नाम
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Course : ----------

दिनांक अनुदेशक का हस्ताक्षर
Date : ---------- Instructor Initial :

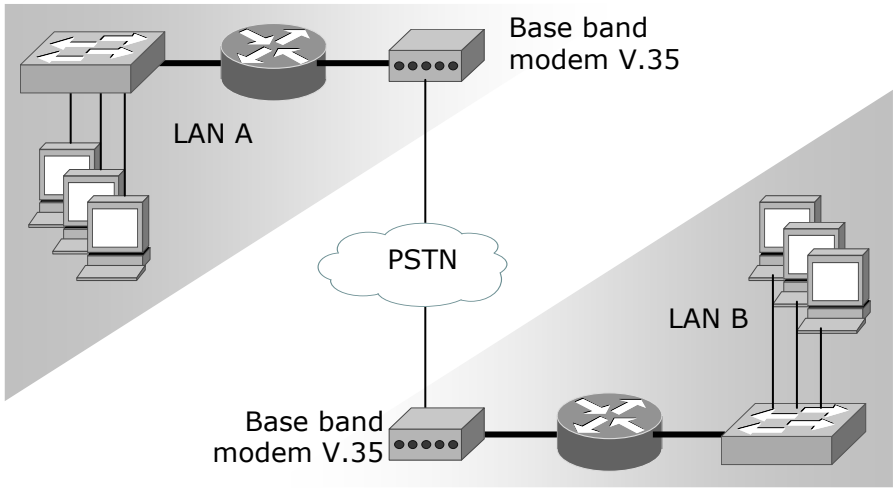
Name of experiment: **Study of Leased line Modems**

Object

To connect two local area networks through simulated leased lines

Introduction

In typical environment to interconnect to remote LANs we lease line form service providers. From service provider end the channels are extended to user location through copper cables, which are terminated on base band modems as shown



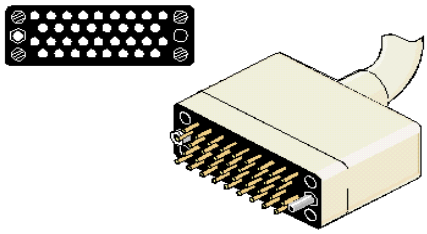
In leased line circuits clock to extract data will be provided by service provider. In general scenario the base band modem with g.703 interface provided with service provider is in master mode with external clock and the other modem with v.35 interface at user location will be in slave mode.

To simulate leased line we require enabling one of the V.35 modems to master mode with internal clock generation (since no external clock is available) and the other in slave mode.

V.35 Interface & Connector

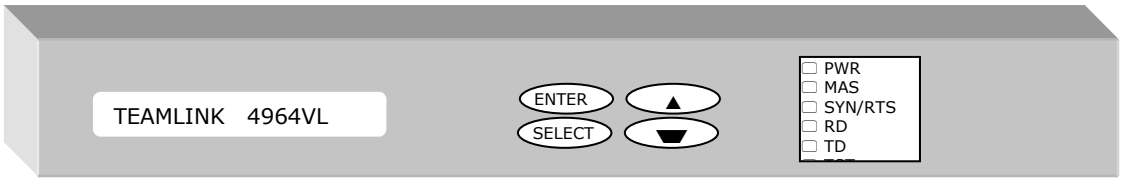
V.35 is an ITU standard for high-speed synchronous data exchange, it is the interface standard used by most Routers and Modems that connect to E0 / E1 carriers.

V.35 connectors are used for serial transmission between communications devices.



Team link 4064 Modem

This Team link 4064 family is a full duplex 64/128 Kbps Digital Modem/Line Driver used for data transmission over 2-wire unconditioned twisted pair lines. The Team link 4064 provides Point-to-Point Digital Connectivity over leased lines through telecommunication network or privately owned circuits to interconnect the workstations or networking equipment located at two different places. A pair of modem is required to operate on a link.



The front panel indications

Indication	Status
PWR	ON when +5V supply is present
MAS	ON if the modem is set for MASTER mode OFF if the modem is set for SLAVE mode
G.703SYN/ RTS	ON when proper connection with PCM (for G.703 modem) ON if the RTS signal is active from DTE (for V.35 modem)
RD	ON when from DTE to modem is all 0's OFF when from DTE to modem is all 1's FLASHES for 1's and 0's
TD	ON when from DTE to modem is all 0's OFF when from DTE to modem is all 1's FLASHES for 1's and 0's
TST	ON for Loop back tests BLINKS for built in BERT with remote loop test OFF otherwise
ERR	FLASHES once, if any error is detected in the data during the internal BER test or CRC error during data transmission OFF other wise
LOS	ON if the re is a loss of SYNC between the Master and Slave modems OFF if both Master and Slave modems are in Synchronization

MMI to configure TEAMLINK base band modem

Press ENTER to go to main menu

MAIN MENU		SUB MENU		OPTIONS	EXECUTE
CONFIG	▽	TYPE CONFIG	SELECT	MASTER	ENTER
				SLAVE	
	▽	CLK CONFIG		EXTERNAL	
				LOCAL	
	▽	SPEED CONFIG		64K	
				128K	
		EXIT to MAIN MENU			
STATUS	▽	BER	RESET		
	▽	SYSTEM TIME			
		EXIT to MAIN MENU			
DIAG	▽	LOCAL LOOPBACK	SELECT	START	
		LL MODE ON		EXIT	
	▽	REM LOOPBACK		START	
		RL MODE ON		EXIT	
	▽	LOCAL DIG		START	
		LOCAL DIG ON		EXIT	
	▽	PATTERN GEN		START	
		PATTERN GEN ON		EXIT	
		EXIT to MAIN MENU			
EXIT		UPDATE	SELECT	YES	
				NO	

Procedure

1. Select either a V.35 or G.703 modem and switch on the power supply.
2. Record the information displayed on front panel

3. Record the lamp indications on front panel

PWR		TD	
MAS		TST	
SYNC/RTS		ERR	
RD		LOS	

4. Press Enter button to enter into configuration mode
5. Study the MMI table and set the modem to **MASTER** mode with **Internal clock** at **64Kbps** rate

6. Record the steps followed to CONFIGURE

7. Record the information displayed on front panel

8. Record the lamp indications on front panel

PWR		TD	
MAS		TST	
SYNC/RTS		ERR	
RD		LOS	

9. Ensure that the other end modem is in **SLAVE** mode, otherwise configure to Slave mode

10. Interconnect both the modems with Line cable.

11. Record the lamp indications on front panel on either modems

	MASTER modem		**SLAVE modem**
PWR		PWR	
MAS		MAS	
SYNC/RTS		SYNC/RTS	
RD		RD	
TD		TD	
TST		TST	
ERR		ERR	
LOS		LOS	

12. Switch off the modems and Connect modems to Routers with serial interface cable with proper connectors. Switch on the routers and modems.

13. Record the lamp indications on front panel of both the modems

	MASTER modem		**SLAVE modem**
PWR		PWR	
MAS		MAS	
SYNC/RTS		SYNC/RTS	
RD		RD	
TD		TD	
TST		TST	
ERR		ERR	
LOS		LOS	

Diagnostics

Base band modems are provided with inbuilt loop diagnostics (V.54 protocol ITU-T standard) to check the integrity of the leased line connectivity.

V.54 is an ITU standard for various loop back tests that can be incorporated into modems for testing the telephone circuit and isolating transmission problems.

Operating modes includes local & remote loop backs with Digital as well as Analog tests.

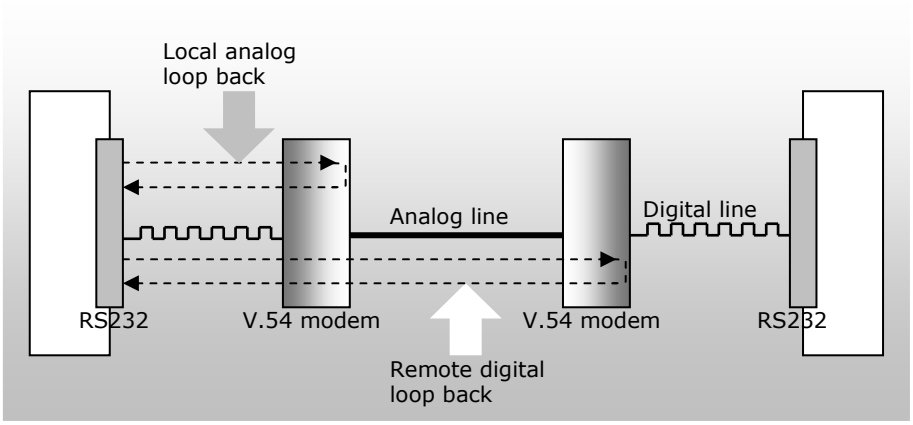
1. Local ANALOG loop: (defined in the V.54 protocol as Loop 3) tests the integrity of the Serial connector card, the cable connecting the card to the modem, and the local modem.

2. Remote DIGITAL loop: (defined in the V.54 protocol as Loop 2) tests the integrity of the Serial connector card, the cable connecting the card to the modem, the local modem, the carrier connection, and the remote modem.

   Built in BERT, if activated (the modem starts generating and checking standard 511- bit pseudo random pattern) in **remote digital loop** test mode for quick fault isolation on communication link.

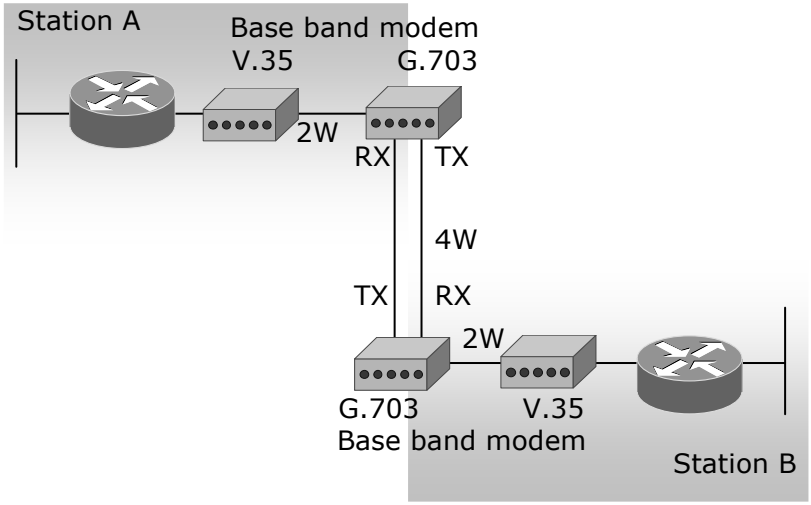
3. Local DIGITAL loop: To extend digital loop from local modem for fault isolation on communication link on remote side.

Bit-error-rate testing and loopbacks are used by carriers and ISPs to help resolve problems as well as test the quality of T1/E1 links. By early detection of poor quality links and quick problem isolation to improve network's quality of service



The loop tests can be activated through by entering into DIAG menu and choose the appropriate test with the help of MMI table.

Connectivity diagram for Diagnostics



1. Connect the modems as shown in the figure above

    a. 2W connectivity between V.35 (local) and G.703 (Remote) modems.

    b. 4W cross connectivity between G.703 modems.

    c. Ensure that both the G.703 modems in MASTER mode, and enable LOCAL clock in one of the G.703 modem & EXTERNAL clock in the other G.703 Modem.

    d. Keep both the V.35 modems in SLAVE mode & enable EXTERNAL clock in them.

2. Switch on the modems.

3. Record the Display panel obervations.

Station A		**Station B**	
V.35 Modem	**G.703 Modem**	**G.703 Modem**	**V.35 Modem**

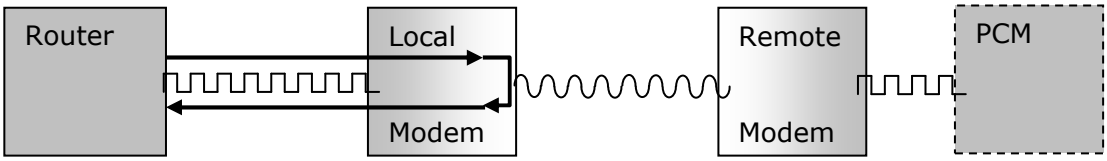
4. Record LED panel observations (Enter '**O**' for indications ON and '**ZZ**' for blinking)

Indications	**Station A**		**Station B**	
	Local / V.35 Modem	**Remote / G.703 Modem**	**Remote / G.703 Modem**	**Local / V.35 Modem**
PWR				
MAS				
SYNC/RTS				
RD				
TD				
TST				
ERR				
LOS				

5. Switch on the **Router** on **Station A**
6. Record observations (Enter '**O**' for indications ON and '**ZZ**' for blinking)

Indications	**Local modem / V.35**	**Remote Modem / G.703**
PWR		
MAS		
SYNC/RTS		
RD		
TD		
TST		
ERR		
LOS		

LOCAL LOOP BACK TEST



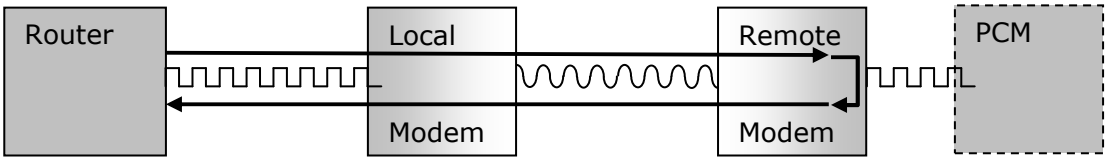
7. At station A, on V.35 modem select DIAGS, go to LOCAL LOOP BACK and START. **{**you are requesting your LOCAL V.35 modem to loop back the signal received from DTE (router)**}**
   This test is done to check the performance of local modem.
8. Record observations (Enter '**O**' for indications ON and '**ZZ**' for blinking)

Indications	**Local modem / V.35**	**Remote Modem / G.703**
PWR		
MAS		
SYNC/RTS		
RD		
TD		
TST		
ERR		
LOS		

9. Now EXIT from LOCAL LOOP BACK

REMOTE LOOP BACK TEST with BERT

This test allows easy quick testing of local / V.35 and remote / G.703 modems as well as communication links (two wire lines) between them.



10. At station A on V.35 modem
    a. Select DIAGS, go to PATTERN GEN and START
    b. Select REM. LOOP BACK and START.

(Remote loop back with pattern generator **ON,** allows easy quick testing of local modem as well as communication links (two wire lines) between them. If errors are (ERR indication) observed, the line circuits in the local modem / V.35 are not operating properly or the line connection between the modems is faulty or the loop resistance is more than that a modem can drive)

11. Record observations (Enter '**O**' for indications ON and '**ZZ**' for blinking)

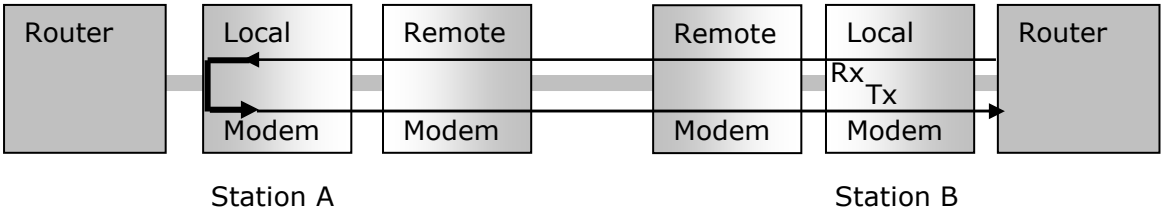
Indications	**Local modem / V.35**	**Remote Modem / G.703**
PWR		
MAS		
SYNC/RTS		
RD		
TD		
TST		
ERR		
LOS		

12. Now EXIT from REM. LOOP BACK and PATTERN GEN

LOCAL DIGITAL LOOP BACK TEST

This test when given at Station A is observed at Station B for complete test of the setup, that includes both end Modems, both end local leads and the Carrier system in whole.

13. At station A, on Local modem / V.35, select DIAGS go to LOCAL DIG and START (i.e. your looping back the signal received from station B)



14. Record observations (Enter '**O**' for indications ON and '**ZZ**' for blinking)

Indications	**Station A**		**Station B**	
	Local / V.35 Modem	**Remote / G.703 Modem**	**Remote / G.703 Modem**	**Local / V.35 Modem**
PWR				
MAS				
SYNC/RTS				
RD				
TD				
TST				
ERR				
LOS				

15. Now EXIT from the LOCAL DIG

1. What type of Modem is Team link 4064?

2. Write the Configuration settings of V.35 & G.703 Modems required for leased line connectivity?

3. Write about loop back testings on Modems and their benefits?