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subject: SARTS Testing At Access Points Between Tandem Channel Units

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TECHNICAL NOTES

1. *INTRODUCTION*

These notes provide access point application guidelines and testing methods to permit SARTS remote testing of circuits at access points between tandem channel units. Tandem Channel units are used for interconnecting back-to-back Digital Channel Banks (D Banks). The primary application of these channel units is for multi-facility trunks used in Foreign Exchange (FX) circuit applications. These testing methods are designed to use the present capabilities of SARTS (Generics 2.4 and 2PC1).

The signaling and transmission paths at this interface are described and step by step procedures for signaling tests using SARTS are given.

2. *TANDEM INTERFACE CONFIGURATION*

The voice frequency transmission between tandem channel units is four-wire 600 ohm. Signaling and supervision is carried through the connection on separate signaling leads as well as simplexed on the transmission leads. Two signaling states are transmitted on the signaling leads and two states are transmitted on the simplex, as shown in Figure 1.

The signaling output leads from a channel unit are, an E lead and a simplex on the T and R leads (the simplexed lead is called E1). These leads follow the E lead convention that an open is an on-hook and a ground represents an off-hook. Signaling inputs to a channel unit are on the Ex lead, and a simplex on the T1 and R1

leads (the simplex lead is called Ex1). An open on these leads is detected as an on-hook and a ground an off-hook. This signaling convention is similar to the Type V E and M lead interface.*

The Ex lead is carried out of the channel bank on the M lead, and will appear on the M point of the distributing frame terminal block.

3. *ACCESS POINT CONFIGURATION*

A 6-wire access point should be used between Tandem Channel Units. Assuming the normal convention of the switch end of the circuit at the "A" end of the circuit the EF orientation should be used. However if the switch is at the "Z" end of the circuit then the FE orientation is required to use the following methods. The V F connections that are carried through the A and B paths of the access point are wired in normal fashion. See for example FS 5 of SD 1P138-01.

The E and Ex leads, which are unique to tandem channel units, require special handling. They will be connected to the TC and RC paths of the access point, with the E lead of each channel unit cross connected to the Ex lead of the other. This frogging of the E, Ex leads must be done on the E side of the access point, as shown in Figure 1.

3.1 *Access Configuration Code*

The "MBA" configuration code will be used if the access point is wired EF and the "MAB" code used in those cases where the FE orientation must be used.

3.2 *Signaling Format*

It is recommended that the Signaling Format be shown as "NON" on the 703 line of the access point data. This signaling format is incorrect for an "MAB" or "MBA" configuration code and it should give the tester a clue that this is a unique access point and will require special testing techniques. The tester should replace

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* "Notes on The Network," BSP 781-030-100, Issue 2, December 1980.

the "NON" with the "EMF" Signaling Format before sending the 703 line.

4. *WIRING CONFIRMATION TESTS*

Since the wiring of the E, Ex leads can lead to confusion, the wiring of the access point should be tested as part of the pre-service testing of the circuit. This can be done by checking that the Equipment side channel Ex lead is found on the E lead at the access point and that the Equipment side Ex1 lead is simplexed on the A pair. These checks are made by splitting the leads and measuring for a DC voltage on the leads in the "E" direction. On the A pair either a tip to ground or ring to ground measurement can be made in the "E" direction. The expected voltage on the E lead or B pair is about -34 volts for a D1 or D4 channel bank and -9 volts for a D3 channel bank.

5. *SIGNALING TESTS*

Tandem channel units are rich in options. The methods given assume that the tandem channel units are correctly optioned. While incorrectly optioned channel units may work on an end to end basis they will not work properly during these tests.

The signaling states for correctly wired F.X. circuits as seen at an access point between tandem channel units are listed in Table 1.

5.1 *Towards Switch*

These methods are designed to draw dial tone and outpulse towards the switch as a way of testing an F X circuit. Methods are given for Loop start and Ground start circuits.

5.1.1 *Loop Start* For loop start circuits the steps to draw dial tone and outpulse are given in Chart 1. Chart 2 lists the steps required to draw dial tone and Touch Tone address on a loop start circuit.

5.1.2 *Ground Start* The steps to draw dial tone and dial pulse on a ground start circuit are given in Chart 3. Chart 4 gives the procedure to draw dial tone and Touch Tone address on a ground start circuit.

5.2 *Towards Station*

Procedures for ringing the station end of an F X circuit are given in Charts 5 and 6. Chart 5 is for use with loop start circuits and Chart 6 covers ground start circuits. When ringing a station using these methods the tester should remember that continuous ringing is supplied to the station. The ringing continues until either the customer answers or the tester removes the ground from the simplex circuit by use of the L01/LP/CLSD/RL/B/ command.

6. *TRANSMISSION TESTS*

To perform transmission tests on F X circuits the circuit must be put in the off-hook state. For measurements between a tandem channel unit and the office end of a circuit the E lead must be grounded in the direction towards the office end channel unit. This will give a loop closed signal to the office end channel unit. To make measurements towards the station end the M lead must be grounded in the direction towards the station. This will be recognized by the station end channel unit as a tip ground signal, which will cause the station end channel unit to close the tip lead providing continuity on the transmission leads.

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Atts.
Figure 1
Table 1
Charts 1,6

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FIGURE 1

BACK-TO-BACK TANDEM CHANNEL UNIT CONNECTION

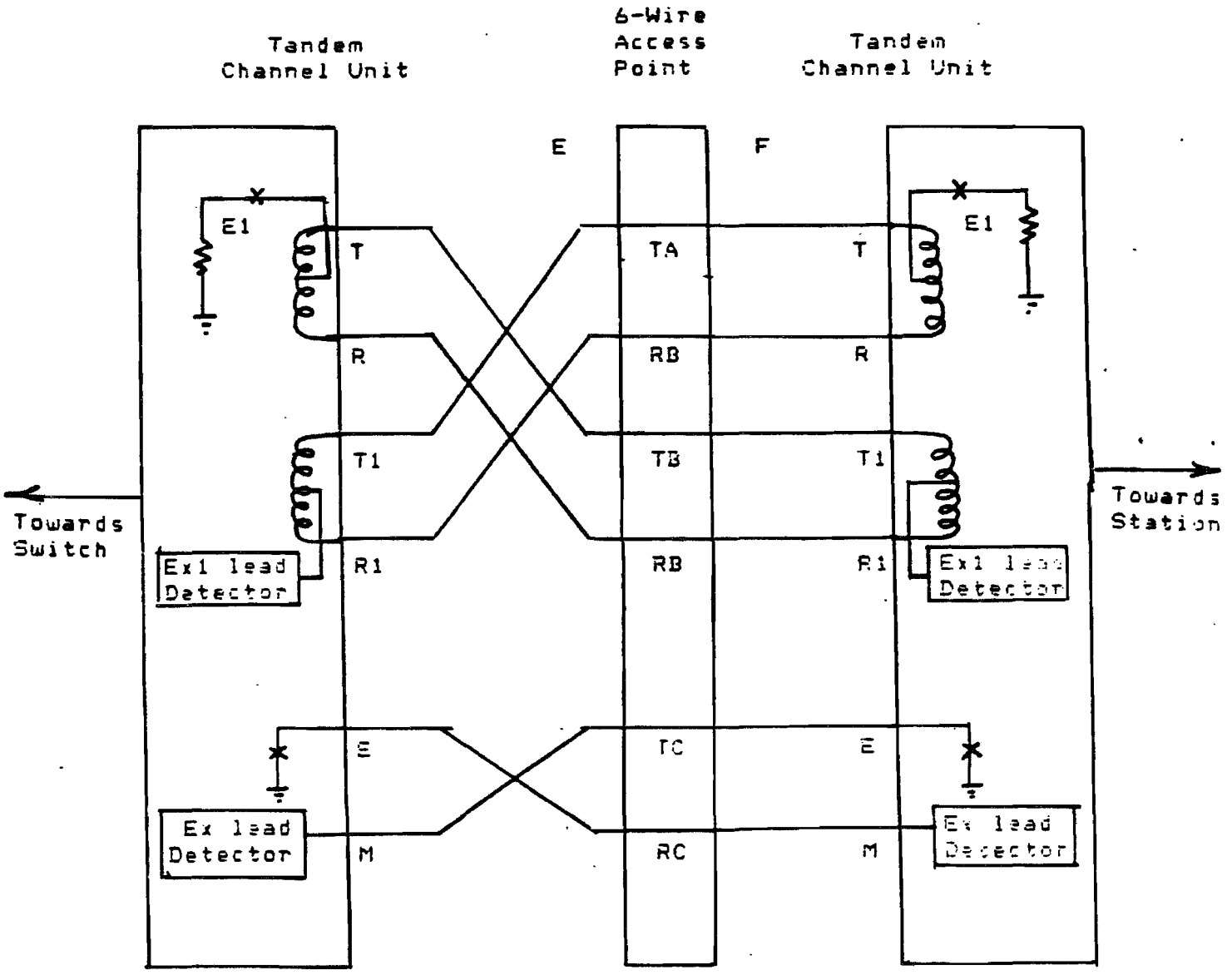

TABLE 1

FOREIGN EXCHANGE SIGNALING STATES AT ACCESS POINTS
BETWEEN BACK-TO-BACK TANDEM CHANNEL UNITS

SIGNALING TOWARDS SWITCH END (E DIRECTION)

CIRCUIT CONDITION	E LEAD	A PAIR SIMPLEX
LOOP START CIRCUIT		
Loop Closed	ground	open
Loop Open	open	open
GROUND START CIRCUIT		
Loop closed	ground	
Loop Open	open	
Ring Grounded		ground
Ring Not Grounded		open

SIGNALING TOWARDS STATION END (F DIRECTION)

CIRCUIT CONDITION	M LEAD	B PAIR SIMPLEX
LOOP START CIRCUIT		
Ringing	ground	ground
Not Ringing	open	open
GROUND START CIRCUIT		
Tip Grounded	ground	
Tip Not Grounded	open	
Ringing		ground
Not Ringing		open

CHART 1

DIAL PULSE TO SWITCH (LOOP START)	
COMMAND	**RESULT**
G01/E/A&B/	Establish test direction towards switch.
L01/LP/OPN/RL/A/	Split V. F. circuit.
G07/TLK/	Establish talk line.
H12/	Set up Talk & Listen paths.
E01/E/E/GRD/	Ground E lead towards switch causing loop closure to switch and drawing dial tone.(Tester should hear dial tone)
E03/E/S/Tel /10/58/	Puts circuit on hook followed by off hook, dial tone detection, and out pulsing. Tester should hear ring back followed by answer.
E07/E/	Office end channel unit opens loop to office to put circuit in on hook state.

TOUCH TONE TO SWITCH (LOOP START)	
COMMAND	**RESULT**
G01/E/A&B/	Establish test direction towards switch.
L01/LP/OPN/RL/A/	Split V. F. circuit.
G07/TLK/	Establish talk line.
H12/	Set up Talk & Listen paths.
E01/E/E/GRD/	Grounds E lead towards Switch causing loop closure to switch and drawing dial tone.(Tester should hear dial tone)
E04/S/Tel /SUPVN E/	Puts circuit on hook followed by off hook, dial tone detection, and Touch Tone addressing towards the switch. Tester should hear ring back followed by answer.
E07/E/	Office end channel unit opens loop to office to put circuit in on hook state.

CHART 3

DIAL PULSE TO SWITCH (GROUND START)	
COMMAND	**RESULT**
G01/E/A&B/	Establish test direction towards switch.
L01/LP/CLSD/RL/A/	Split V.F. circuit.
G07/TLK/	Establish talk line.
H12/	Set up Talk & Listen paths.
E01/M/E/OPN/	Opens tip ground signaling path to station end channel unit. (Prevents PBX ringing for PBXs that ring on tip ground with open loop)
E01/E/E/GRD/	Grounds E lead towards switch causing a loop closure to the switch.
L01/LP/CLSD&GRD/RL/A/	Causes the office end channel unit to give a ring ground to the switch. This will draw dial tone.
E03/E/S/Tel /10/58/	Opens loop then closes loop, detects dial tone, and out pulses. (The circuit will "pump" during the open loop interval)
	Tester should hear ring back followed by answer.
L01/LP/CLSD/RL/A/	Removes ring ground signal by putting an open on the Ex1 signaling path. (The office end channel unit autonomously removes the ring ground towards the switch when tip ground is detected)
E07/E&M/	Returns the E&M leads to normal, the office end channel unit opens the loop to the switch putting the circuit in the on hook state.

TOUCH TONE TO SWITCH (GROUND START)	
COMMAND	**RESULT**
G01/E/A&B	Establish test direction towards switch.
L01/LP/CLSD/RL/A/	Split V. F. circuit.
G07/TLK/	Establish talk line.
H12/	Set up Talk & Listen paths.
E01/M/E/OPN/	Opens tip ground signaling path to station end channel unit. (Prevents PBX ringing for PBXs that ring on tip ground with open loop)
E01/E/E/OPN/	Sends open loop signal to office end channel unit to ensure that circuit is on hook.
E01/E/E/GRD/	Sends closed loop signal to office end channel unit.
L04/S/Tel# /GST/SUPVN A/	After minimum of 4 seconds applies ground to the simplex which translates to ring ground in the office end channel unit, this should draw dial tone, if dial tone is detected then Touch Tone addressing is sent towards office end channel unit. Tester should hear ring back followed by answer.
E07/E&M/	Returns the E&M leads to normal, the office end channel unit opens the loop to the switch putting the circuit in the on hook state.

CHART 5

RING TOWARDS STATION (LOOP START)	
COMMAND	**RESULT**
G01/F/A&B/	Establish test direction towards the station.
L01/LP/CLSD/RL/B/	Splits V. F. circuit.
G07/TLK	Establish talk line.
H12/	Set up Talk & Listen paths.
E01/E/E/OPN/	Opens loop closure signaling path to keep an answer at the station from drawing dial tone.
L01/LP/CLSD&GRD/RL/B/	Station end channel unit sends continuous ringing to station. When station goes off hook and returns loop closure to the station end channel unit the channel unit locally trips ringing. However, if station goes on hook before the following command is executed ringing will resume.
L01/LP/CLSD/RL/B/	Removes ringing signal to station end channel unit. If this command is not executed ringing will resume when station is put on hook.
G09/	Restores circuit to normal.

RING TOWARDS STATION (GROUND START)	
COMMAND	**RESULT**
G01/F/A&B/	Establish test direction towards station.
L01/LP/CLSD/RL/B/	Split V. F. circuit.
G07/TLK	Establish talk line.
H12/	Set up Talk & Listen paths.
E01/M/F/GRD/	Causes station end channel unit to send tip ground to station. NOTE (Some PBXs recognize a tip ground as a ringing signal.)
L01/LP/CLSD&GRD/RL/B/	Station end channel unit sends continuous ringing to station. When station goes off hook and returns loop closure to the station end channel unit the channel unit locally trips ringing. However, if station goes on hook before the following command is executed ringing will resume.
L01/LP/CLSD/RL/B/	Removes ringing signal to station end channel unit. If this command is not executed ringing will resume when station is put on hook.
G09/	Restores circuit to normal.