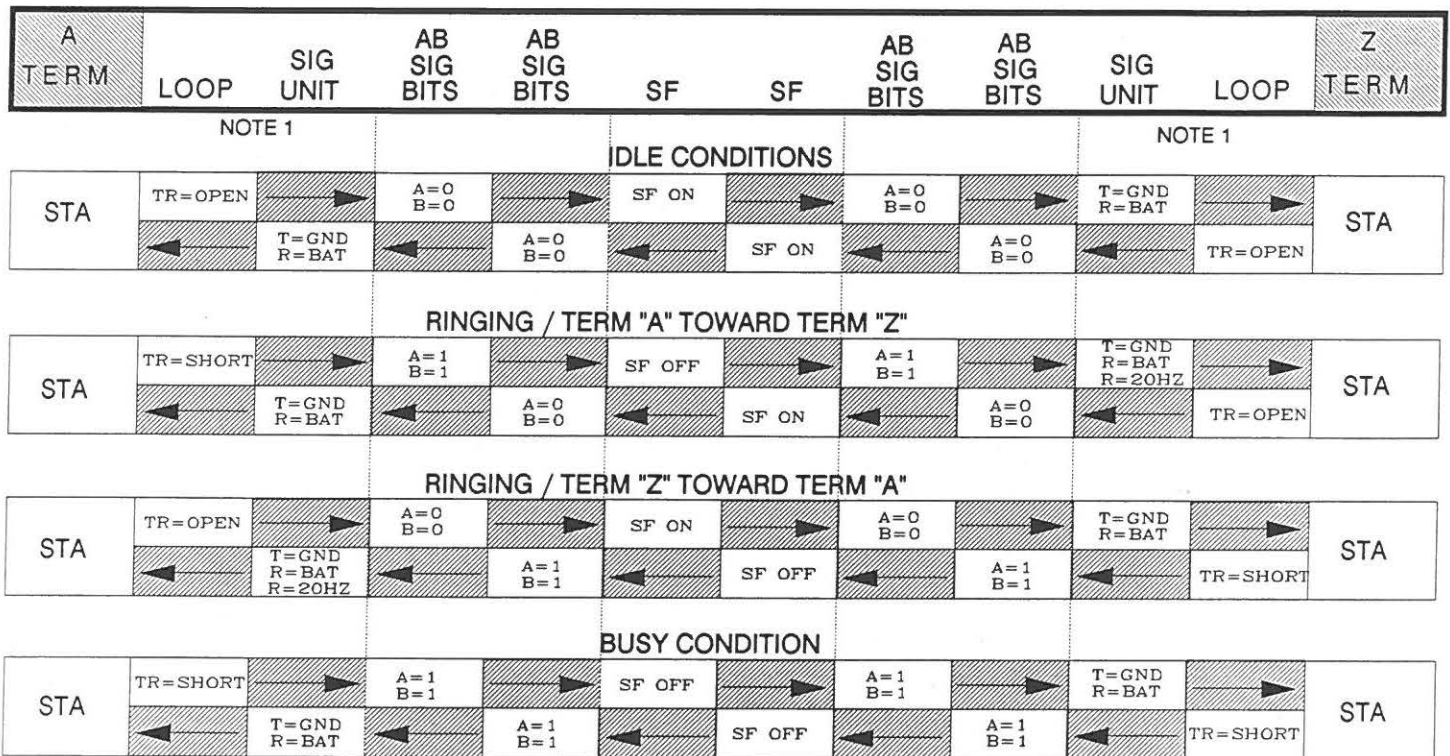
UNIT	CLEI #	ACP #	OPTIONS	INFORMATION
2RD/PLAR	D4C2300	ACP 365-005-044	PLAR/RD (J3,J4,J8,J9) = B/S M1,M2 (S6) = (R or B/S) F(J6) = W/S S7,S8 = expose white #s DA(J2) = W/S DA(J2) = B/S (see S(J2) option) S(J2) = W/S S(J2) = W/S	PLAR Application Used with non-digital facility between D4 PLARs or D3 PLAR at one end Selects 48V Talk battery Used for AC(20 Hz) application Used for DC(signaling pulse) application For DC sig nonlooped application (provides internal ground) For DC sig looped application
4RD/PLAR	D4C2400	ACP 365-005-045	PLAR/RD (J3,J4,J8) = B/S M1,M2 (S6) = (R or B/S) S7,S8 = expose white #s DA(J2) = W/S DA(J2) = B/S (see S(J2) option) S(J2) = W/S S(J2) = W/S	PLAR Application Used with non-digital facility between D4 PLARs or D3 PLAR at one end Used for AC(20 Hz) application Used for DC(signaling pulse) application For DC sig nonlooped application (provides internal ground) For DC sig looped application

SIGNALING TO LOGIC LEVEL TABLE - AUTOMATIC RINGDOWN

FROM NEAR END			FROM FAR END		
SIG BIT	LOGIC LEVEL	CONDITION	SIG BIT	LOGIC LEVEL	CONDITION
A	0	LOOP OPEN	A	0	LOOP OPEN
	1	LOOP CLOSED		1	LOOP CLOSED
B		FOLLOWS "A"	B		FOLLOWS "A"

WITH OPTION M1 IN PLAR BLACK SHOWING

AUTOMATIC RINGDOWN SIGNALING COMBINED ANALOG AND DIGITAL CXR



SIGNALING OPTIONS - AUTOMATIC RINGDOWN (PLAR) APPLICATION

D4 SIG UNIT SEE APPLICABLE UNITS & OPTIONS ON OPPOSITE PAGE	
DACS	TC(0000,0000), TRB (W/ M1,M2 RED/BLACK SHOWING)
FAC CONNS	
LT1B	68B
M2&M3	E/M
M4<2	EM

NOTE 1 FOR 4W OPERATION
 T CONDITION APPEARS ACROSS TR SIMPLEX
 R CONDITION APPEARS ACROSS T1R1 SIMPLEX
 TR CONDITIONS WILL APPEAR ACROSS TR/T1R1 SIMPLEX

D4 CHANNEL UNIT OPTION TABLE

UNIT	CLEI #	ACP #	OPTIONS	INFORMATION
2RD/PLAR	D4C2300	ACP 365-005-044	PLAR/RD (J3,J4,J8,J9) = B/S M1,M2 (S6) = (W/S) F(J6) = W/S S7,S8 = expose white #s DA(J2) = W/S DA(J2) = B/S (see S(J2) option) S(J2) = W/S S(J2) = W/S	PLAR Application Used with digital facility between D4 PLARs(WILL NOT WORK W/ FAC CONN) Selects 48V Talk battery Used for AC(20 Hz) application Used for DC(signaling pulse) application For DC sig nonlooped application (provides internal ground) For DC sig looped application
4RD/PLAR	D4C2400	ACP 365-005-045	PLAR/RD (J3,J4,J8) = B/S M1,M2 (S6) = (W/S) S7,S8 = expose white #s DA(J2) = W/S DA(J2) = B/S (see S(J2) option) S(J2) = W/S S(J2) = W/S	PLAR Application Used with digital facility between D4 PLARs(WILL NOT WORK W/ FAC CONN) Used for AC(20 Hz) application Used for DC(signaling pulse) application For DC sig nonlooped application (provides internal ground) For DC sig looped application

SIGNALING TO LOGIC LEVEL TABLE - AUTOMATIC RINGDOWN

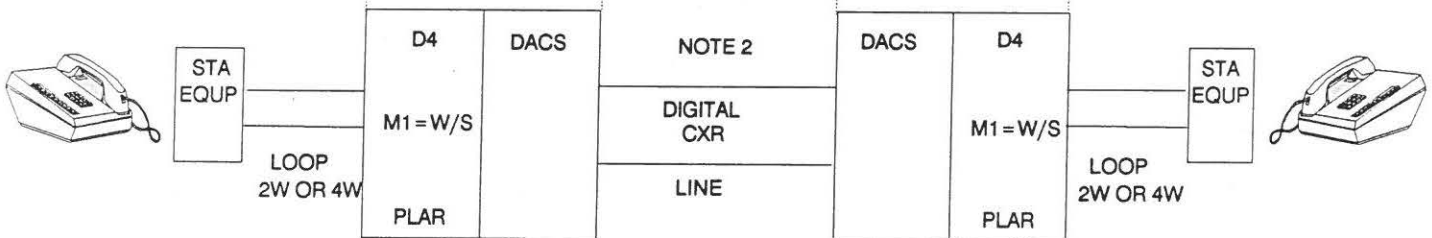
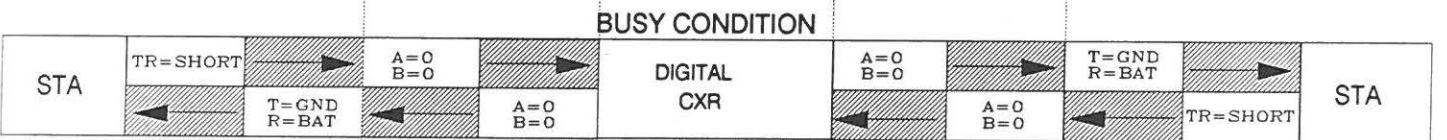
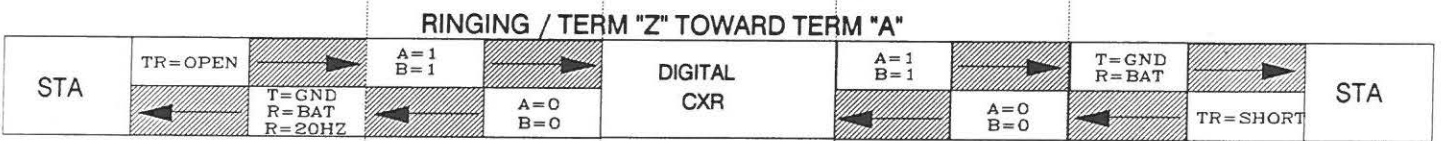
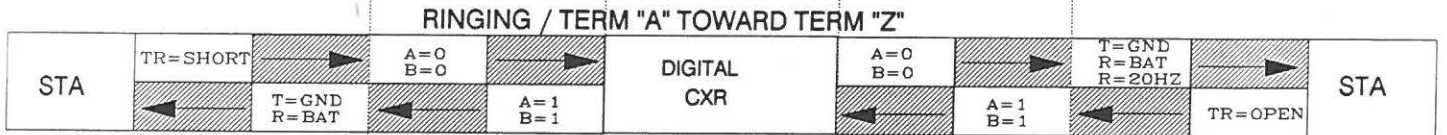
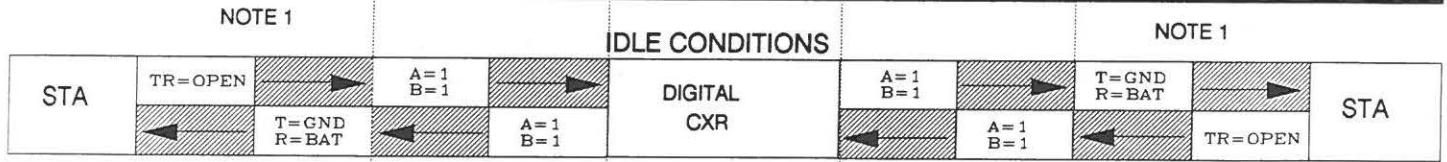
FROM NEAR END			FROM FAR END		
SIG BIT	LOGIC LEVEL	CONDITION	SIG BIT	LOGIC LEVEL	CONDITION
A	1	LOOP OPEN	A	1	LOOP OPEN
	0	LOOP CLOSED		0	LOOP CLOSED
B		FOLLOWS "A"	B		FOLLOWS "A"

WITH OPTION M1 IN PLARs WHITE SHOWING

AUTOMATIC RINGDOWN SIGNALING

DIGITAL CXR (D4 RD/PLAR AT BOTH ENDS)

A TERM	LOOP	SIG UNIT	AB SIG BITS	AB SIG BITS		AB SIG BITS	AB SIG BITS	SIG UNIT	LOOP	Z TERM
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SIGNALING OPTIONS - AUTOMATIC RINGDOWN (PLAR) APPLICATION

D4 SIG UNIT	
SEE APPLICABLE UNITS & OPTIONS ON OPPOSITE PAGE	
DACS	TC(1111,1111),TRB (W/ M1,M2 WHITE SHOWING)

NOTE 1 FOR 4W OPERATION
 T CONDITION APPEARS ACROSS TR SIMPLEX
 R CONDITION APPEARS ACROSS T1R1 SIMPLEX
 TR CONDITIONS WILL APPEAR ACROSS TR/T1R1 SIMPLEX

NOTE 2 THIS CONFIGURATION (M1 W/S IN PLARs) WILL NOT WORK WITH
 WITH FACILITY CONNECTORS BETWEEN THE PLARs.

DIGITAL SIGNALING JOB AID

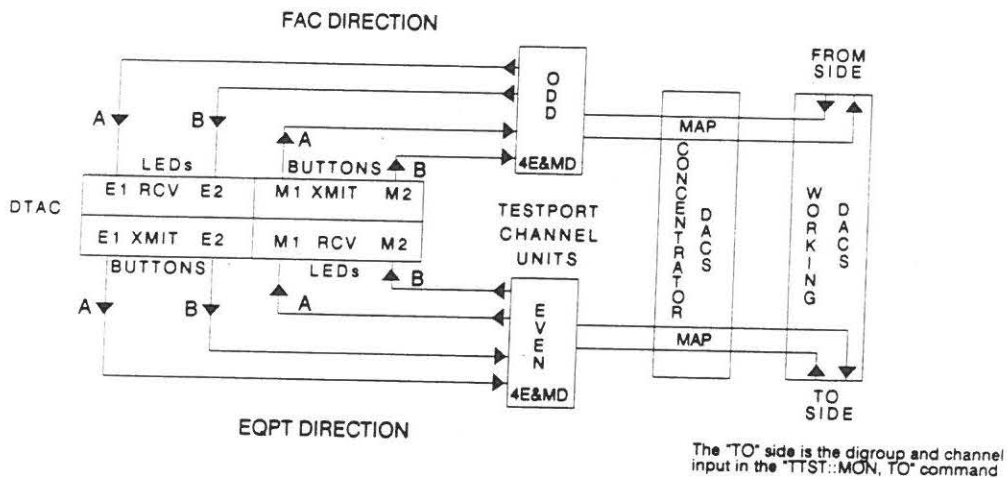
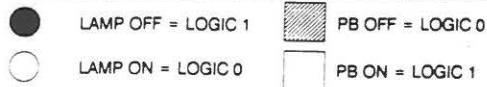
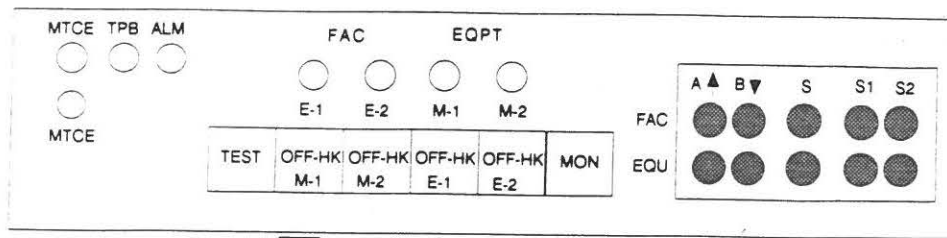
TEST SET/LOGIC CONVERSION TABLES

The following tables describe the conversion of "A" and "B" Signaling Bit logic levels, found in the Signaling Job Aid, to test set conditions.

All Tables contain Lamp indications for "RECEIVE" signals and Test Set operation to "TRANSMIT" signals. Diagrams of Test Sets are also provided.

ALL TRANSMIT AND RECEIVE SIGNALS ARE IN REFERENCE TO THE LOGIC STATE OF THE SIGNALING BITS IN THE DS-1 SIGNAL

DTAC PANEL



LAMPS

Receive logic level "0" at DS-1 = Lamp ON
 Receive logic level "1" at DS-1 = Lamp OFF

FROM FAC DIRECTION

"A" bit drives E1 LAMP
 "B" bit drives E2 LAMP

FROM EQPT DIRECTION

"A" bit drives M1 LAMP
 "B" bit drives M2 LAMP

PUSHBUTTONS

Pushbutton ON = Transmit logic level "1" at DS-1
 Pushbutton OFF = Transmit logic level "0" at DS-1

TOWARD FAC DIRECTION

M1 Pushbutton drives "A" bit
 M2 Pushbutton drives "B" bit

TOWARD EQPT DIRECTION

E1 Pushbutton drives "A" bit
 E2 Pushbutton drives "B" bit

DATS TEST SET

LAMPS

Receive logic level "0" at DS-1 = Lamp ON
 Receive logic level "1" at DS-1 = Lamp OFF

FROM "A" OR "Z" TERM

"A" bit drives RCV A LAMP
 "B" bit drives RCV B LAMP

KEYPAD COMMANDS

TRANSMIT OFFHOOK = Transmit logic level "1" at DS-1

TRANSMIT ON HOOK = Transmit logic level "0" at DS-1

[F7] for "A"
 [F9] for "B"
 [F8] for "A"
 [FA] for "B"

TOWARD "A" OR "Z" TERM

TRMT A drives "A" bit
 TRMT B drives "B" bit

DATS ☐ POWER ON ☐ OFF		CH NO. [AXY] STEP [E8] ☐ MONITOR [E4] ☐ SPLIT [E5]		VF TEST CHANNEL AAA1-UNEQUIPPED AAA2-INVALID AAA3-TEMPORARILY INVALID ☐ VF POWER- dBm [E6] ☐ VF FREQUENCY- HZ [E7]		4W TALK CH NO. [ACXY] STEP [E9] ☐ E LIT FOR ON HOOK																	
DS1C ☐ DG A [C3] ☐ DG B [C4]		VF INPUT dBm0 ☐ 0 [F1] ☐ -10 [F2] ☐ -13 [F3] ☐ -16 [F4]		VF OUTPUT ☐ NO. 4 ESS [C1] ☐ STANDARD [C2]		SUPERVISION LIT FOR ON HOOK E { ☐ RCV A ☐ RCV B F { ☐ TRMT A [OFF [F7] ☐ TRMT B [ON [F8] ☐ TRMT B [OFF [F9] ☐ TRMT B [ON [FA]																	
DS1 CODING ☐ D1A ☐ D1B ☐ D1C ☐ D1D [C5] ☐ D2 [C6] ☐ D3 [C7] (SEQ)		GO ALARMS ☐ FRAMING ☐ REMOTE ☐ BPV [C9] ☐ BIT ERROR [CA] ☐ OTHER ☐ CHECK LOOP TIMING [CF] ☐ AA-LOOPED ☐ FF-NO LOOP		CONTROL ☐ LOCK [FE] ☐ LOOP [EF] TEST [FC] CKT ORDER [CO] TOLL COMM [EA] B = CLEAR D = DO IT		ALL OTHER CHANNELS ☐ PASS THRU [E1] ☐ SPLIT ON HOOK [E2] ☐ SPLIT OFF HOOK [E3]																	
		KEYPAD <table border="1"> <tr><td>1</td><td>2</td><td>3</td><td>A</td></tr> <tr><td>4</td><td>5</td><td>6</td><td>B</td></tr> <tr><td>7</td><td>8</td><td>9</td><td>C</td></tr> <tr><td>0</td><td>F</td><td>E</td><td>D</td></tr> </table>		1	2	3	A	4	5	6	B	7	8	9	C	0	F	E	D	TEL SET ☐ CORR PANEL [EO] ☐ TALK CHANNEL [FO]			
1	2	3	A																				
4	5	6	B																				
7	8	9	C																				
0	F	E	D																				

SPTS TEST SET

LAMPS

Receive logic level "0" at DS-1 = Lamp ON
Receive logic level "1" at DS-1 = Lamp OFF

FROM "A" OR "Z" TERM

"A" bit drives "A" LAMP
"B" bit drives "B" LAMP

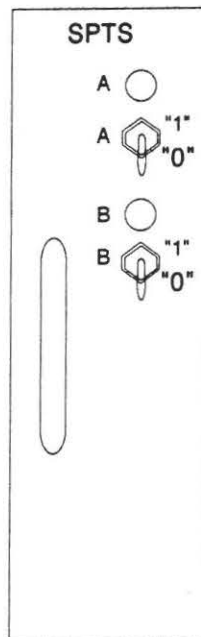
TOGGLE SWITCHES

Switch set to "0" = Transmit logic level "1" at the DS1

Switch set to "1" = Transmit logic level "0" at the DS1

TOWARD "A" OR "Z" TERM

TRMT A drives "A" bit
TRMT B drives "B" bit



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TABLE A

CLEI CODES

AT&T - PROPRIETARY INFORMATION

CLEI Codes for a Digital Central Office

<u>CLEI</u>	<u>Description</u>
T1MA100A	DACS FRAME
LTU14A0D	LT1B MOUNTING
LTU210AA	LT2 ANALOG/DIGITAL CONVERTER
LTU1M1A2	GRANGER TRANS-MUX MOD 2
LTU2GAA1	GRANGER TRANS-MUX MOD 3
LTU2GBE1	GRANGER TRANS-MUX MOD 4
D4MS103B	D4 CHANNEL BANK MOUNTING
D4CB003A	D4 CHANNEL BANK MOUNTING
D4CB004A	D4 CHANNEL BANK MOUNTING
D4CB014B	D4 CHANNEL BANK MOUNTING
D4ES1112	D4 CHANNEL BANK MOUNTING

LT1B Plug-Ins

LTSCBAO	CHANNEL 1 & 13
LTSCBGO	CHANNEL 2 & 14
LTSCBBO	CHANNEL 3 & 15
LTSCBHO	CHANNEL 4 & 16
LTSCBCO	CHANNEL 5 & 17
LTSCBJO	CHANNEL 6 & 18
LTSCBDO	CHANNEL 7 & 19
LTSCBKO	CHANNEL 8 & 20
LTSCBEO	CHANNEL 9 & 21
LTSCBLO	CHANNEL 10 & 22
LTSCBFO	CHANNEL 11 & 23
LTSCBMO	CHANNEL 12 & 24

LT-1B Signaling Units Plug-Ins

LTSC100	NO SF SIGNALING
LTSC200	SF, EM
LTSC300	OFFICE END OF FX
LTSC400	STATION END OF FX

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Use pursuant to Company Instructions

D4 Channel Unit Plug-Ins and Equivalent

<u>Name</u>	<u>CLEI</u>	<u>Operation</u>	<u>SF Unit</u>	<u>F Type</u>
2RD/PLAR	D4C2100	2-wire	D1B or PLAR	FGM, FGN
	D4C2300	2-wire	D1B or PLAR	FGM, FGN
4RD/PLAR	D4C2200	4-wire	D1B or PLAR	FHM, FHN
	D4C2400	4-wire	D1B or PLAR	FHM, FHN
4E&M	D4CE100	4-wire	B SF	FBA, FBB
4E&MER	D4CE120	4-wire	B SF	FWA
4E&MD	D4CE141	Used for testport channel only -DTAC-		
2E&M	D4CE200	2-wire	B SF(900 ohms)	No 2 wire compatibility
	D4CE600	2-wire	B SF(600 ohms)	signals as FBA, FBB
4PLR	D4CE700	4-wire	PLR	FBN
2DX/GT	D4CE300	2-wire	DX2 (2w)	FGA
	D4CE331,333	2-wire	DX2 (2w)	FGA
4DX	D4CE400	4-wire	DX2 (4w)	FHA
	D4CE410,411	4-wire	DX2 (4w)	FHA
	D4CE451	4-wire	DX2 (4w)	FHA
4TDM	D4CE500	4-wire		FPD
	(Back to back D4 use)			
2FXS	D4CX100	2-wire <u>stn</u>	E2S	FSA, FSB
2FXS/GT	D4CX300	2-wire <u>stn</u>	E2S	FSA, FSB
2FXS/LS	D4CX700	2-wire <u>stn</u>	E2S (LS)	FSA, FSB (LS)
2FXO	D4CX200	2-wire <u>ofc</u>	E2L	FLA, FLB
	D4CX210	2-wire <u>ofc</u>	E2L	FLA, FLB
2FXO/GT	D4CX400,403	2-wire <u>ofc</u>	E2L	FLA, FLB
2FXO/LS	D4CX800	2-wire <u>ofc</u>	E2L (LS)	FLA, FLB
4FXS	D4CX500	4-wire <u>stn</u>	E1R	FRA
	D4CX510	4-wire <u>stn</u>	E1R	FRA
	D4CX511	4-wire <u>stn</u>	E1R	FRA
4FXO	D4CX600	4-wire <u>ofc</u>	E1P	FPA
	D4CX610	4-wire <u>ofc</u>	E1P	FPA
	D4CX611	4-wire <u>ofc</u>	E1P	FPA
4TO	D4CO100	4-wire	4w amp	none
	D4CO110	4-wire	4w amp	none
2TO	D4CO200	2-wire	Term Set (2w loop)	none
4ETO	D4CO300	4-wire	4w amp w/xmt eql.	none
	D4CO310	4-wire	4w amp w/xmt eql.	none
4LSXO	D4CL100	4-wire	Used w/ 4ESS	none
DPT	D4CD200	2-w interface bet' D4 & 2w DP term ckt		
DPO	D4CD100	2-w interface bet' D4 & 2w DP orig ckt		
PG5R	D4CP210	Bet' D4 and analog prog. 5KHZ prog rec		
PG5T	D4CP100	Bet' D4 and analog prog. 5KHZ prog xmt		
4USF	D4CUW25	SF to digital signal converter		
2PBX	D4CX900	Interface bet Stn PBX & 4ESS Switch		

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TABLE B

**DACS
TRUNK CONDITIONING
CODES**

AT&T - PROPRIETARY INFORMATION

Trunk Conditioning for DACS

<u>Type of Circuit</u>	<u>Trunk Conditioning</u>
2W No signaling	(,), TRSP, TRB
4W No signaling	Entered in DACS as just TRSP, TRB
example: data, SS1, SS4 ckts, SF sig.	
2W auto-ringdown	(0000, 0000), TRB (2 OR 4 RD/ <u>PLAR OPTION</u>) (M1 of S6 = Black Showing)*Preferred*
4W auto-ringdown	
2W code select	(1111, 1111), TRB (M2 of S6 = White Showing)
4W code select	
2W ringdown	(1111, 1111), TRB (2 OR 4 <u>RD/PLAR OPTION</u>)
4W ringdown	
2W dial tie trunks	(0011, 0011), TRB
4W dial tie trunks	
4W E&M intermediate	
2W electro mech. switch tie lines	
4W electro mech. switch tie lines	
2W #1 ESS dial tie lines	
4W #1 ESS dial tie lines	
4W EPSCS-#1 ESS dial tie lines	
example: PBX tie trunks	
2W FX loop start - station end	(0000, 0101), TRB
4W FX loop start - station end	
2W FX loop start - office end	
4W FX loop start - office end	
4W FX loop start - intermediate tandem - back to back thru ckt	
2W FX ground start - station end	(0101, 1101), TRB
4W FX ground start - station end	
2W FX ground start - office end	
4W FX ground start - office end	
4W FX ground start - intermediate tandem - back to back thru ckt	

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TABLE C

**FACILITY CONNECTOR
OPTIONS**

AT&T - PROPRIETARY INFORMATION

✓
Date: 5-20-87 / GMS

File: LTOPT

Subject: Signaling Options for LT (FAC) Connectors
(Granger, LT2, LT1B)

<u>Granger M4 & LT2</u>	<u>Granger M2, M3</u>	<u>LT1-B</u>	S1 SW	S2 SW	MINI JUMPER
CC	CCIS	LTSC100 (68A)	--	NONE	--
EM	EM	LTSC200 (68B)	4,8	2,4	NORM
PL	FXOL	LTSC300 (68C)	4,8	2	NORM
PG	FXOG	LTSC300 (68C)	4,8	1	NORM
RL	FXSL	LTSC400 (68D)	4,8	2	NORM
RG	FXSG	LTSC400 (68D)	4,8	1	NORM

NOTE 1: The LT or Facility connector should be optioned for whatever is on the digital side of the connector on a per channel basis.

NOTE 2: Plans have been made to have the M2 & M3 Grangers modified to accept similar option commands for signaling as is presently applied to the M4 & LT2 Facility Connectors.

The above info should make this transition easier to work with when various locations of M2 & M3 Grangers have been modified. This will also make remote provisioning of Facility connectors more standard.

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TABLE D

**NCI CODES
(JA-9)**

AT&T - PROPRIETARY INFORMATION

NETWORK CHANNEL INTERFACE (NCI) AND NETWORK INTERFACE (NI) CODES

The NCI and NI describe the electrical conditions on a local exchange channel. There are interface codes for both the NI and NCI at the point-of-interface (POI). The NCI and NI codes can be found on the WORD document.

CODE COMPONENTS

The interface codes are made up of four components:

- (1) Number of wires
- (2) Protocol code
- (3) Nominal reference impedance code
- (4) Where applicable, protocol option

PROTOCOL CODE

The protocol code defines the technical characteristics associated with the type of signaling and type of facilities at both the NI and POI. The protocol specified for the NI and POI may be different or the same. However, only certain combinations are technically possible.

REFERENCE IMPEDANCE

The third component of the interface code is the nominal reference impedance. This is not necessarily the impedance of the circuit itself but the impedance to which the circuit is designed. This is the impedance which should be used for transmission measurements.

PROTOCOL OPTION

The fourth component of the interface code is the protocol option. This option portion indicated AT&T-Communication's signaling function at the POI. Not all protocol codes have protocol option codes.

For example, for the code 4EA2-E, the four components are as follows:

- (a) The 4 or 04 represents the number of wires. Table 1-9A defines the allowable entries for this component. Note that this is a two-digit code. However, throughout documents the zero for the initial digit is usually omitted for simplicity.
- (b) The EA represents the protocol code. In this example, it is Type I E&M lead signaling. Table 1-9B provides a glossary of protocol codes.
- (c) The 2 represents the nominal reference impedance. In this example it is 600 OHMS. Table 1-9C defines the allowable entries.
- (d) The E is the protocol option. In this example it indicates that the end user or IC originates on the E lead. The protocol option codes are defined with the protocol code in Table 1-9B.

NOTE: For a complete description of interface codes see:

PUB 62500 - Switched Access Services

PUB 62501 - Special Access Services

313-400-110 - Descriptions, Procedures Responsibilities (Provisional ACP)

Table 1-9A

Total Wires

<u>Number of Wires</u>	<u>Code</u>
2	02
4	04
6	06
7	07
8	08
9	09

Table 1-9C

Reference Impedance Code

<u>Value</u>	<u>Code</u>
110	0
600	2
900*	3*
135	5
75	6
100	9

*With the exception of interface code 4DD3, the impedance character 3 when used at a 4-wire transmission path at the POI denotes at IC-provided transmission equipment termination rather than a 900 impedance. Such terminations were provided by ICs in accordance with the Federal Communications Commission (FCC) Docket No. 20099 Settlement Agreement and by ATT-C in previous provisioning processes.

Table 1-9B

Glossary of Protocol Codes and Selected Options

<u>CODE</u>	<u>OPTION</u>	<u>DEFINITION</u>
AB		accepts and provides 20 Hz ringing signal at IC terminal location
AC		accepts and provides 20 Hz ringing signal at end user premises
AH		analog high-capacity interface
	B	60 kHz to 108 kHz (12 channels)
	C	312 kHz to 552 kHz (60 Channels)
	D	564 kHz to 3084 kHz (600 channels)
DA		data stream in VF frequency band at end user premises
DB		data stream in VF frequency band at IC terminal
	10	Frequency shift (108 data set type)
	43	VF for 43A1 to 43B1 Telegraph Carrier
DC		direct current of voltage
	1	monitoring interface with series RC combination (McCulloh format)
	2	Telephone Company energized alarm channel
	3	Metallic facilities (DC continuity) for direct current/low frequency control signals or slow speed data (30 baud)
DD		DATAPHONE Select-A-Station (and TABS) interface at IC terminal location
DE		DATAPHONE Select-A-Station (and TABS) interface at end-user premises
DO		digital interface at IC terminal location at the digital signal level
		zero A (DS-0A)
DS		digital hierarchy interface
	15	1.544 Mbps (DS1) format per PUB41451 plus D4
	15E	8-bit PCM encoded in one 64 kbps of the DS1 signal
	15F	8-bit PCM encoded in two 64 kbps of the DS1 signal
	15G	8-bit PCM encoded in three 64 kbps of the DS1 signal
	15H	14/11-bit PCM encoded in six 64 kbps of the DS1 signal
	15J	1.544 Mbps format per PUB 41451
	15K	1.544 Mbps format per PUB 41451 plus extended framing format
	15L	1.544 Mbps (DS1) with SF signaling
	27	274.176 Mbps (DS4)
	27L	274.176 Mbps (DS4) with SF signaling
	31	3.152 Mbps (DS1C)
	31L	3.152 Mbps (DS1C) with SF signaling
	44	44.736 Mbps (DS3)
	44L	44.736 Mbps (DS3) with SF signaling
	63	6.312 Mbps (DS2)
	63L	6.312 Mbps (DS2) with SF Signaling
DU		digital access interface at end user premises
	24	2.4 kbps
	48	4.8 kbps
	56	56.0 kbps
	96	9.6 kbps
	A	1.544 Mbps format per PUB 41451
	B	1.544 Mbps format per PUB 414511 plus D4
	C	1.544 Mbps format per PUB 41451 plus extended framing format

Table 1-9B(cont)

Glossary of Protocol Codes and Selected Options

<u>CODE</u>	<u>OPTION</u>	<u>DEFINITION</u>
DX		duplex signaling interface at IC terminal location
DY		duplex signaling interface at end user premises
EA		Type I E&M Lead Signaling.
	E	IC terminal location or end user originates E Lead
	M	IC or end user at NI originates on M Lead
EB		Type II E&M Lead Signaling.
	E	IC or end user at NI originates on E Lead
	M	IC or end user originates on M lead
EC		Type III E&M signaling at IC terminal location, IC originates on M lead
EX		Back-to-back carrier arrangement with tandem signaling
	A	LEC has closed end
	B	LEC supplies dial tone
GO		ground start loop signaling - open end
GS		ground start loop signaling - closed end
LA		end user loop start loop signaling - Type A registered port open end
LB		end user loop start loop signaling - Type B registered port open end
LC		end user loop start loop signaling - Type C registered port open end
LO		loop start loop signaling - open end
LR		20 HZ automatic ringdown interface at IC with LEC provided PLAR
LS		loop start loop signaling - closed end
NO		no signaling interface, transmission only
PG		program transmission - no do signaling
	1	nominal frequency from 50 to 15000 Hz
	3	nominal frequency from 200 to 3500 Hz
	5	nominal frequency from 100 to 5000 Hz
	8	nominal frequency from 50 to 8000 Hz
RV	0	reverse battery supplied by LEC, IC originates
	T	reverse battery supplied by end user, end user terminates
SF		single frequency signaling within VF band at either IC terminal location
TF		or end user premises
TT		telephotograph interface
		telegraph/teletypewriter interface at their IC POI or end user NI
		20.0 milliamperes
		3.0 milliamperes
		62.5 milliamperes
TV		television interface combined (diplexed) video and one audio signal
		combined (diplexed) video and two audio signals
		video plus one (or two) audio 5 KHz signals or one (or two) two-wire
	15	video plus one (or two) audio 15 KHz signal(s)

Table 1-9B(cont)

Glossary of Protocol Codes and Selected Options

<u>CODE</u>	<u>OPTION</u>	<u>DEFINITION</u>
WA		wideband bandwidth interface at end user NI
	1	limited bandwidth
	2	nominal passband from 29000 to 44000Hz
WB		wideband data interface at IC POI
	18S	18.75 kbps, synchronous
	19A	up to 19.2 kbps asynchronous
	19S	19.2 kbps synchronous
	23A	up to 230.4 kbps, asynchronous
	23S	230.4 kbps, synchronous
	40S	40.8 kbps, synchronous
	50A	up to 50.0 kbps, asynchronous
	50S	50.0 kbps, synchronous
	64	64.0 kbps, restored polar
WC -		wideband data interface at end user NI
	18.75	kbps, synchronous
	19	for 12-wire interface: 19.2 kbps, synchronous for 10-wire interface: up to 19.2 kbps, asynchronous
	23	up to 230.4 kbps, synchronous
	23S	230.4 kbps, synchronous
	40	40.8 kbps, synchronous
		12-wire interface: 50.0 kbps, synchronous for 10-wire interface: up to 50.0 kbps, asynchronous
WD -	1	nominal passband from 300 to 16000 Hz
	2	nominal passband from 28000 to 44000 Hz
	3	nominal passband from 29000 to 44000 Hz